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BRITISH STANDARD

BS 2655-8: 1971

Incorporating Amendment Nos. 1 and 2

Specification for

Lifts, escalators, passenger conveyors and paternosters —

Part 8: Modernization or reconstruction of lifts, escalators and paternosters

UDC 621.876

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Institution of Electrical Engineers
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Mechanical Handling Engineers' Association
National Association of Lift Makers
Post Office
Retail Trading Standards Association

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Foreword

In order to keep abreast of progress in the industries concerned, British Standards are subject to periodical review. Suggestions for improvements will be recorded and in due course brought to the notice of the committees charged with the revision of the standards to which they refer.

A complete list of British Standards, numbering over 9,000, fully indexed and with a note of the contents of each, will be found in the BSI Catalogue which may be purchased from BSI Sales Department. The Catalogue may be consulted in many public libraries and similar institutions.

This British Standard, prepared under the authority of the Mechanical Engineering Industry Standards Committee, is a revision of and supersedes the 1965 edition of BS 2655, which was entitled "Electric lifts".

The new title reflects the extension of the scope of this British Standard. An amendment to Part 2 of this standard has been published, and implements the change in title. The revised Parts 1 and 3 and additional new Parts are being published separately and, together with Part 2, 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, 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[1)] 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, speed and car internal 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 surfaces remain parallel to the direction of motion and are 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 axe 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.

CP407:1972, *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.

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

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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 specifies engineering and safety requirements relevant to the modernization or reconstruction of lifts, escalators and paternosters, and is the first issue of BS 2655 which covers this aspect.

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

Such modernization or reconstruction of existing lifts as is commissioned before 31 May 1984, for use in existing buildings that were built before 31 May 1979, are permitted to be in accordance with either this standard or BS 5655-1. After 31 May 1984, the requirements of BS 5655-1 only are applicable unless it can be shown that, owing to space limitations, compliance is not reasonably practicable. Special provisions are permissible to meet certain site conditions often present in buildings that have been in use for many years. It is intended that the use of new equipment should not automatically be restricted because certain site conditions are now more rigorous than formerly.

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 13 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 Scope

This Part of the British Standard deals with the engineering and safety requirements to be incorporated when modernizing and/or reconstructing lifts, escalators and paternosters with the object that parts affected by such changes shall comply with Parts 1, 4 or 5 of this standard as far as it is reasonably practicable to do so. Where it is not reasonably practicable to comply, provision is made in this Part to allow such deviations as will secure a minimum acceptable standard of safety having regard to circumstances affecting the installation.

In other words, it is the intention of this Part to be constructive rather than restrictive, and to allow an installation of reasonable standard to be modernized or reconstructed in stages as necessary.

In the case of completely new installations replacing those existing, special provisions are made to meet certain site restrictions which are often present in buildings that have been in use for many years. These are made so that the use of new equipment is not automatically restricted because certain site requirements are now more rigorous than formerly.

In cases where a lift, escalator or paternoster is moved to a different location, it is not deemed as an alteration, and the equipment, when reinstalled, shall comply with all the requirements of Part 1 of this standard.

Appendix A is a check list which summarizes, for electric lifts, the major alterations covered by this part of the standard and the consequent requirements affecting various parts of the installation. Appendix B provides a similar summary in respect of hydraulic lifts.

2 Electric lifts

2.1 Requirements for the major alterations defined in 2.2

All lifts undergoing major alterations shall comply with the requirements of this standard in the following respects:

1) The lift machine shall be provided with an electrically released brake to conform to Part 1, **2.15.4** and **2.15.5**.

2) An electrical switch shall be provided for the car door or gate and the switch, together with its connections, shall conform to Part 1, **2.9.1** and its note; but it is not a mandatory requirement that the car door or gate shall be locked while the car is in motion.

3) An electrical switch shall be provided on the safety gear and/or on the governor to conform to Part 1, **2.12.1** 6) and **2.13.5**.

4) The car emergency devices shall conform to Part 1, **2.10**.

5) Car and landing collapsible gates shall, where permitted, conform to **2.3.2** and **2.3.3** of this Part 8.

6) The machine room shall be secured against unauthorized access, and a danger notice shall be fitted to the outside of the door to conform to Part 6, **2.4.4**.

7) Adequate artificial lighting shall be provided in the machine room to conform to Part 6, **2.4.3**.

8) The lift well construction shall comply with Part 6, **2.2.2** except that where fire regulations permit the use of wire grille or similar construction material, the mesh or opening shall not be greater than 30 mm or 1¼ in and of sufficient strength to resist, without undue material deformation, the accidental impact by users of the staircase or adjoining floors, or by materials or trucks being moved in the vicinity. Where the clearance between the inside of an open type lift well enclosure and any moving or movable part of the lift equipment or apparatus is less than 100 mm or 4 in, the mesh or openings in the enclosure shall be further protected by netting of square mesh not greater than 12 mm or ½ in and made of wire not smaller than 0.9 mm or 0.036 in.

9) The counterbalance shall be checked against possible car modifications since the original installation.

10) There shall be provision for the opening of a landing door by an authorized person by means of an emergency key, irrespective of the position of the lift car.

11) It may not be possible in every case to comply with the car bottom clearance requirements in full as specified in Part 1, **2.3.1**. However, every endeavour should be made to do so.

12) Bottom runby for lifts with counterweights, as specified in Part 1, **2.3.2**, is required for reliable operation. However, if these requirements cannot be met in full, the runby may be reduced.

13) If the car top clearance cannot be made to satisfy the requirements of Part 1, **2.3.5**, or **2.3.6** a warning notice shall be displayed on the car top, adjacent to the mechanics' control station, and indicating "Reduced overhead clearance".

14) Reduced stroke oil buffers may be used for lifts having speeds of 2.5 m/s or 500 ft/min or more, provided that in all other respects they comply with Part 1, **2.2.2**.

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15) Where the car capacity does not conform to the requirements of Part 1, **2.11**, and where it is not required to do so by any of the following major alterations, an exemption (regularly renewable) shall be obtained from an appropriate authority before a new test certificate (when required by Part 8, **6.1**) is issued. The load plate shall, in all cases, conform to Part 1, **2.17**.

16) Where a major alteration involves a change or an addition to the wiring of the installation, the main switches and wiring of the completed installation shall conform to Part 1, **2.20** and **2.22**.

17) Locking devices for landing entrances shall conform to Part 1, **2.9**.

2.2 Specific requirements for major alterations

2.2.1 General. The following shall be considered as major alterations and, in addition to the requirements of **2.1**, the completed installation shall conform to the requirements of **2.2.2** to **2.2.18**:

1) Change in rated speed (see **2.2.2**)

2) Change in rated load (see **2.2.3**)

3) Change in dead weight of car (see **2.2.4**)

4) Change in travel (see **2.2.5**)

5) Change in size or type of guides (see **2.2.6**)

6) Replacement of car or counterweight safety gear (see **2.2.7**)

7) Addition of top of car control station (see **2.2.8**)

8) Change to roller guide shoes (see **2.2.9**)

9) Addition of landing door and/or car door operating devices (see **2.2.10**)

10) Change in type of control system (see **2.2.11**)

11) Change in type of power system (see **2.2.12**)

12) Change in power supply to the equipment (see **2.2.13**)

13) Replacement of an existing lift machine by a new machine (see **2.2.14**)

14) Replacement of an existing controller by a new controller (see **2.2.15**)

15) Replacement of an existing lift machine brake by a new brake (see **2.2.16**)

16) Replacement of landing doors or gates (see **2.2.17**)

17) Replacement or addition of landing door or gate locking devices, or car door or gate electric switches (see **2.2.18**).

2.2.2 Change in rated speed. Where the alteration consists of a change in the rated speed:

1) The car and the counterweight buffers shall conform to Part 1, **2.2**.

2) For a lift uprated in speed, Part 8, **2.1** 11), 12), 13) and 14) apply.

3) Car doors or gates shall be provided at all entrances to conform to Part 1, **2.6** or Part 8, **2.3.2**.

4) Safety gear shall be provided in accordance with Part 1, **2.12** and **2.13**.

5) The car capacity shall conform to Part 1, **2.11**.

6) The lift machine, sheaves, pulleys and suspension shall conform to Part 1, **2.14** and **2.15**.

7) Terminal stopping and final limit switches shall conform to Part 1, **2.21**.

8) The operation and operating devices shall conform to Part 1, **2.19**.

2.2.3 Change in rated load. Where the alteration consists of a change in the rated load:

1) The lift structure, supporting beams and foundations shall comply with the structural requirements covered by Part 6 of this standard.

2) Guide rails, supports and fixings shall comply with Part 1, **2.1**.

3) Buffers for the car and the counterweight shall comply with Part 1, **2.2** and Part 8, **2.1** 14).

4) The car frame, car platform, car enclosure and car doors or gates shall conform to Part 1, **2.4**, **2.5** and **2.6**.

5) The capacity shall conform to Part 1, **2.11**.

6) The counterweight shall conform to the requrements of Part 1, **2.16**, and its weight shall be adjusted as appropriate. Existing rod type counterweights may be retained provided that new counterweight rods, having a safety factor of not less than 5, are fitted. Any safety rope connection to a rod type counterweight shall be such as to operate the car safety gear if any part of the counterweight becomes detached.

7) Safety gear shall be provided in accordance with Part 1, **2.12** and **2.13**.

8) The lift machine, sheaves, pulleys and suspension shall conform to Part 1, **2.14** and **2.15**.

2.2.4 Change in dead weight of car. Where the alteration results in a change in the dead weight of the car and its attachments of more than 5 %, the completed installation shall conform to the requirements of Part 8, **2.2.3**.

2.2.5 Change in travel. Where the travel is increased or decreased:

1) The guide lengths in the direction of the change in travel shall comply with Part 1, **2.1.2**.

2) The terminal stopping and final limit switches shall be re-located to conform to Part 1, **2.21**.

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3) The car and counterweight clearances and runbys shall conform to Part 1, **2.3**, in the direction of the change in travel.

2.2.6 Change in size or type of guides. Where the size or type of guides is changed, the new guides together with their fixings and the car or counterweight safety gear shall conform to Part 1, **2.1** and **2.12**.

2.2.7 Replacement of car or counterweight safety gear. Where the car or counterweight safety gear is replaced or changed in type:

1) The new safety gear shall conform to Part 1, **2.12** and **2.13** for such equipment capable of stopping and sustaining the load as defined in Part 1, **2.11**.

2) The guides and their fixings shall comply with Part 1, **2.1**.

3) The buffers shall comply with Part 1, **2.2** and Part 8, **2.1** 14).

4) The top and bottom clearances shall comply with Part 1, **2.3** [except as permitted by Part 8, **2.1** 11), 12) and 13)].

2.2.8 Addition of top of car control station. Where the alteration consists only of the addition of top of car control stations, they shall conform to the requirements of Part 1, **2.19.6**, except that the car may travel at a speed not exceeding 0.8 m/s or 160 ft/min where it is not reasonably practicable to reduce the speed to 0.5 m/s or 100 ft/min. A switch as specified in Part 1, **2.19.7** shall be provided in each lift pit.

2.2.9 Change to roller guide shoes. Where roller or similar type guide shoes are installed, which allow a definite limited movement of the car or counterweight with respect to the guides, the shoes shall comply with Part 1, **2.4** and **2.16.4**.

The clearance between the car and/or counterweight safety jaws and the guides shall be such that the safety jaws cannot touch the guides when the car or counterweight frame is pressed towards the guide faces with sufficient force to take up all movement of the roller guide shoes. This may require extensive alterations to the existing car or counterweight safety gear.

2.2.10 Addition of landing door and/or car door operating devices. Where landing and/or car door power operating devices are installed, the landing and the car equipment shall conform to the requirements of Part 1, **2.4** to **2.10** inclusive. In addition the overhead clearances shall conform to Part 1, **2.3** except as permitted by Part 8, **2.1** 12) and 13).

2.2.11 Change in type of control system. Where the alteration consists of a change in the control system governing the method of operating the lift:

1) Lift cars and car doors or gates shall conform to Part 1, **2.5** and **2.6**, except as permitted by Part 8, **2.3.2**.

2) The capacity shall conform to Part 1, **2.11**.

3) Terminal stopping and final limit switches shall conform to Part 1, **2.21**.

4) Safety gear shall be provided in accordance with Part 1, **2.12** and **2.13**.

5) The operating devices and control equipment shall conform to Part 1, **2.18**, **2.19** and **2.20**.

2.2.12 Change in type of power system. Where the alteration consists of a change in the power system governing the control of the driving motor:

1) The terminal stopping and final limit switches shall conform to Part 1, **2.21**.

2) The car platform shall comply with Part 1, **2.5.6**.

3) The capacity shall conform to Part 1, **2.11**.

4) Operating devices and control equipment shall conform to Part 1, **2.18**, **2.19** and **2.20**.

5) Hand winding facilities shall be provided to comply with Part 1, **2.15.3**.

6) Safety gear shall be provided in accordance with Part 1, **2.12** and **2.13**.

2.2.13 Change in power supply to the equipment. Where the alteration consists of a change in the power supply involving a change in the voltage, frequency or the number of phases, or a change from d.c. to a.c., or vice versa, or a change to a combination of d.c. and a.c., only such electrical equipment as can be adjusted to operate satisfactorily shall be retained. In addition:

1) Hand winding facilities shall be provided to conform to Part 1, **2.15.3**.

2) New operating devices and control equipment shall conform to Part 1, **2.18**, **2.19** and **2.20**.

3) The terminal stopping and final limit switches shall conform to Part 1, **2.21**.

4) Single-speed polyphase induction motors shall conform to the requirements of Part 2 of this standard where applicable.

5) Where the change in power supply involves the use of static rectifiers, means shall be provided on each lift controller to absorb energy regenerated by the lift motor under overhauling load conditions to limit the lift speed to a maximum of 125 % rated speed.

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2.2.14 Replacement of an existing lift machine by a new machine. Where the alteration involves the replacement of an existing lift machine by a new machine:

1) The new machine shall conform to Part 1, **2.15**.

2) The capacity shall conform to Part 1, **2.11**.

3) The means of suspension shall conform to Part 1, **2.14**.

4) Safety gear shall be provided in accordance with Part 1, **2.12** and **2.13**.

2.2.15 Replacement of an existing controller by a new controller. Where the alteration consists of the replacement of an existing controller by a new controller without any change in the type of control system or power system, the new controller shall conform to the requirements of Part 1, **2.18** and **2.20**.

2.2.16 Replacement of an existing lift machine brake by a new brake. Where the alteration involves the replacement of an existing lift machine brake by a new brake, the new brake shall conform to Part 1, **2.15.4** and **2.15.5**.

2.2.17 Replacement of landing doors or gates. Where one or more landing doors or gates are replaced by new doors, all the doors and their interlocks shall conform to Part 1, **2.6** and **2.9**.

Single damaged gates may be replaced with new close-picket type gates to conform to Part 8, **2.3.3**, but where the majority of the landing gates are replaced after the date of this standard they shall all be replaced with doors and interlocks to conform to Part 1, **2.6** and **2.9**.

2.2.18 Replacement or addition of landing door or gate locking devices, or car door or gate electrical switches. Where the alteration consists of the replacement or addition of landing door interlocks, all the locking devices shall conform to Part 1, **2.9**.

Where the alteration consists of the addition of car door or gate electrical switches, the alteration shall conform to Part 1, **2.9.1** and its note, but it is not a mandatory requirement that the car door or gate shall be locked while the car is in motion.

2.3 General requirements for minor alterations

2.3.1 Any alteration not listed in Part 8, **2.2.1** as a major alteration (e.g. a minor reduction in speed and/or load) shall be considered a minor alteration if not carried out in conjunction with a major alteration. Minor alterations that directly affect safety shall conform to the requirements of Part 1 of this standard for the parts concerned.

2.3.2 Open type car gates shall, where practicable, be replaced with solid doors or shutter or multi-leaf type doors conforming to Part 1, **2.6**.

Where it is not practicable to make this change, close-picket type gates extending the full height and width of the car openings may be used, provided that:

1) The top track of the gate does not obstruct the entrance.

2) The gate has no openings exceeding 65 mm or 2½ in in width between the vertical members of the gate when it is fully extended.

3) The gate is manually operated.

4) The lift speed does not exceed 0.75 m/s or 150 ft/min.

5) An EMERGENCY STOP switch is fitted in the car.

2.3.3 Open type landing gates shall, where practicable, be replaced with solid doors or shutter or multi-leaf type doors conforming to Part 1, **2.6**.

Exceptionally, where fire regulations permit, open type landing gates may be replaced with close-picket type gates extending the full height and width of the opening, conforming to Part 8, **2.3.2** 1), 2), 3) and 4). In addition:

1) Measures shall be taken to prevent the access of feet through the gate.

2) Measures shall be taken to prevent unauthorized access to the inter-locking device and to the control devices in the lift car.

2.3.4 Where a new governor is added, or an existing governor is replaced, then it, and its operating rope, shall comply with Part 1, **2.13**.

2.3.5 Where landing entrances are taken out of use, provision shall be made for emergency openings as required by Part 6, **2.1**.

2.4 Repairs and replacements of damaged, broken or worn parts

2.4.1 Repairs and replacements of damaged, broken or worn parts shall be made with parts of equivalent design, strength and material. The apparatus to which such parts are fitted shall be re-adjusted to function with appropriate clearances.

2.4.2 Governor ropes or safety ropes shall be replaced by ropes complying with Part 1, **2.13.6**.

2.4.3 Replacement of timber load supporting members shall be made with those constructed in steel meeting the requirement of this standard. Damaged or worn sections of timber guide rails may be replaced with equivalent timber sections.

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2.5 Replacement of an existing lift in its present lift well

Where an existing lift is replaced, it shall completely conform to the requirements of Part 1, except as permitted by Part 8, **2.1** 11), 12), 13) and 14).

NOTE It is preferable to modify existing wells in whole or in part to conform to Part 3.

3 Hydraulic lifts

3.1 Requirements for the major alterations defined in 3.2

All lifts undergoing major alterations shall comply with this standard in the following respects:

1) An electrical switch shall be provided for the car door or gate and the switch, together with its connections, shall conform to Part 1, **2.9.1** and its note; but it is not a mandatory requirement that the car door or gate shall be locked while the car is in motion.

2) An electrical switch shall be provided on the safety gear (where fitted) and/or on the governor to conform to Part 1, **2.12.1** 6) and **2.13.5**.

3) The car emergency devices shall conform to Part 1, **2.10**.

4) Car and landing collapsible gates shall, where permitted, conform to **2.3.2** and **2.3.3** of this Part 8.

5) The machine room shall be secured against unauthorized access, and a danger notice shall be fitted to the outside of the door to conform to Part 6, **2.4.4**.

6) Adequate artificial lighting shall be provided in the machine room to conform to Part 6, **2.4.3**.

7) The lift well construction shall comply with Part 6, **2.2.2** except that where fire regulations permit the use of wire grille or similar construction material, the mesh or opening shall be not greater than 30 mm or 1 ¼ in and of sufficient strength to resist, without undue material deformation, the accidental impact by users of the staircase or adjoining floors, or by materials or trucks being moved in the vicinity. Where the clearance between the inside of an open type lift well enclosure and any moving or movable part of the lift equipment or apparatus is less than 100 mm or 4 in, the mesh or openings in the enclosure shall be further protected by netting of square mesh not greater than 12 mm or ½ in and made of wire not smaller than 0.9 mm or 0.036 in.

8) The counterbalance, where used, shall be checked against possible car modifications since the original installation.

9) There shall be provision for the opening of a landing door by an authorized person by means of an emergency key, irrespective of the position of the lift car.

10) The operating pressures shall be checked, and shall not exceed the original design values unless the equipment has been proved to withstand a static pressure equal to twice the new maximum operating pressure without permanent deformation.

11) It may not be possible in every case to comply with the car bottom clearance requirements in full as specified in Part 1, **5.3.1**. However, every endeavour should be made to do so.

12) Bottom runby as specified in Part 1, **5.3.5** is required for reliable operation. However, if these requirements cannot be met in full, the runby may be reduced.

13) If the car top clearance cannot be made to satisfy the requirements of Part 1, **5.3.4**, a warning notice shall be displayed on the car top, adjacent to the mechanics' control station and indicating "Reduced overhead clearance".

14) Reduced stroke oil buffers may be used for lifts having speeds of 2.5 m/s or 500 ft/min or more, provided that in all other respects they comply with Part 1, **2.2.2**.

15) Where the car capacity does not conform to the requirements of Part 1, **5.11**, and where it is not required to do so by any of the following major alterations, an exemption (regularly renewable) shall be obtained from an appropriate authority before a new test certificate (when required by Part 8, **6.1**) is issued. The load plate shall, in all cases, conform to Part 1, **5.17**.

16) Where a major alteration involves a change or an addition to the wiring of the installation, the main switches and wiring of the completed installation shall conform to Part 1, **2.20** and **5.19**.

17) Locking devices for landing entrances shall conform to Part 1, **2.9**.

3.2 Specific requirements for major alterations

3.2.1 General. The following shall be considered as major alterations, and in addition to the requirements of **3.1**, the completed installation shall conform to the requirements of **3.2.2** to **3.2.17**:

1) Change in rated speed (see **3.2.2**)

2) Change in rated load (see **3.2.3**)

3) Change in dead weight of car (see **3.2.4**)

4) Change in travel (see **3.2.5**)

5) Change in size or type of guides (see **3.2.6**)

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6) Replacement of car or counterweight safety gear (see **3.2.7**)

7) Addition of top of car control station (see **3.2.8**)

8) Change to roller guide shoes (see **3.2.9**)

9) Addition of landing door and/or car door operating devices (see **3.2.10**)

10) Change in type of control system (see **3.2.11**)

11) Change in type of power system (see **3.2.12**)

12) Change in power supply to the equipment (see **3.2.13**)

13) Replacement of existing hoisting machinery by new machinery (see **3.2.14**)

14) Replacement of an existing controller by a new controller (see **3.2.15**)

15) Replacement of landing doors or gates (see **3.2.16**)

16) Replacement or addition of landing door or gate locking devices, or car door or gate electrical switches (see **3.2.17**).

3.2.2 Change in rated speed. Where the alteration consists of a change in the rated speed:

1) The car and the counterweight buffers shall conform to Part 1, **5.2**.

2) Car doors or gates shall be provided at all entrances to conform to Part 1, **2.6** or Part 8, **3.3.2**.

3) Safety gear shall be provided in accordance with Part 1, **5.12**.

4) The car capacity shall conform to Part 1, **2.11**.

5) The operating cylinder shall conform to Part 1, **5.15.7** and pulleys, sheaves and suspension ropes or chains shall conform to Part 1, **5.14**.

6) Terminal stopping switches shall conform to Part 1, **5.20**.

7) The operation and operating devices shall conform to Part 1, **2.19**.

3.2.3 Change in rated load. Where the alteration consists of a change in the rated load:

1) The lift structure supporting beams and foundations shall comply with the structural requirements covered by Part 6 of this standard.

2) Guide rails, supports and fixings shall comply with Part 1, **5.1**.

3) Buffers for the car and the counterweight (if fitted) shall comply with Part 1, **5.2** and Part 8, **3.1** 14).

4) The car frame, car platform, car enclosure and car doors or gates shall conform to Part 1, **5.4**, **2.5** and **2.6**.

5) The capacity shall conform to Part 1, **2.11**.

6) The counterweight (if fitted) shall conform to the requirements of Part 1, **2.16**, and its weight shall be adjusted as appropriate. Existing rod type counterweights may be retained provided that new counterweight rods, having a safety factor of not less than 5, are fitted. Any safety rope connection to a rod type counterweight shall be such as to operate the car safety gear if any part of the counterweight becomes detached.

7) Safety gear shall be provided in accordance with Part 1, **5.12**.

8) The operating cylinder shall conform to Part 1, **5.15.7** and pulleys, sheaves and suspension ropes or chains shall conform to Part 1, **5.14**.

3.2.4 Change in dead weight of car. Where the alteration results in a change in the dead weight of a car and its attachments of more than 5 %, the completed installation shall conform to the requirements of Part 8, **3.2.3**.

3.2.5 Change in travel. Where the travel is increased or decreased:

1) The guide lengths in the direction of the change in travel shall comply with Part 1, **2.1.2**.

2) The terminal stopping switches and permanent stops shall be re-located to conform to Part 1, **5.20** and **5.13** respectively.

3) The car and counterweight clearances and runby shall conform to Part 1, **5.3** in the direction of the change in travel.

4) Rams and ram stops shall conform to Part 1, **5.15.4**.

3.2.6 Change in size or type of guides. Where the size or type of guide rails is changed, the new guide rails together with their fixings and the car or counterweight safety gear shall conform to Part 1, **5.1** and **5.12** respectively.

3.2.7 Replacement of car or counterweight safety gear. Where the car or counterweight safety gear is replaced or changed in type:

1) The new safety gear shall conform to Part 1, **5.12** for such equipment capable of stopping and sustaining the load as defined in Part 1, **2.11**.

2) The guides and their fixings shall comply with Part 1, **5.1**.

3) The buffers shall comply with Part 1, **5.2** and Part 8, **3.1** 14).

4) The top and bottom clearances shall comply with Part 1, **5.3** [except as permitted by Part 8, **3.1** 11), 12) and 13)].

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3.2.8 Addition of top of car control station. Where the alteration consists only of the addition of top of car control stations, they shall conform to the requirements of Part 1, **2.19.6** and **2.19.8**.

3.2.9 Change to roller guide shoes. Where roller or similar type guide shoes are installed, which allow a definite limited movement of the car or counterweight with respect to the guides, the shoes shall comply with Part 1, **5.4** and **2.16.4**.

The clearance between the car and/or counterweight safety jaws and the guides shall be such that the safety jaws cannot touch the guides when the car or counterweight frame is pressed towards the guide faces with sufficient force to take up all movement of the roller guide shoes. This may require extensive alterations to the existing car or counterweight safety gear.

3.2.10 Addition of landing door and/or car door operating devices. Where landing and/or car door power operating devices are installed, the landing and the car equipment shall conform to the requirements of Part 1, **2.4** to **2.10** inclusive. In addition, the overhead clearances shall conform to Part 1, **5.3**, except as permitted by Part 8, **3.1** 12) and 13).

3.2.11 Change in type of control system. Where the alteration consists of a change in the control system governing the method of operating the lift:

1) Lift cars and doors or gates shall conform to Part 1, **2.5** and **2.6**, except as permitted by Part 8, **3.3.2**.

2) The capacity shall conform to Part 1, **2.11**.

3) Terminal stopping switches and permanent stops shall conform to Part 1, **5.20** and **5.13** respectively.

4) Safety gear shall be provided in accordance with Part 1, **5.12**.

5) The operating devices and control equipment shall conform to Part 1, **5.18**, **2.19** and **2.20**.

3.2.12 Change in type of power system. Where the alteration consists of a change to the power system:

1) The terminal stopping and permanent stops shall conform to Part 1, **5.20** and **5.13** respectively.

2) The car platform shall comply with Part 1, **2.5.6**.

3) The capacity shall conform to Part 1, **2.11**.

4) Operating devices and control equipment shall conform to Part 1, **5.18**, **2.19** and **2.20**.

5) Manual operating facilities shall be provided to conform to Part 1, **5.15.2**.

6) Safety gear shall be provided in accordance with Part 1, **5.12**.

3.2.13 Change in power supply to the equipment. Where the alteration consists of a change in the power supply involving a change in the voltage, frequency or the number of phases, or a change from d.c. to a.c. or vice versa or a change to a combination of d.c. and a.c., only such electrical equipment as can be adjusted to operate satisfactorily shall be retained. In addition:

1) Manual operating facilities shall be provided to conform to Part 1, **5.15.2**.

2) New operating devices and control equipment shall conform to Part 1, **5.18**, **2.19** and **2.20**.

3) Terminal stopping switches and permanent stops shall conform to Part 1, **5.20** and **5.13** respectively.

3.2.14 Replacement of existing hoisting machinery by new machinery. Where the alteration involves the replacement of existing hoisting machinery by new machinery:

1) New machinery shall conform to Part 1, **5.15**.

2) The capacity shall conform to Part 1, **2.11**.

3) The means of suspension shall conform to Part 1, **5.14**.

4) Safety gear shall be provided in accordance with Part 1, **5.12**.

3.2.15 Replacement of an existing controller by a new controller. Where the alteration consists of the replacement of an existing controller by a new controller without any change in the type of control system, the new controller shall conform to the requirements of Part 1, **5.18** and **2.20**.

3.2.16 Replacement of landing doors or gates. Where one or more landing doors or gates are replaced by new doors, all the doors and their interlocks shall conform to Part 1, **2.6** and **2.9**.

Single damaged gates may be replaced with new close-picket type gates to conform to Part 8, **2.3.3**, but where the majority of the landing gates are replaced after the date of this standard, they shall all be replaced with doors and interlocks to conform to Part 1, **2.6** and **2.9**.

3.2.17 Replacement or addition of landing door or gate locking devices, or car door or gate electrical switches. Where the alteration consists of the replacement or addition of landing door interlocks, all the locking devices shall conform to Part 1, **2.9**. Where the alteration consists of the addition of car door or gate electrical switches, the alteration shall conform to Part 1, **2.9.1** and its note, but it is not a mandatory requirement that the car door or gate shall be locked while the car is in motion.

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3.3 General requirements for minor alterations

3.3.1 Any alteration not listed in Part 8, **3.2.1** as a major alteration (e.g. a minor reduction in speed and/or load) shall be considered a minor alteration if not carried out in conjunction with a major alteration. Minor alterations that directly affect safety shall conform to the requirements of Part 1 of this standard for the parts concerned.

3.3.2 Open type car gates shall, where practicable, be replaced with solid doors or shutter or multi-leaf type doors conforming to Part 1, **2.6**.

Where it is not practicable to make this change, close-picket type gates conforming to Part 8, **2.3.2** may be used.

3.3.3 Open type landing gates shall, where practicable, be replaced with solid doors or shutters or multi-leaf type doors conforming to Part 1, **2.6**.

Exceptionally, where fire regulations permit, open type landing gates may be replaced with close-picket type gates conforming to Part 8, **2.3.3**.

3.3.4 Where a new governor is added, or an existing governor is replaced, then it, and its operating rope, shall comply with Part 1, **2.13**.

3.3.5 Where landing entrances are taken out of use provision shall be made for emergency openings as required by Part 6, **2.1**.

3.4 Repairs and replacements of damaged, broken or worn parts

3.4.1 Repairs and replacements of damaged, broken or worn parts shall be made with parts of equivalent design, strength and material. The apparatus to which such parts are fitted shall be readjusted to function with appropriate clearances.

3.4.2 Governor ropes or safety ropes shall be replaced by ropes complying with Part 1, **2.13.6**.

3.4.3 Replacement of timber load supporting members shall be made with those constructed in steel meeting the requirements of this standard. Damaged or worn sections of timber guide rails may be replaced with equivalent timber sections.

3.5 Replacement of an existing lift in its present lift well

Where an existing lift is replaced, it shall completely conform to the requirements of Part 1, except as permitted by Part 8, **3.1** 11), 12), 13) and 14).

NOTE It is preferable to modify existing wells in whole or in part to conform to Part 3.

4 Escalators

4.1 General

Reconstruction work involved in the modernization of an escalator usually involves the complete replacement of all equipment within the truss, and as a result (in most cases) the complete replacement of the escalator is the better solution. If, however, retention of the truss is essential the alteration shall conform to the requirements of this standard.

Minor alterations which directly affect safety shall conform to the requirements of this standard. However, replacement components of existing assemblies shall have safety factors no less than those of existing equipment.

4.2 Design requirements

The installation shall conform to Part 4, **2.1**, except as follows:

1) On existing installations where facilities for dimensional changes are restricted, the angle of inclination need not be reduced from its present value even though this exceeds the value permitted by Part 4, **2.1.2**.

2) For existing installations, existing ratings may be maintained for contract load, structural load and step load where there is no change made in design of brake, step drives, power transmission, steps or truss. Load ratings shall be brought in line with Part 4, **2.1.4** as appropriate where new components are introduced.

4.3 Steps

The installation shall conform to Part 4, **2.2**, except as follows:

At the ends of the escalator the distance through which the steps travel in a substantially horizontal direction may be maintained at present value, providing the speed is not increased.

4.4 Landing plates

The installation shall conform to Part 4, **2.3**.

4.5 Comb plates

The installation shall conform to Part 4, **2.4**.

4.6 Balustrading

The installation shall conform to Part 4, **2.5**, except as follows:

Existing balustrade profiles may be maintained provided they do not depart substantially from these conditions as regards the upper portion of the balustrading. Strict compliance is essential for the skirting and lower portion of the balustrading.

4.7 Guards at ceiling intersection

The installation shall conform to Part 4, **2.6**.

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4.8 Handrails

The installation shall conform to Part 4, **2.7**.

4.9 Driving machinery

The installation shall conform to Part 4, **2.8**.

4.10 Safety factors

The installation shall conform to Part 4, **2.9** so far as new equipment is concerned.

4.11 Operating and safety devices

The installation shall conform to Part 4, **2.10**.

4.12 Machinery spaces

The installation shall conform to Part 4, **2.11**.

4.13 Main switches and wiring

The installation shall conform to Part 4, **2.12**.

4.14 Controllers

The installation shall conform to Part 4, **2.13**, except as follows:

Existing controllers may remain if the requirements of this clause are met as regards safety.

4.15 Lighting

The installation shall conform to Part 4, **2.14**.

4.16 Marking

The installation shall conform to Part 4, **2.15**.

5 Paternosters

5.1 General

Minor alterations which directly affect safety shall conform to the requirements of this standard. However, replacement components of existing assemblies shall have safety factors no less than those of existing equipment.

5.2 Factors of safety

Factors of safety on all equipment should not be less than stated in Part 5.

5.3 Speed

The installation shall conform to Part 5, **1.2**.

5.4 Guides and fixings

5.4.1 Rigid guides shall be used for guiding the cars.

5.4.2 Centre guides shall be provided with spear points and crossbeams as covered by Part 5, **2.1** to ensure continuity of guiding.

5.4.3 Timber guides, if used, shall be replaced when wear has reduced the dimension across two opposite faces by 6 mm or 0.25 in from the original.

5.5 Car frames

Guide shoes and bows shall be fitted as stated in Part 5, **2.2**.

5.6 Car capacity and loading

Cars shall conform to Part 5, **2.3**.

5.7 Car enclosure

Cars shall comply to Part 5, **2.4**.

5.8 Landing entrances

Landing entrances shall conform to Part 5, **2.5**.

5.9 Screens and lighting

Screens and lighting shall conform to Part 5, **2.6**.

5.10 Suspension

Suspension shall comply with Part 5, **2.7**.

5.11 Driving machinery and sprockets

Reconstruction of installations shall include for re-instatement of driving machinery in accordance with Part 5, **2.8**. Driving machinery and sprockets shall conform to Part 5, **2.8**.

5.12 Load and warning plates

Load and warning plates shall conform to Part 5, **2.9**.

5.13 Controllers

The installation shall conform to Part 5, **2.10**, except as follows:

Existing controllers may remain if the requirements of this clause are met as regards safety.

5.14 Operation and operating devices

The installation shall comply with Part 5, **2.11**.

5.15 Suppression

Suppression shall comply with Part 5, **2.12**.

5.16 Circuit breaker and main switch

Circuit breakers and main switches shall conform to Part 5, **2.13**.

5.17 Wiring

Wiring shall conform to Part 5, **2.14**.

6 Testing

6.1 General

All parts affected either directly or indirectly by any alteration carried out in all the preceding sections of this Part 8 of the standard shall be retested and in the event of a major alteration, a new test certificate conforming to the requirements of Part 7 shall be issued.

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Appendix A Check list for the major modernization or reconstruction of electric lifts

For full details of major alterations and consequent requirements affecting various parts of the installation see the body of this Part of the standard.

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Major alteration	Part 8	Part 1	Part 8	Items affected
Change in rated speed	2.2.2		2.1(11)	Car bottom clearance
			2.1(12)	Bottom runby (lifts with counterweights)
			2.1(13)	Car top clearance
		2.2.2	2.1(14)	Reduced stroke oil buffers
		2.9.1	2.1(2)	Car door/gate contact
		2.10		Car emergency devices
			2.1(15)	Car capacity and load plate
Change in rated load	2.2.3	2.12.1(6)	2.1(3)	Safety gear switch
		2.13.5		Governor switch
		2.15.4 and 5		Machine brake
			2.1(15)	Radio and TV interference suppression
			2.1(15)	Main switches and wiring
			2.1(9)	Counterbalance
			2.1(10)	Emergency unlocking device
			2.3.2	Car gates
			2.3.3	Landing gates
			2.6	Testing
Change in dead weight of car	2.2.4	2.1		Guide rails, supports and fixings
Change in travel	2.2.5	2.1.2		Guide lengths
Change in type of guides	2.2.6	2.2		Buffers for car and counterweights
Replacement of safety gear	2.2.7	2.3		Bottom runby and top clearances
Top of car control station	2.2.8	2.4		Car frame
Change to roller guide shocs	2.2.9	2.4		Car roller guides
Addition of landing door and/or car door operating devices	2.2.10	2.5		Car enclosure and platform
Change in type of control system	2.2.11	2.5.6		Platform
Change in type of power system	2.2.12	2.6		Car and landing entrance construction
Change in power supply	2.2.13	2.6	2.3.2	Car doors or gates
Replacement of lift machine	2.2.14	2.6	2.3.3	Landing doors or gates
Replacement of lift machine brake	2.2.16	2.7		Power closing of entrances (automatic)
Replacement of controller	2.2.15	2.8		Power closing of entrances (controlled)
Replacement of landing doors/gates	2.2.17	2.9		Locking devices and switches
Replacement of locking devices	2.2.18	2.9.1		Car door or gate electrical switches
Replacement of car door/gate switches	2.2.18	2.11		Car capacity
		2.12		Car and counterweight safety gear
		2.13		Governor
		2.14		Suspension, sheaves and pulleys
		2.15		Lift machine
		2.15.3		Hand winding facilities
		2.16	2.2.3(6)	Counterweight
		2.16.4		Counterweight roller guides
		2.18		Controllers
		2.19		Operation and operating devices
		2.19.6	2.2.8	Top of car control station
		2.21		Terminal stopping and final limit switches
		(Part 2)		Single speed polyphase induction motors
		(Part 6)		Lift structure, beams and foundations
		(Part 6,2.2.2)	(Part 8,2.1(8))	Lift well construction
		(Part 6,2.4.3)		Machine-room lighting
		(Part 6,2.4.4)		Machine-room security
		(Part 6,2.1)		Emergency openings

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Appendix B Check list for the major modernization or reconstruction of hydraulic lifts

For full details of major alterations and consequent requirements affecting various parts of the installation see the body of this Part of the standard.

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Major alteration	Part 8	Part 1	Part 8	Items affected
Change in rated speed	3.2.2		3.1(11)	Car bottom clearance
Change in rated load	3.2.3		3.1(12)	Bottom runby
Change in dead weight of car	3.2.4		3.1(13)	Car top clearance
Change in travel	3.2.5	2.2.2	3.1(14)	Reduced stroke oil buffers
Change in type of guides	3.2.6	2.9.1	3.1(1)	Car door/gate contact
Replacement of safety gear	3.2.7	2.10		Car emergency devices
Top of car control station	3.2.8		3.1(15)	Car capacity and load plate
Change to roller guide shoes	3.2.9	2.12.1(6)	3.1(2)	Safety gear switch
Addition of landing door and/or car door operating devices	3.2.10	2.13.5		Governor switch
Change in type of control system	3.2.11		3.1(10)	Operating pressure
Change in type of power system	3.2.12		3.1(16)	Radio and TV interference suppression
Change in power supply	3.2.13		3.1(16)	Main switches and wiring
Replacement of lift machinery	3.2.14		3.1(8)	Counterbalance
Replacement of controller	3.2.15		3.1(9)	Emergency unlocking device
Replacement of landing doors/gates	3.2.16		3.3.2	Car gates
Replacement of locking devices	3.2.17		3.3.3	Landing gates
Replacement of car door/gate switches	3.2.17		2.6	Testing
		5.1		Guide rails, supports and fixings
		2.1.2		Guide lengths
		5.2		Buffers for car and counterweights
		5.3		Bottom runby and top clearances
		5.4		Car frame
		5.4		Car roller guides
		2.5		Car enclosure and platform
		2.5.6		Platform
		2.6		Car and landing entrance construction
		2.6	3.3.2	Car doors or gates
		2.6	3.3.3	Landing doors or gates
		2.7		Power closing of entrances (automatic)
		2.8		Power closing of entrances (controlled)
		2.9		Locking devices and switches
		2.9.1		Car door or gate electrical switches
		2.11		Car capacity
		5.12		Car and counterweight safety gear
		2.13		Governor
		5.14		Suspension, sheaves and pulleys
		5.15		Hoisting machinery
		5.15.4		Rams
		5.15.2		Manual operating facilities
		2.16	3.2.3(6)	Counterweight
		2.16.4		Counterweight roller guides
		5.18		Controllers
		2.19		Operation and operating devices
		2.19.6	3.2.8	Top of car control station
		5.13 and 5.20		Terminal stopping switches
		(Part 6)		Lift structure, beams and foundations
		(Part 6,2.2.2)	(Part 8,3.1(7))	Lift well construction
		(Part 6,2.4.3)		Machine-room lighting
		(Part 6,2.4.4)		Machine-room security
		(Part 6,2.1)	(Part 8,3.3.5)	Emergency openings

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