

Lifts and service lifts —

Part 6: Code of practice for the selection and installation of new lifts

ICS 91.140.90

Committees responsible for this British Standard

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- Health and Safety Executive
- Institution of Electrical Engineers
- Institution of Incorporated Engineers
- Institution of Mechanical Engineers
- Lift and Escalator Industries Association
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Foreword

This part of BS 5655 has been prepared by Technical Committee MHE/4. It supersedes BS 5655-6:1990, which is withdrawn.

This edition is a full revision of the standard and introduces editorial and technical changes to bring the standard up-to-date.

This part of BS 5655 paraphrases many of the requirements specified in all other relevant standards (listed in the bibliography). It indicates the information that should be exchanged between the interested parties and the sequence of events from the preliminary planning stage to the putting into service of the installation.

Lifts selected in accordance with these recommendations are generally suitable for use by disabled people. Attention is drawn to the Building Regulations 2000 [1], and in particular to Approved Document M. It might be necessary to specify additional features to suit certain disabilities (details can be found in BS 8300 and prEN 81-70¹⁾). Subject to certain limitations, the provision of vertical access for disabled people can be achieved by the provision of powered lifting platforms. Attention is drawn to the Supply of Machinery (Safety) Regulations 1992 (as amended) [2] in respect of powered lifting platforms.

Attention is drawn to the Lifts Regulations 1997 [3] in respect of procedures for contracting parties and in respect of CE marking. The Lifts Regulations 1997 require CE marking of lifts before they are put into service.

General guidance is given in Clause 4 on the procedure to be adopted in obtaining a lift installation that is satisfactory from the aspects of operation, safety and maintenance. It also provides guidance on the exchange of information between the lift contractor and other trades in providing various service facilities.

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

Clause 6 deals with sizing the lift to meet the traffic demands and Clause 7 deals with traffic control. Clause 8 deals with electrical installation. The various types of drive systems for electric traction, hydraulic and the less commonly used chain, rack and pinion and screw lifts are discussed in Clause 9. Recommendations specific to the provision of lifts for disabled people are given in Clause 10.

Attention is drawn to the list of relevant statutory regulations given in Annex A.

This part of BS 5655 should be read in conjunction with BS 7255:2001, which gives recommendations for safe working on lifts that are additional to the features recommended in this part of BS 5655 and are applicable when installing, examining, inspecting, testing, servicing, repairing, dismantling and demolishing permanent lift installations.

As a code of practice, this part of BS 5655 takes the form of guidance and recommendations. It should not be quoted as if it were a specification and particular care should be taken to ensure that claims of compliance are not misleading.

NOTE Although this part of BS 5655-6 does not give recommendations for existing lift installations, it may be used for guidance when making alterations to such installations. However, attention is drawn to the fact that claims of compliance with this part of BS 5655-6 are not valid for existing lift installations.

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

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

Summary of pages

This document comprises a front cover, an inside front cover, pages i and ii, pages 1 to 65 and a back cover.

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¹⁾ In preparation.

1 Scope

This part of BS 5655 gives recommendations for the selection and installation of new passenger and passenger/goods lifts. It also gives recommendations for issues peripheral to the selection and installation of lifts, such as building design. It is applicable at the early stages of a project for architects, building contractors, building owners, building managers, developers, general and specialized engineering consultants, lift contractors, principal contractors, purchasers, and other interested parties.

This part of BS 5655 does not give recommendations for existing lift installations.

NOTE Although this part of BS 5655 does not give recommendations for existing installations, it may be used as guidance when making alterations to such installations.

2 Normative references

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

BS 88 (all parts), *Cartridge fuses for voltages up to and including 1 000 V a.c. and 1 500 V d.c.*

BS 1363-1, *13 A plugs, socket-outlets and adaptors — Part 1: Specification for rewirable and non-rewirable 13 A fused plugs.*

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

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

BS 5499-1, *Fire safety signs, notices and graphic symbols — Part 1: Specification for fire safety signs.*

BS 5588-5:1991, *Fire precautions in the design, construction and use of buildings — Part 5: Code of practice for firefighting stairs and lifts.*²⁾

BS 5588-8, *Fire precautions in the design, construction and use of buildings — Code of practice for means of escape for disabled people.*

BS 5606:1990 (amended 1998), *Guide to accuracy in buildings.*

BS 5655-7, *Lifts and service lifts — Part 7: Specification for manual control devices, indicators and additional fittings.*³⁾

BS 5776, *Specification for powered stairlifts.*

BS 5900, *Specification for powered domestic lifts with partially enclosed cars and no lift-well enclosures.*

BS 5965, *Specification for manually driven balanced personal homelifts.*

BS 6440:1999, *Powered lifting platforms for use by disabled persons — Code of practice.*

BS 7255:2001, *Code of practice for safe working on lifts.*

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

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

BS EN 81-1:1998, *Safety rules for the construction and installation of lifts — Part 1: Electric lifts.*

BS EN 81-2:1998, *Safety rules for the construction and installation of lifts — Part 2: Hydraulic lifts.*

BS EN 81-3:2001, *Safety rules for the construction and installation of lifts — Part 3: Electrical and hydraulic service lifts.*

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

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

BS EN 60947-3:1999, *Specification for low-voltage switchgear and controlgear — Part 3: Switches, disconnectors, switch-disconnectors and fuse-combination units.*

²⁾ To be replaced by prEN 81-72, currently in preparation.

³⁾ To be replaced by prEN 81-70, currently in preparation.

BS ISO 4190-1, *Lift (US: Elevator) installation — Part 1: Class I, II, III and VI lifts.*

BS ISO 4190-2, *Lift (US: Elevator) installation — Part 2: Class IV lifts.*

3 Terms and definitions

For the purposes of this part of BS 5655 the following terms and definitions apply.

3.1

authorized person

person responsible for ensuring that specific plant and equipment are safe for the intended work to be undertaken

[BS 7255]

NOTE An authorized person is likely to have undergone such training, and to have sufficient knowledge and experience of the relevant plant, to enable them to recognize potential dangers of such plant. Alternatively, an authorized person can have been instructed on the specific task assigned to them, the avoidance of any potential hazards that are applicable, and the reduction of risks, and if necessary, have been given training relevant to that task.

3.2

balancing weight

mass that saves energy

3.3

building contractor

person responsible for construction works

NOTE The building contractor may be the principal contractor.

3.4

car

part of a lift that carries passengers and/or other loads

[BS 7255]

3.5

control system

system that controls the manner in which the lift and doors operate

3.6

counterweight

mass that ensures traction

3.7

entrance

complete landing door assembly, together with its surround

[BS 7255]

3.8

fire-fighting lift

lift designated to have additional protection, with controls that enable it to be used under the direct control of the fire brigade in fighting a fire

3.9

fire resistance

ability of a component or construction of a building to satisfy for a stated period of time some or all of the appropriate criteria specified in the relevant part of BS 476

[BS 5588-8]

3.10

goods/passenger lift

lift intended mainly for the transport of goods, which are generally accompanied by persons

3.11**group of lifts**

two or more lifts that are electrically inter-connected

3.12**levelling**

operation that improves the accuracy of stopping at landings

3.13**lift contractor**

party that is contracted to supply and install the lift(s)

3.14**owner**

legal entity having right of possession of a lift and responsibility for its safe working
[BS 7255]

NOTE The owner is usually the landlord or proprietor of the building in which a lift is situated.

3.15**machinery space**

space inside or outside a well where the machinery, as a whole or in parts, is placed
[BS 7255]

3.16**machine room**

room in which a machine or machines and/or the associated equipment are placed

3.17**machine-room-less lift**

passenger or goods/passenger lift, which does not require a separate machine room and where the machine is generally located in the well and the control panel is integrated into the wall of the well

NOTE A machine-room-less lift is commonly referred to as an MRL lift.

3.18**main contractor**

see principal contractor (3.24)

3.19**notified body**

body appointed to carry out one or more of the conformity assessment procedures

3.20**observation lift**

lift that provides a panoramic outlook
[BS 7255]

NOTE The well for such a lift can be partially enclosed.

3.21**passenger**

person transported by a lift in the car
[BS 7255]

3.22**planning supervisor**

person responsible for overall coordination of health and safety aspects

3.23**power system**

system that provides power for directly controlling the motion of the lift

3.24

principal contractor

person responsible for health and safety issues, including employee training

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

3.25

pulley room

room, not containing a lift machine, in which pulleys are located

[BS 7255]

NOTE This room can also contain other equipment, such as the overspeed governor(s) and electrical equipment associated with a lift.

3.26

pulley space

space inside or outside a well where pulleys are placed

3.27

putting into service

making available for use a lift that has undergone examinations and tests

3.28

rated load

load which the equipment has been designed to carry

[BS 7255]

3.29

rated speed

speed at which the equipment has been designed to operate

3.30

relevelling

operation, after the lift has stopped, to permit the stopping position to be corrected during loading or unloading, if necessary by successive movements

3.31

starts per hour (electric traction lifts)

number of times during 1 h that the drive motor is energized in order for the lift to travel between any two floors in either direction

3.32

starts per hour (hydraulic lifts)

number of times during 1 h that the pump motor is energized in order for the lift to travel between any two floors in the upwards direction

3.33

user

person making use of the services of a lift installation

[BS 7255]

NOTE A user is not necessarily the same as a passenger.

3.34

well

space in which the car, the counterweight or the balancing weight travels

[BS 7255]

NOTE This space is normally bounded by the bottom of the pit, the walls and the ceiling of the well.

4 General guidance

NOTE A series of checklists for the various tender documents is given in Annex B.

4.1 Exchange of information

Lifts are classified in the BS ISO 4190 series of standards as shown in Table 1.

Table 1 — BS ISO 4190 classification of lifts

Class	Purpose
Class I	Lifts designed for the transport of persons
Class II	Lifts designed mainly for the transport of persons but in which goods may be carried
Class III	Lifts designed for health care purposes, including hospitals and nursing homes
Class IV	Lifts designed for the transport of goods that are generally accompanied by persons
Class V	Service lifts (dumb waiters)
Class VI	Lifts designed to suit buildings with intensive traffic, i.e. lifts with speeds of 2.5 m/s and above

The rated load should range from 320 kg to 2 500 kg and the rated speed should range from 0.4 m/s to 1.0 m/s for hydraulic lifts and 0.63 m/s to 6.00 m/s for electric traction lifts. Higher speeds are currently available, but should be discussed in detail between the lift contractor and the purchaser's representative.

If the projected installation is one of the arrangements described above, the following guidance will enable the preliminary scheme for the installation, in particular the traffic sizing (see Clause 6), to be established, and general planning details to be determined by the architect, or any person assuming such function. These details should be finally settled at the earliest possible stage, by a detailed investigation, with the purchaser's representative reaching agreement with the lift contractor, where necessary, before an order is finalized. This will enable a check to be made that all the necessary information has been exchanged.

NOTE A typical checklist of the information to be exchanged is shown in B.1.

4.2 Lift enquiry or invitation to tender

4.2.1 General

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

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

NOTE 1 Attention is particularly drawn to the Lifts Regulations 1997 [3] with regard to new lifts.

NOTE 2 A typical checklist of the information to be exchanged is shown in B.2.1.

When building restrictions, or special types of load, preclude the use of lifts conforming to the relevant requirements of BS EN 81-1:1998 and BS EN 81-2:1998, additional data should be included in the enquiry documents as necessary, according to the particular circumstances.

NOTE 3 Attention is drawn to the Lifts Regulations 1997 [3], which require a Design Examination Certificate to be obtained under certain circumstances.

NOTE 4 Attention is drawn to the Disability Discrimination Act 1995 [4]. See Clause 10 and A.4.

4.2.2 Additional items

The enquiry documents should indicate any additional items beyond those required by BS EN 81-1 and BS EN 81-2, such as dismantling of an existing lift, vision panels, forced ventilation, landing architrave, telephone, level of fire resistance, any special controls, fire-fighting lifts and designations (see 7.2.3) and any beneficial use (see 4.5.4).

Where applicable, the principal contractor should specify the building construction for the well and machine room, provide notes on possible fixings for guides, etc., and indicate any special installation method for the lift that might be required on system building sites (see 4.4.8).

NOTE 1 This can necessitate agreement between the principal contractor and the lift contractor before a tender can be submitted.

NOTE 2 Annex C gives guidance regarding interface fixings for steel-framed buildings.

Lifts to be installed in adverse conditions, e.g. chemical works, lifts used with power trucks and lifts used in vandal-prone situations (see BS 5655-13) and similar applications, require special consideration according to the circumstances.

4.2.3 Finishes

Finishes should be specified at the enquiry stage. See also **4.3.5**.

NOTE 1 A list of possible finishes is given in **B.2.2**.

NOTE 2 Attention is drawn to the Disability Discrimination Act 1995 [4]. See Clause **10** and **A.4**.

4.2.4 Other items

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

NOTE **B.2.3** gives details of the items normally supplied by the lift contractor and **B.2.4** gives details of the items normally supplied by the principal contractor.

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

The provision of architraves, or finish surrounds to doors, should be the subject of agreement between the lift contractor and the purchaser's representative.

4.2.5 Inserts

According to the construction methods adopted, inserts for attaching equipment might be required. The builder should have primary responsibility for the specification, supply and installation of inserts. The builder and the lift contractor should agree the exact requirements, particularly with respect to dimensions and tolerances, before a tender is offered (see Annex C).

4.2.6 Building contract programme

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

NOTE Attention is drawn to the Lifting Operations and Lifting Equipment Regulations 1998 [5] and to local regulations and by-laws with regard to access, storage and crange facilities.

4.2.7 Pre-tender health and safety plan

NOTE Attention is drawn to Regulation 15 of the Construction (Design and Management) Regulations 1994 [6] which requires a pre-tender health and safety plan to be prepared that is sufficiently developed for it to form part of the tender documentation supplied to the lift contractor.

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

- information the purchaser has made available;
- information about risks which cannot be avoided;
- any surveys of the site and its neighbourhood with the related health and safety implications;
- contributions from designers;
- any identified precautionary measures to be taken against particular risks.

4.2.8 Tender submissions

Tender submissions should be returned to the principal contractor or the person issuing the invitation to tender, and should include all the information required, additional information to support the tender bid and the pre-tender health and safety plan, and the results of the risk assessments.

NOTE Attention is drawn to the Control of Substances Hazardous to Health Regulations 1994 (as amended) [7].

4.3 Acceptance of tender and subsequent procedure

NOTE The procedure indicated in 4.3.1, 4.3.2, 4.3.3, 4.3.4, 4.3.5 and 4.3.6 particularly relates to the most usual case, where the lift contractor is a subcontractor (contractor under the Construction (Design and Management) Regulations 1994 [6]).

4.3.1 Order

The contractor is instructed by the purchaser to place an order with the selected lift contractor.
If alternative schemes have been offered, the order should clearly indicate which has been accepted.

4.3.2 Lift contractor's programme

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

- a) the order was placed;
- b) the lift site will be ready;
- c) provision of lift electricity supplies is required;
- d) the lift will be completed;
- e) handover and CE marking are required.

The period between order and delivery of materials falls into two stages:

- 1) the finalizing of details; and
- 2) the actual production of the equipment, which is dependent on the first stage.

Within the first stage, other dates might need to be considered, such as when:

- i) all relevant building information will be available;
- ii) builders' drawings prepared by the lift contractor will be available;
- iii) the layout drawings will be approved;
- iv) the finishes will be finally accepted and approved.

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

4.3.3 Drawings

After the order has been placed the lift contractor should supply drawings showing the builders' work required, the point loadings and machine room layouts, etc., indicating minimum dimensions and tolerances. To enable these to be prepared, the purchaser's representative should furnish the lift contractor with the relevant detail building drawings.

4.3.4 Approval of drawings

The purchaser's representative should give written approval of the drawings referred to in 4.3.3 submitted by the lift contractor (after modification if necessary and within the limitations of the information provided), and at the same time should obtain such additional copies as might be required for distribution to other parties concerned.

4.3.5 Selection of finishes

The purchaser's choice of finishes (see 4.2.3), such as architrave finishing, decorative features, decorative finishes, colours, etc., should be communicated by the purchaser's representative to the lift contractor, preferably not later than the time of approval of the drawings. Delays in these decisions can adversely affect the completion of the contract.

NOTE Attention is drawn to the Disability Discrimination Act 1995 [4]. See Clause 10 and A.4.

4.3.6 Electricity supplies to lift

A temporary electricity supply (at $400\text{ V }^{+10}_{-5}\%$) will be required for the installation of the lift(s) if a permanent supply is not available. A permanent power supply is desirable for final commissioning and testing, but a temporary supply is acceptable provided that it is equivalent to the permanent supply.

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

4.4 Coordination of site work

4.4.1 *Pre-construction and site meetings*

For the successful progress of site work, full cooperation between all parties is essential, and on large sites regular meetings are beneficial. Programmes for the constructional work in that part of the building containing the lift should be made in consultation between all parties concerned. It is important that critical dimensional tolerances (see 5.2) are fully discussed at this stage as correction after wells have been formed can result in time delays.

4.4.2 *Health and safety plan and file*

4.4.2.1 *Construction-phase health and safety plan*

NOTE Attention is drawn to Regulation 15 of the Construction (Design and Management) Regulations 1994 [6], which requires a construction-phase health and safety plan to be prepared prior to any work being carried out, in order that the lift contractor can carry out or manage the construction work.

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

- the principal contractor's health and safety policy and assessments;
- the health and safety plan prepared by the planning supervisor (3.22);
- details of the risks, and the management of the risks, created by the contractors and subcontractors.

The detail and size of the construction-phase health and safety plan should depend on the nature and extent of the project and the contracting arrangements for the construction work, and should be relevant to the circumstances of the project.

The construction-phase health and safety plan should continually evolve in order to provide a focus for the coordination of health and safety as the construction progresses.

4.4.2.2 *Construction-phase health and safety file*

NOTE 1 Attention is drawn to Regulation 14(d) of the Construction (Design and Management) Regulations 1994 [6], which requires the planning supervisor to produce a health and safety file.

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

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

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

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

4.4.3 *Preparatory work on site*

It is customary for the lift contractor to make periodic visits to the site before the starting date to check progress on the well construction and discuss relevant matters with the building contractor. The lift contractor should check that all building work has been carried out in accordance with the agreed dimensions (see 5.2). Immediately before the time for lift installation to commence, the lift contractor should check that site conditions are fit to permit installation to proceed. The preparatory work should ideally be completed before lift installation starts.

NOTE A typical list of preparatory work is given in B.3.

In certain system buildings and buildings of over ten floors, it can be necessary, by prior agreement, to start erection before the top portion of the well has been constructed, in which case the general contractor should temporarily deck out and waterproof. This is a special requirement and should be included in the pre-tender health and safety plan and specified at the time of the tender enquiry.

4.4.4 Delivery of material

The lift contractor should advise the building contractor when equipment is ready for dispatch. The building contractor in consultation with the lift contractor should make arrangements on site to receive and unload the equipment with appropriate hoisting tackle, slings, supports, etc, as near as possible to the well.

4.4.5 Storage and protection

Provision should be made by the building contractor for storing, protecting and preserving against loss, deterioration or damage, all material on the site.

NOTE Attention is drawn to the adverse effect of damp conditions on electrical equipment and on steel wire ropes.

Lift equipment normally receives a protective coat of paint at the works before dispatch to site. Further painting will be necessary in the form of a finishing coat and can either take place on site, or be applied at the works with retouching on site where necessary. Any additional painting required owing to adverse site conditions and damage to decorative finishes should be subject to separate negotiation between the lift contractor and the purchaser.

4.4.6 Services of other trades

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

4.4.7 Scaffolding, fencing, etc.

Scaffolding, timbers, rollers and similar plant required for the unloading and installation of the lift and also for the proper guarding and close fencing of the well should be provided, erected and maintained by the building contractor.

The well should not be used as a means of disposal for rubbish from the upper floors. Such practice is dangerous. The well and machine room should be handed over to the lift contractor complete, and no other trades should be allowed to work in them during the whole time of installation of the lift, except by arrangement with the lift contractor and under the provisions of a safe system of work (see BS 7255).

4.4.8 Special installation procedures

If there is insufficient time for the lift(s) to be installed in the conventional fashion, i.e. after the well is completely built, special procedures are needed. This applies particularly to industrialized multi-storey buildings.

Methods of construction differ in detail. For example, it can be necessary to use a crane to lower and position lift equipment into the progressively rising top of the well (see 4.4.3). The building contractor should provide a suitable portable cover for the completed portion of the well in order to protect the lift erectors working below. When the top of the well has been reached, it is normal practice to cap it immediately with a precast load-bearing floor slab on to which is lowered the pre-assembled machine room equipment. The building contractor should then complete and weatherproof the machine room as swiftly as possible.

On all such projects the closest cooperation between the building contractor and the lift contractor is essential from an early stage.

4.4.9 Connecting to power supply

The lift contractor should give prior warning to the building contractor of the date the power supply to the lift is required, so that suitable arrangements for connection can be made (see 4.3.6, 8.3 and 8.4).

4.4.10 Use of the lift prior to acceptance

Until the lift is put into service, it should not be used by any persons other than those involved in the actual installation of the lift.

4.5 Procedure following test, including inspection and maintenance

NOTE Attention is drawn to the Lifting Operations and Lifting Equipment Regulations 1998 [5], which require lifts in certain premises to be examined at intervals, e.g. within every period of 6 months, by a person competent to carry such examinations, who is required to report on a prescribed form. The reports are normally kept in a register by the building owner or occupier.

4.5.1 Acceptance

NOTE 1 Attention is drawn to Regulation 13 of the Lifts Regulations 1997 [3], in respect of the placing of lifts on the market.

Testing of the lift should be carried out in accordance with the appropriate part of BS EN 81, and with PAS 32-1 and PAS 32-2 as applicable.

The purchaser should make timely arrangements for accepting the lift on completion of the tests. Special arrangements (see 4.5.3 and 4.5.4) are necessary if there is to be a period between the lift being put into service and the lift going into normal service.

NOTE 2 It is advisable for the purchaser to arrange insurance cover for the lift.

4.5.2 Maintenance

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

NOTE 1 Such service can be secured under a service contract. It is preferable and normal for the lift contractor to be entrusted with the servicing during the guarantee period of a new lift. The scope of a service contract can be extended to cover intermediate service calls, repairs and replacement of worn parts.

All maintenance should take account of the lift contractor's instruction manual supplied with the installation.

NOTE 2 This will ensure the application of safe systems of work and the necessary instructions to ensure that all parts are kept in good working order (see BS EN 13015).

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

- the equipment is not misused;
- unauthorized persons are not permitted to enter the well or machine rooms.

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

NOTE 4 Attention should be paid to methods of ensuring that lifts are not overloaded, particularly when they are used in connection with furniture and equipment removals, internal redecoration and other similar activities which might be undertaken within the building.

NOTE 5 Any guarantee provided by the lift contractor is generally conditional upon the lift receiving regular and adequate servicing and covers the free replacement of parts that prove defective through reasons of faulty materials or workmanship during the guarantee period. The guarantee period is generally 12 months and is known as the Defects Liability Period.

4.5.3 Lift not in immediate use (caretaker maintenance)

When conditions do not permit a lift to be taken into normal service immediately following completion and acceptance, it should be immobilized.

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

NOTE A separate service contract is usually made with the lift contractor to pay regular visits during this period, to inspect, lubricate and report on the condition of the lift. During the inspection it is desirable that the lift should be moved under power. A date is usually agreed with the lift contractor from which the guarantee period (4.5.2, Note 5) will commence.

4.5.4 Temporary use of lifts

If the purchaser intends to permit temporary use of a lift by another party, such as the building contractor, before taking it into normal service, but after the acceptance procedures discussed in 4.5.1 have taken place, then the responsibilities of those concerned should be clearly defined and agreed.

Temporary use of a lift should be considered at an early stage, having regard to the conditions under which it is likely to take place.

NOTE The BS EN 81 series of standards require a permanent two-way voice communication with a rescue service to be available at all times.

4.5.5 Cleaning

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

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

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

During the lifetime of the installation, cleaning of various parts, e.g. the glass in an observation lift, often becomes necessary. This cleaning should be undertaken only by persons competent to carry out these tasks.

5 Building construction

5.1 General

NOTE This clause describes essential details of building construction for electric and hydraulic lifts. The full requirements are specified in the BS EN 81 series. The majority of the details described here have been extracted and paraphrased from those standards.

Reference should be made to the drawings supplied by the manufacturer of the equipment, where additional building work (such as fixings, cutting away for switches and making good) is required.

It is important to plan at an early stage the access route into and through the building for introducing large or heavy components, e.g. hydraulic jack, pre-assembled car, and lift machine. If, owing to building restrictions, hydraulic jacks cannot be accommodated in a single length, special arrangements can be necessary and the lift contractor should be consulted.

5.2 Dimensional tolerances

5.2.1 General

The architect, or any person assuming such functions, in agreement with the builder, should either ensure that the well dimensions are sufficient for the lift to be installed, or add additional tolerances to the target size dimensions for the well.

5.2.2 Well dimensions

COMMENTARY ON 5.2.2. *Lifts have to move vertically through a building and the car and landing door equipment have to interconnect, so the plumbness of the well and the alignment of the landing openings are of paramount importance. It is therefore important that the well is not built to the usually applied construction industry practices, which allow deviations from the target sizes as both increased and decreased dimensions. It is also important to ensure that the well is built to a high degree of verticality, i.e. plumb. Decreased dimensions are thus not acceptable to the lift industry and allowances need to be made by the architect, builder or structural engineer to accommodate the high degree of verticality needed. Failure to do so can result in significant reworking and serious delays.*

The principal contractor should apply the guidance given in BS 5606 during the building construction.

NOTE 1 BS 5606 is a general code of practice for ensuring accuracy in building construction, and indicates the expected limits of building accuracy for different types of construction. The target sizes are usually given as a dimension to which a plus/minus tolerance can be applied. The plan dimensions of wells are given by the lift contractor and define the minimum clear plumb sizes, whatever type of construction is used. BS 5606:1990, Figure 2 illustrates the target sizes required by the lift contractor.

The purchaser's representative, in conjunction with the builder, should ensure that the minimum clear plumb sizes specified by the lift contractor are included in the building design and are obtained in the finished work.

The purchaser's representative, in conjunction with the builder, should ensure that dimensions in excess of the recommended minimum plumb dimensions for wells and openings do not exceed the maximum values shown in Table 2, beyond which changes in design can be necessary.

The purchaser's representative should take into account the constructional tolerances appropriate to any particular building technique, when specifying the well structural dimensions to meet the lift contractor's dimensional requirements.

Table 2 — Limits of accuracy of well plumb dimensions (see BS ISO 4190)

Well height (storeys)	Limit of accuracy K
<20	+50 mm, –0 mm
>20	+1.0 mm, –0 mm per extra storey up to maximum of 100 mm

NOTE 2 The dimensional tolerance K is a positive value only. Unlike other building tolerances, K cannot have a negative value. If the well is built with a negative value of K , this can require reconstruction of the well in the affected areas or extensive modifications to the lift equipment, if this is possible, resulting in delays.

At the planning stage, the well dimensions should be in accordance with those specified in BS ISO 4190-1 and BS ISO 4190-2.

NOTE 3 BS ISO 4190-1 and BS ISO 4190-2 are internationally agreed. The well dimensions specified in these standards should be used in the initial planning stage, but may be increased or decreased if necessary at a later stage to meet the requirements of a specific product.

Figure 1 illustrates the structural limits of accuracy pertaining to single and multiple well arrangements. If the net well dimensions W_w (well width) and W_d (well depth) and the nominal structural entrance opening dimensions C and D are defined by plumb lines, it is essential that the actual wall does not encroach upon the space bounded by those dimensions. Dimension K in Figure 1, which is the limit of accuracy of dimensions W_w and W_d , should not exceed the value given in Table 2 for the relevant well height.

NOTE 4 In the case of multiple lifts situated side by side, dimension K is not applicable to the space between the plumb wells. BS ISO 4190-1 and BS ISO 4190-2 specify a minimum of 200 mm for this space.

5.2.3 Landing door openings

NOTE 1 Attention is drawn to the Building Regulations 2000 [1], Approved Document M, in respect of the provision of clear opening widths (at least 800 mm for lift doors) and landings (an unobstructed space of at least 1 500 mm × 1 500 mm). Duties under the Disability Discrimination Act 1995 [4] can also impose additional requirements (see A.4).

The finished landing openings should be accurate to target size and vertically aligned one above the other for the full travel of the lift.

NOTE 2 In constructing the structural openings in concrete walls to wells it is often not possible to achieve a degree of accuracy vertically that will allow doors and frames to be inserted in the openings without some form of masking or packing to overcome the inaccuracies. Provisions should be made in the building design by increasing the nominal landing door opening height from the target finished floor level to each head and the nominal landing door opening to each jamb.

The alignment of the landing face from floor to floor should not vary to a greater extent than can be accommodated by the subsequent front wall finish. The architraves should be set accurately plumb.

NOTE 3 The alignment of the landing face of the front wall of the well is of importance when architraves of fixed dimensions are required.

Where architraves are to be supplied by the lift contractor, it should be ensured that:

- there is a true alignment of the sill line with the landing along the front line of the well, allowing it to serve as the datum-line for the well dimensions;
- the dimension L in Figure 1, which is the limit of accuracy of dimensions C and D , pit depth P_h and headroom S_h , does not exceed 25 mm;
- the distance from the plumb well to the outer face of the front wall, dimension M in Figure 1, does not vary to an extent greater than can be accommodated by the subsequent front wall finish;
- the architraves are set plumb;
- architraves installed in conjunction with multiple wells are laterally aligned to ensure visual acceptance.

NOTE 4 To facilitate accurate alignment of landing sills, it is common practice to provide at each landing an independent threshold, the position of which can be adjusted. To prevent water from draining into the well, from cleaning or sprinkler operation, a slight fall away from the lift entrance is recommended.

Where architraves are supplied by the building contractor, each of the finished openings should be accurately plumb above the one below for the full travel of the lift, and the finished openings should all meet the target size.

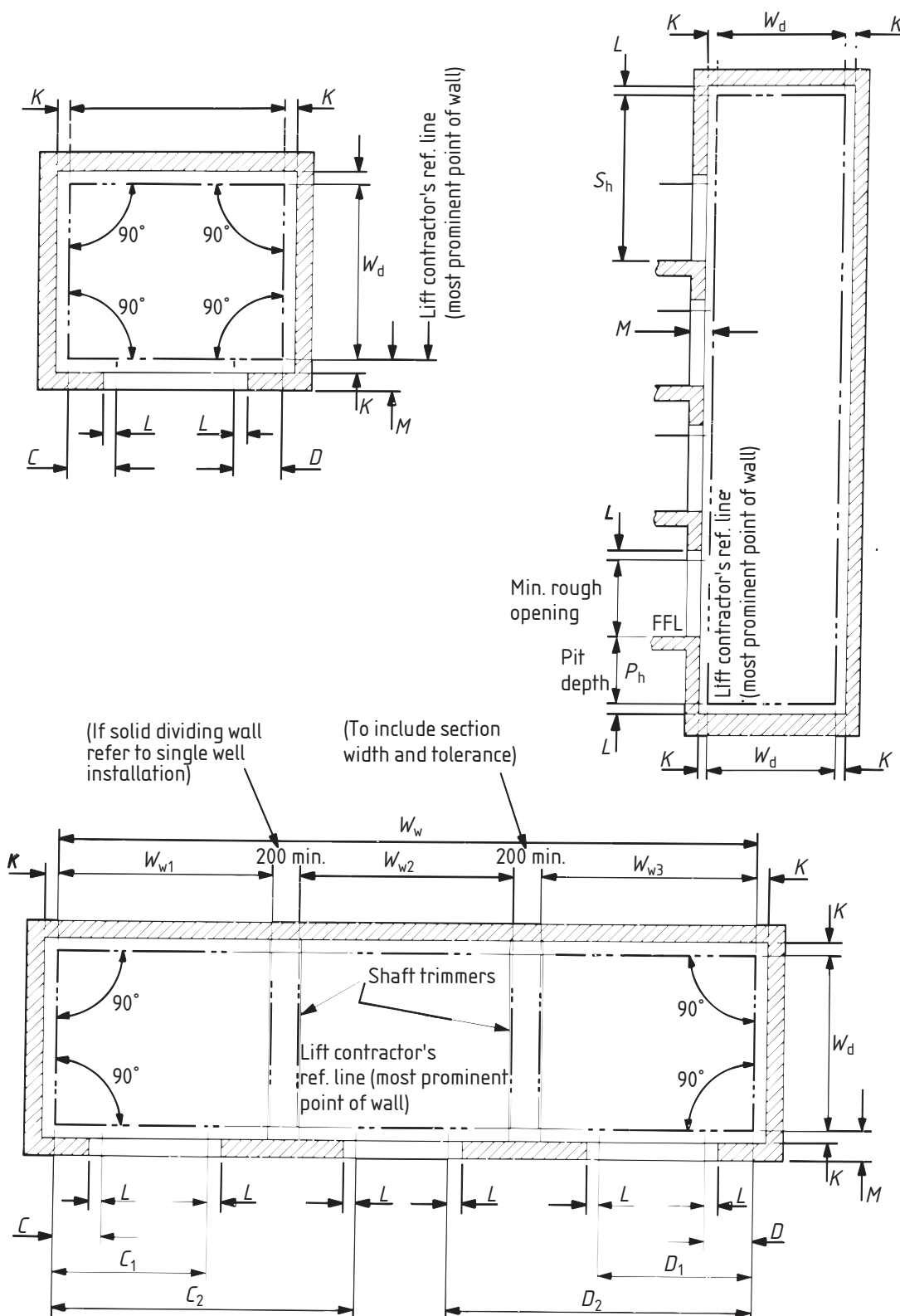


Figure 1 — Structural limits of accuracy

5.3 Well construction

5.3.1 General provision

It is essential that the counterweight of a lift be contained within the same well as the car.

5.3.2 Exclusive use of the well

The well should be exclusively for the lift and should not contain cables or devices, etc., other than for the lift. If the well contains heating equipment for the well (excluding hot water or steam heating), any control and adjustment devices should be located outside the well.

5.3.3 Ventilation of the well

NOTE Attention is drawn to the fact that building or fire regulations might require the well to be ventilated.

Special arrangements can be needed where the ventilation provided naturally, as the result of door operations and through gaps around doors, access traps/doors and other openings into the well such as ductwork, is insufficient.

The well should not be used to provide ventilation of rooms other than those for the service of the lifts. When the well is ventilated via the machine room or pulley room, through trunking to the outside should be used. The vents should be louvred or otherwise protected to prevent rain, snow, birds, etc. from entering the well.

In order to reduce “buffeting” for lifts with a speed exceeding 2.50 m/s, pressure release vents might be needed. A single lift can require a vent of a minimum area of 0.3 m² with an additional vent area of 0.1 m² for each additional lift sharing a common well.

5.3.4 Well containing cars or counterweights belonging to several lifts or service lifts

In the lower part of the well a rigid screen should be erected between the moving parts (car or counterweight) of different lifts or service lifts. This partition should extend from a position not more than 0.30 m above the pit floor to a position at least 2.50 m above the floor of the lowest landing.

If the horizontal distance between the edge of the car roof and a moving part (car, counterweight or balancing weight) of an adjacent lift or service lift is less than 0.50 m, the partition should be extended through the full height of the well. The width of the partition should be at least equal to that of the moving part, or part of this, which is to be guarded, plus 0.10 m on each side.

It is strongly recommended that the partition in every instance extends the full height of the well.

Protection in the well should conform to BS EN 81-1:1998, 5.6 and BS EN 81-2:1998, 5.6.

5.3.5 Well enclosure

Where a well is required to contribute to preventing the spread of fire, it is essential that each well be totally enclosed by an imperforate wall, floor and ceiling, except for:

- a) landing doors;
- b) inspection and emergency doors to the well and inspection traps;
- c) vent openings for escape of gases and smoke in the event of fire;
- d) ventilation openings;
- e) permanent openings between the well and the machine room or pulley room.

It is essential that the walls, floor and ceiling of the well be:

- 1) made of durable materials and treated to prevent the creation of dust;

NOTE Attention is drawn to the Building Regulations 2000 [1] and to local regulations and bye-laws in respect of the materials used in the construction of wells.

- 2) of sufficient mechanical strength.

Where a well is not required to contribute to preventing the spread of fire, e.g. observation lifts (see Annex D), it does not need to be totally enclosed. In this case the well should conform to BS EN 81-1:1998 and BS EN 81-2:1998.

As far as is practicable, the inner surfaces of a well enclosure facing any car entrance should form a smooth continuous flush surface without projection or recesses. Where any projections or recesses cannot be made flush and project more than 200 mm, they should be bevelled to an angle of 75° from the horizontal above and below the projection by means of metal plates, concrete or other similar non-combustible material. Where practicable, all other inner surfaces of the well enclosure should form a continuous flush surface without projections or recesses.

Permanent electric lighting should be available in the well for each lift, allowing it to be lit during repairs or servicing, even when all doors are closed. The lighting should be switched from the well and the machine room. This lighting should comprise one lamp positioned not more than 0.5 m from the highest and lowest points in the well with intermediate lamp(s) (see BS EN 81-1:1998, 5.9 and BS EN 81-2:1998, 5.9). The average level of illumination should be at least 50 lux, measured 1.00 m above the plane of the car roof and pit floor.

5.3.6 Reactions on the building structure

The building structure should be able to support at least the loads that might be applied:

- by the machine;
- by the guides in normal operation and at the moment of safety gear operation (in either a downward or an upward direction);
- by the operation of the buffers;
- in the case of off-centring of the load in the car; or
- by the operation of the anti-rebound device.

The location of lifts in stairwells is not recommended, as special arrangements need to be made to fix the guides, fit support beams, ensure appropriate ride quality and provide continuous enclosures, etc.

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

5.3.7 Fire resistance

5.3.7.1 Construction materials should be used that are known not to give off toxic fumes and smoke in the case of a fire. A fire officer/adviser should be consulted to determine the degree of fire resistance for the well structure and landing entrances.

NOTE 1 Where there is a statutory regulation for fire resistance of well enclosures and doors, attention is drawn to the Building Regulations 2000 [1] and to any relevant approved documents to which they refer.

NOTE 2 Tests for the various fire resistance ratings referred to in the following subclauses are specified in the relevant part of BS 476. Unlike other fire-resistant doors in a building, lift doors that are in accordance with BS 476-22 are not thermally insulated.

5.3.7.2 When fire resistance is required and entrances having access to the well have doors that close automatically, the degree of fire resistance of the entrances should be at least half that required for the enclosure. For example, for well enclosures that are required to have a fire resistance not greater than 1 h, the fire resistance of the entrance should be 30 min. For well enclosures that are required to have a fire resistance greater than 1 h but not more than 2 h, the fire resistance of the entrance should be 1 h.

5.3.7.3 When entrances having access to the well have doors that are manually closed, it is essential that the degrees of fire resistance of the entrances are not less than that required for the enclosure. For example, for well enclosures that are required to have a fire resistance not greater than 30 min, the fire resistance of the entrance should be 30 min. For well enclosures that are required to have a fire resistance greater than 30 min but not more than 1 h, the fire resistance of the entrance should be 1 h.

5.3.7.4 When specifically required, the lift contractor may provide landing doors and frames that have a fire resistance rated at 2 h. Any requirement in excess of 2 h should be provided by protection that 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.

5.3.7.5 Automatic or self-closing lift doors are not smoke-proof or smoke-tight, particularly in the case of sliding doors. Accordingly, if the entrance to wells needs to be substantially smoke-tight, auxiliary protective means should be provided in addition to the doors normally provided by the lift contractor.

5.3.7.6 The installation of a fire-fighting lift places additional requirements on both the lift, the routing of its power supply cables to the control equipment and its building environment. The fire precautions recommended in BS 5588-5⁴⁾ should be followed.

5.3.8 Entrances

Access to the car, provided by entrances in the well enclosure, should not be in the path of the counterweight.

Lift entrances that open out into an area exposed to the weather should be suitably protected by canopies, sloped landing levels and weatherproof controls.

5.3.9 Inspection doors, emergency doors and inspection traps

Inspection doors, emergency doors and inspection traps to the well should be provided only for the evacuation of passengers or to provide access for servicing.

Inspection doors should have a height of not less than 1.40 m and a width of not less than 0.60 m. Emergency doors should have a height of not less than 1.80 m and a width of not less than 0.35 m. Inspection traps should have a height of not less than 0.50 m and a width of not less than 0.50 m.

Where the well extends for some distance without a landing door, a means of evacuating passengers should be provided. This can be either intermediate emergency doors at intervals not exceeding 11 m or adjacent cars fitted with an emergency door. The lift contractor should provide any details needed to suit the conditions of a particular building and lift installation to the building contractor at the earliest possible time.

The fire resistance of each inspection door, emergency door or inspection trap should be not less than those recommended in 5.3.7.2 and 5.3.7.3 for the enclosure.

Inspection doors, emergency doors and inspection traps should not open towards the interior of the well.

Inspection doors, emergency doors and inspection traps should be provided with a key-operated lock, capable of being closed and locked without a key. It is recommended that the lock does not include a device to retain the bolt in a retracted position. The key should be the same key as that required for the landing door emergency release. It should have a label attached to it, detailing essential precautions to be taken when using the key.

It should be possible to open inspection doors, emergency doors and inspection traps from inside the well without a key, even when locked. However, operation of the lift should always be dependent upon the closed condition of these doors and traps.

Inspection doors, emergency doors and inspection traps should be imperforate and should meet the same recommendations for mechanical strength as the landing doors.

It is essential that a permanent safety sign and warning notice be displayed on the outside of all inspection doors, emergency doors and inspection traps in accordance with Annex E.

5.3.10 Lift pits

The lower part of the well should consist of a pit, the bottom of which should be smooth and approximately level, except for any buffer and guide bases and water drainage devices. The pit should remain impervious to the infiltration of water, following the building-in of guide fixings, buffers, any grids, etc.

If there is an access door to the pit, other than the landing doors, it should be in accordance with 5.3.9. Such a door should always be provided if the pit depth exceeds 2.50 m. To permit authorized personnel to descend safely into the pit and in the absence of any other access, another permanent means should be provided that is easily accessible from the landing door and does not project into the clear running space of the lift equipment.

Wells should preferably not be situated above a space accessible to persons. If accessible spaces exist underneath the car or counterweight, it is essential that the base of the pit be designed for an imposed load of at least 5 000 N/m², and either:

- a) there should be a solid pier extending down to solid ground; or
- b) there should be an alternative means to support the loads imposed; or
- c) the counterweight should be equipped with safety gears.

⁴⁾ To be replaced by prEN 81-72, currently in preparation.

With direct acting hydraulically operated lifts, jacks under the car should have lined boreholes. A borehole is normally made during the building construction and the work is normally carried out by a specialist contractor. The borehole should be watertight, should have a limit of accuracy within 25 mm of plumb in 3 000 mm and should have its centreline within ± 10 mm, measured at pit floor. The liner should be watertight and non-rusting in order to protect the cylinder from corrosion.

Details of the diameter and depth required are supplied by the lift contractor, who should also give details of the ram and cylinder lengths to be handled on site.

5.4 Machine rooms and pulley rooms

5.4.1 General

NOTE This subclause applies to conventional machine rooms or pulley rooms, and enclosures outside the well. If control panels are to be installed in the pulley room, the pulley room should be considered as another machine room. See 5.5 for machine-room-less lift applications.

It is essential that machine rooms or pulley rooms, or enclosures, are not used for purposes other than lifts, do not contain cables or devices other than for the lift, and do not provide means of access to other parts of the building. These rooms may, however, contain:

- a) machines for service lifts or escalators;
- b) equipment for ventilating, heating or air conditioning of these rooms, excluding hot water or steam heating.
- c) fire detectors or extinguishers, with a high operating temperature, appropriate for the electrical equipment, stable over a period of time and suitably protected against accidental impact.

When the function of the building requires it (e.g. dwellings, hotels, hospitals, schools or libraries), the walls, floor and ceilings of machine rooms and pulley rooms should substantially absorb the sounds associated with the operation of the lifts.

5.4.2 Construction

NOTE Attention is drawn to the fire resistance requirements for machine rooms and pulley rooms given in the relevant building regulations. Attention is also drawn to the need to take precautions to minimize the spread of fire from the machine rooms and pulley rooms into the well or from the machine rooms or pulley rooms to adjacent parts of the building.

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

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

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

The machine room and pulley room walls, ceiling and floor should be sealed or painted to stop dust circulation, which otherwise could damage rotating machinery and cause failure of electrical control equipment. Machine rooms and pulley rooms should also be weather-proof. If ventilation louvres are provided, they should be designed and sited to prevent rain, snow, birds, etc. from entering the machine room or pulley room.

It is essential that these conditions be complied with before lift machinery is installed. Additional features for fire-fighting lifts, where required, should be in accordance with BS 5588-5.

5.4.3 Other openings

It is important that the dimensions of holes in the slab and machine room/pulley room floor be reduced to a minimum. With the aim of removing the danger of objects falling through openings situated above the well, including those for electric cables, ferrules should be provided that project at least 50 mm above the slab or finished floor.