

**Scottish Health Technical Memorandum**  
**08-02:**  
Specialist services  
Lifts

# Contents

	<i>page</i>
<b>Acknowledgements .....</b>	<b>6</b>
<b>Preface .....</b>	<b>7</b>
About Scottish Health Technical Memoranda.....	7
Structure of the Scottish Health Technical Memorandum suite .....	8
<b>Executive summary .....</b>	<b>10</b>
<b>Glossary of terms .....</b>	<b>11</b>
 <b>1. Introduction .....</b>	 <b>13</b>
1.1 Scope .....	13
1.5 Structure.....	13
1.6 Lifts in healthcare buildings .....	14
1.9 User considerations.....	14
 <b>2. Statutory requirements and staff functions .....</b>	 <b>15</b>
2.1 Lifts Regulations 1997 .....	15
2.6 Two important regulations affecting lifts .....	15
2.9 Other relevant regulations .....	16
2.11 Professional roles and responsibilities .....	17
 <b>3. Lift provision.....</b>	 <b>21</b>
3.1 Regulatory environment .....	21
3.5 Circulation and location of lifts.....	21
3.11 Types of lift in healthcare buildings .....	22
3.41 Lifts for emergency purposes .....	28
3.64 Standard healthcare lifts.....	30
 <b>4. Lift planning .....</b>	 <b>32</b>
4.4 Lift traffic design .....	32
4.11 Basic principles of lift provision.....	33
4.21 Dual-role lift requirements .....	34
4.24 Lift dynamics .....	34
4.34 Lift traffic design .....	36

4.44	Lift installation management.....	38
<b>5.</b>	<b>Lift equipment.....</b>	<b>39</b>
5.1	Introduction.....	39
5.4	Types of lift drive .....	39
5.14	Life expectancy .....	40
5.15	Energy saving.....	40
5.21	Drive systems.....	41
5.27	Rescue equipment .....	42
5.35	Machine-roomed lifts .....	43
5.56	Machine-room-less (MRL) lifts.....	45
5.72	Hydraulic lifts .....	48
5.74	Well .....	48
5.99	Landings.....	50
5.108	Lift car.....	51
5.149	Lift control.....	56
5.161	Electrical.....	58
5.172	Noise and vibration (acoustics) .....	59
5.177	Ride quality.....	60
<b>6.</b>	<b>Commissioning, validation and checks .....</b>	<b>61</b>
6.1	Commissioning principles.....	61
6.3	Validation of tender/specification .....	61
6.8	Checks during manufacture.....	61
6.12	Checks during installation.....	62
<b>7.</b>	<b>Testing.....</b>	<b>64</b>
<b>8.</b>	<b>Management of lift installations .....</b>	<b>65</b>
8.12	Emergency alarms .....	66
8.15	Emergency release of trapped passengers .....	66
8.31	Risk assessment, method statements and permits to work.....	68
<b>9.</b>	<b>Maintenance.....</b>	<b>69</b>
9.6	Regular checks.....	69
9.14	Preventive maintenance .....	70
9.19	Maintenance contracts .....	71
9.27	Maintenance contractor management .....	72

9.35	Maintenance audits .....	73
<b>10.</b>	<b>Modernisation and upgrading .....</b>	<b>74</b>
10.3	Safety audit and upgrading of existing lifts .....	74
10.8	Modernisation of CE-marked lifts .....	74
10.14	Modernisation of non-CE-marked lifts .....	76
10.18	Improving the accessibility of existing lifts .....	77
	<b>Appendix A: Relevant statutory regulations .....</b>	<b>78</b>
	<b>Appendix B: Project stages according to BS5655-6:2002.....</b>	<b>82</b>
	<b>Appendix C: Considerations for energy-efficient lift design.....</b>	<b>90</b>
	<b>Appendix D: Supplement to BS8486-1: 2007 .....</b>	<b>93</b>
	<b>Appendix E: Supplement to BS8486-2: 2007 .....</b>	<b>102</b>
	<b>Appendix F: Typical instructions for the safe release of passengers trapped in electric traction lifts .....</b>	<b>111</b>
	<b>Appendix G: Typical instructions for the safe release of passengers trapped in an hydraulic lift.....</b>	<b>114</b>
	<b>Appendix H: Typical instructions for the safe release of passengers trapped in a machine-room-less electric traction lift.....</b>	<b>116</b>
	<b>Appendix J: Guidance in the provision of escalators .....</b>	<b>118</b>
	<b>Appendix K: Guidance in the provision of lifting platforms and platform (wheelchair) stairlifts .....</b>	<b>123</b>
	<b>References.....</b>	<b>126</b>

***Disclaimer***

The contents of this document are provided by way of general guidance only at the time of its publication. Any party making any use thereof or placing any reliance thereon shall do so only upon exercise of that party's own judgement as to the adequacy of the contents in the particular circumstances of its use and application. No warranty is given as to the accuracy, relevance or completeness of the contents of this document and Health Facilities Scotland, a Division of NHS National Services Scotland, shall have no responsibility for any errors in or omissions therefrom, or any use made of, or reliance placed upon, any of the contents of this document.

## Acknowledgements

---

Health Facilities Scotland would like to thank the Steering Group led by the Department of Health for their efforts in producing the HTM 08-02 document.

HTM 08-02 has been amended by Health Facilities Scotland for use in NHSScotland as SHTM 08-02.

## Preface

---

### About Scottish Health Technical Memoranda

Engineering Scottish Health Technical Memoranda (SHTMs) give comprehensive advice and guidance on the design, installation and operation of specialised building and engineering technology used in the delivery of healthcare.

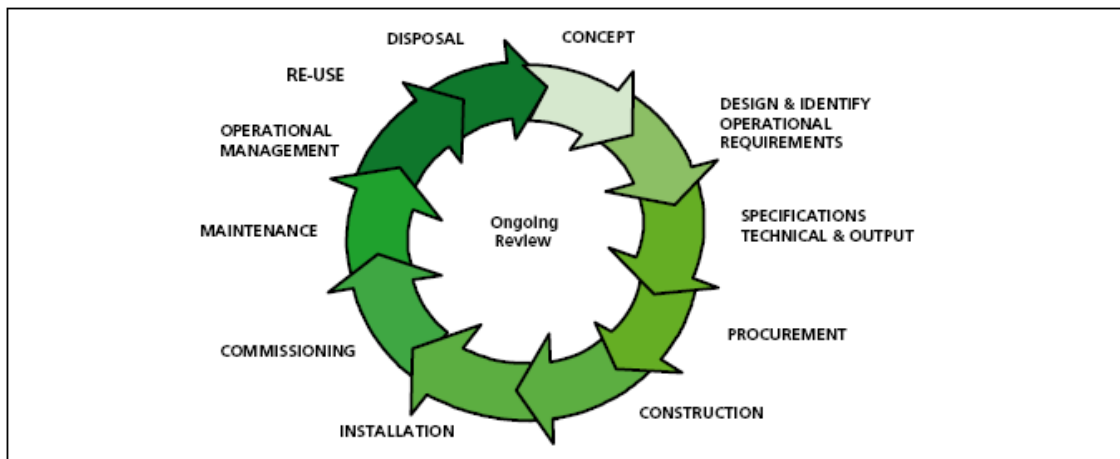
The focus of SHTM guidance remains on healthcare-specific elements of standards, policies and up-to-date established best practice. They are applicable to new and existing sites, and are for use at various stages during the whole building lifecycle: Healthcare providers have a duty of care to ensure that appropriate engineering governance arrangements are in place and are managed effectively. The Engineering Scottish Health Technical Memorandum series provides best practice engineering standards and policy to enable management of this duty of care.

It is not the intention within this suite of documents to repeat unnecessarily international or European standards, industry standards or UK Government legislation. Where appropriate, these will be referenced.

Healthcare-specific technical engineering guidance is a vital tool in the safe and efficient operation of healthcare facilities. Scottish Health Technical Memorandum guidance is the main source of specific healthcare-related guidance for estates and facilities professionals.

The core suite of eight subject areas provides access to guidance which:

- is more streamlined and accessible;
- encapsulates the latest standards and best practice in healthcare engineering;
- provides a structured reference for healthcare engineering.



Healthcare building life-cycle

## Structure of the Scottish Health Technical Memorandum suite

The series of engineering-specific guidance contains a suite of eight core subjects:

Scottish Health Technical Memorandum 00: Policies and principles (applicable to all Scottish Health Technical Memoranda in this series)

Scottish Health Technical Memorandum 01: Decontamination

Scottish Health Technical Memorandum 02: Medical gases

Scottish Health Technical Memorandum 03: Heating and ventilation systems

Scottish Health Technical Memorandum 04: Water systems

Scottish Health Technical Memorandum 05 Reserved for future use

Scottish Health Technical Memorandum 06: Electrical services

Scottish Health Technical Memorandum 07: Environment and sustainability

Scottish Health Technical Memorandum 08: Specialist services

Some subject areas may be further developed into topics shown as -01, -02 etc and further referenced into Parts A, B etc.

Example: Scottish Health Technical Memorandum 06-02 Part A will represent: Electrical safety guidance for low voltage systems

In a similar way Scottish Health Technical Memorandum 07-02 will simply represent: Environment and Sustainability – EnCO<sub>2</sub>de.

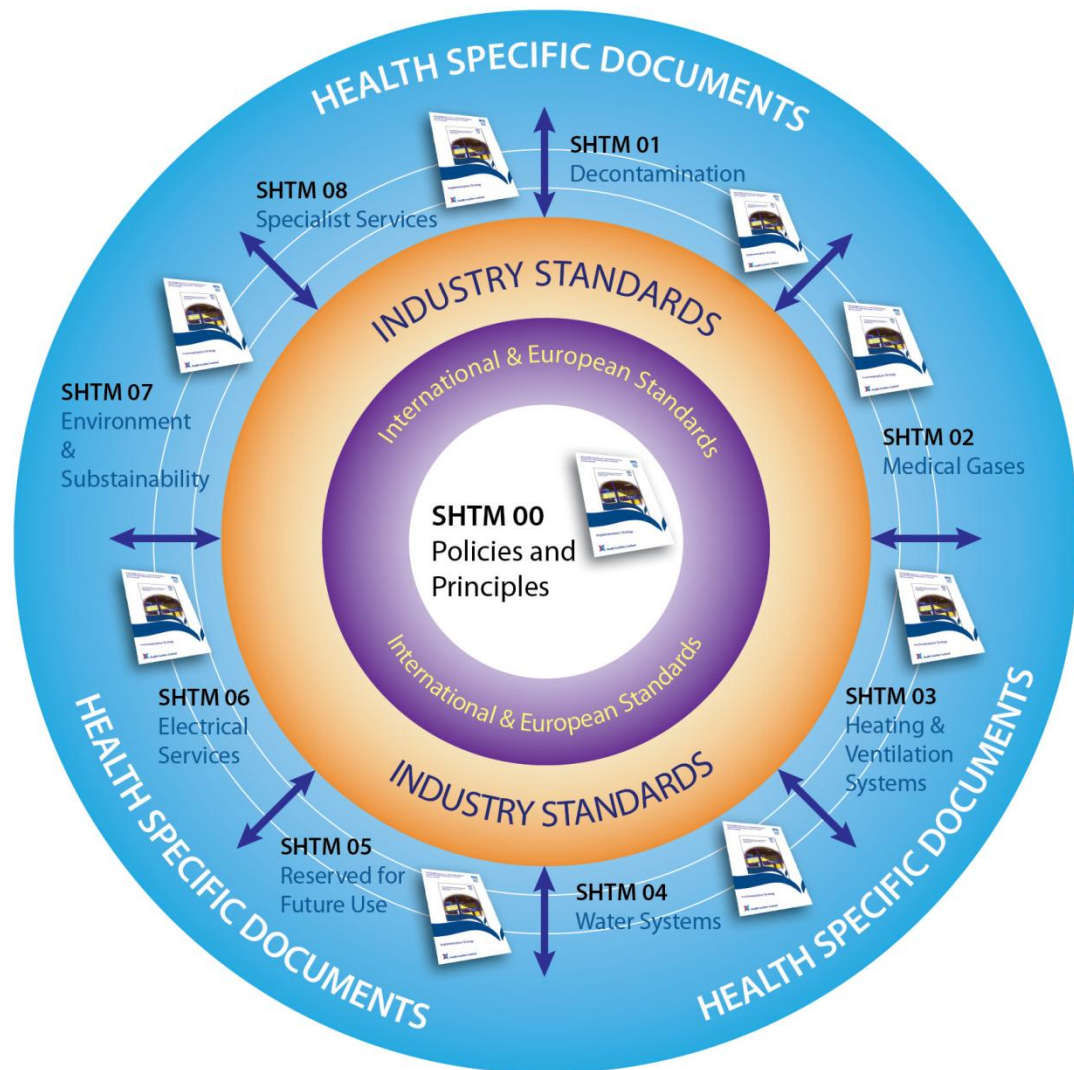
All Scottish Health Technical Memoranda are supported by the initial document Scottish Health Technical Memorandum 00 which embraces the management



and operational policies from previous documents and explores risk management issues.

Some variation in style and structure is reflected by the topic and approach of the different review working groups.

Health Facilities Scotland wishes to acknowledge the contribution made by professional bodies, engineering consultants, healthcare specialists and NHS staff who have contributed to the review.



Engineering guidance structure

## Executive summary

---

This Scottish Health Technical Memorandum gives comprehensive advice and guidance on the planning, design, installation, commissioning, testing, maintenance and operation of new lifts (vertical transportation) in healthcare buildings. It also provides supporting information that can be used in specifications for manufacturers, procurement contracts and the briefing of design teams.

Although this Scottish Health Technical Memorandum is applicable to new installations, it can be used for the upgrading and modernisation of existing installations, and is of use at various stages during the inception, design, commissioning, testing and maintenance of lift services.

It is intended to be read by directors of estates and facilities, buildings services engineers, electrical and mechanical engineers, facilities managers, architects, premises designers, consulting engineers, equipment suppliers, equipment examiners, testers and maintainers.

This guidance supersedes the four parts of Scottish Health Technical Memorandum 2024 published in 2001 and may be used to support the specification of lifts in healthcare buildings.

## Glossary of terms

**Note:** An extensive list of definitions is not provided in this Scottish Health Technical Memorandum. Occasionally, where a definition contributes to the understanding of the text, it is presented at that point.

A glossary of lift and escalator terms is also provided in CIBSE Guide D – ‘Transportation systems in buildings’.

Most of the Acts, Regulations, Standards and Codes of Practice cited in this Scottish Health Technical Memorandum also contain definitions of terms (see the References section).

A useful guide to the lifts directive can be found at:

[http://ec.europa.eu/enterprise/sectors/mechanical/documents/legislation/lifts/index\\_en.htm](http://ec.europa.eu/enterprise/sectors/mechanical/documents/legislation/lifts/index_en.htm)

**Bed lift:** A lift that is for carrying patients on a standard extended bed together with the necessary staff and equipment. This lift should have a rated load of 2,500kg with clear car floor area of 1,800mm wide by 2,700mm deep and clear door opening width of 1,400mm.

**Escape lift:** A passenger lift protect in accordance with Scottish Health Technical Memorandum 81 Part 1 and Scottish Fire Practice Note 3: Escape Bed Lifts to enable it to be used to transport staff safely along with patients and visitors to the ground storey in the event of a fire.

**Fire-fighting lift:** A lift designed to have additional fire protection, with controls that enable it to be used under the direct control of the fire-and-rescue service when fighting a fire.

**Goods lift:** A lift used for moving conventional goods and “dirty” items (for example furniture, equipment, building materials, equipment maintenance supplies, waste etc).

**Healthcare building:** a hospital, treatment centre, health centre, clinic, surgery, walk-in centre or other building where patients are provided with medical care by a clinician.

**Housekeeping lift:** A lift used for the movement of “clean” items such as mail, stationery supplies, medical supplies, food, linen etc.

**Hydraulic lift:** Permanently installed lifting equipment, serving defined landing levels, having a car designed for the transportation of passengers or persons and goods, suspended by jacks, ropes or chains and moving in guide rails inclined not more than 15° to the vertical.

**LOLER – Lifting Operations and Lifting Equipment Regulations 1998:**

These regulations govern all activities concerned with the operation, inspection and use of lifting equipment – including lifts.

**Machine room:** Room in which a lift machine or machines and/or the associated equipment are placed.

**Machine-room-less lift:** Passenger lift that 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.

**Passenger lift:** A lift primarily used to carry general passenger traffic, including standing passengers and passengers using mobility aids such as wheelchairs.

**PUWER – Provision and Use of Work Equipment Regulations:** These regulations require that equipment provided for use at work is suitable for the intended use, maintained in a safe condition, and inspected at suitable intervals and in certain circumstances.

**Trolley/stretchers lift:** A lift for carrying a patient on a trolley (dimensions: 800mm by 2,375mm), on a stretcher or on an empty extended standard hospital bed, together with the necessary staff and equipment.

# 1. Introduction

---

## Scope

- 1.1 This Scottish Health Technical Memorandum covers new lifts installed in healthcare buildings. However, the recommendations in this Scottish Health Technical Memorandum can be used as guidance for the upgrading of the safety and performance of existing lifts.
- 1.2 It is assumed that equipment with the latest in lift safety technology is provided and that the drive systems are either electric traction or electric hydraulic.
- 1.3 This Scottish Health Technical Memorandum does not cover manually-operated lifts, lifting platforms or stair lifts, escalators or moving walks, where specialist advice should be sought (see also [Appendices J and K](#)).

**Note:** Lifting platforms and stair lifts come under the Supply of Machinery (Safety) Regulations 2008. It is not anticipated that healthcare buildings will contain architectural barriers requiring the provision of lifting platforms, stair lifts or platform stair lifts.

- 1.4 Neither does it cover the movement of dangerous materials and gases in lifts. See Scottish Health Technical Memorandum 02-01: 'Medical gas pipeline systems' for guidance.

## Structure

- 1.5 This Scottish Health Technical Memorandum covers the following:
- **Management policy:** outlining the overall responsibility of managers of healthcare premises and their legal and mandatory obligations in installing and operating a reliable, efficient and economic lift (vertical transportation) service. Guidance is given on lift types and categories and special applications specific to healthcare buildings;
  - **Design considerations:** detailing the planning requirements and considerations that apply to the design of lifts up to the preparation stage of the contract document. Guidance is given on the equipment features required in healthcare buildings, construction, electrical supplies, drives and safety features;
  - **Commissioning and testing:** detailing the requirements for managing the installation stage and for ensuring that equipment is formally tested and certified to contract particulars and is manufactured to the highest level of quality assurance;
  - **Operational management:** providing information for those responsible for overseeing and operating the day-to-day running and maintenance procedures. Coverage includes routine checks, planned preventive maintenance, troubleshooting, emergency rescues and modernisation.

## Lifts in healthcare buildings

- 1.6 Healthcare buildings are dependent on lifts to provide an efficient, fast, comfortable, safe and reliable vertical transportation service for the movement of patients, staff, visitors, medical equipment and ancillary services items.
- 1.7 Healthcare buildings may also be dependent on lifts to provide fire-fighting and evacuation facilities.
- 1.8 All lifts are subject to strict statutory regulations which cover operational safety to ensure that passengers can be fully confident that the lift is safe to use.

## User considerations

- 1.9 The psychological aspects of lift design in terms of being user-friendly need to be addressed to allay anxieties and fears of users.
- 1.10 Travelling in a lift can be perceived as dangerous by persons of a nervous disposition in several different ways, but mainly from the notion of being isolated in a sealed box inside a vertical well, which extends from the lowest floor level to the top floor of the building.
- 1.11 A common claustrophobic fear is that of being trapped between floors without the means to communicate with persons outside to give warning of the predicament or to receive reassurance that assistance is at hand.
- 1.12 In healthcare buildings, choosing the appropriate operational lift speed and drive system is important in order to minimise any adverse effects, particularly on patients.
- 1.13 Psychological appreciations are more subtle and can be influenced by the lift finishes, decor, lighting, apparent reliability, and passenger waiting and travel times.

## 2. Statutory requirements and staff functions

### Lifts Regulations 1997

- 2.1 The Lifts Regulations 1997 are the main regulations concerning the construction and installation of new lifts. They implement Directive 95/16/EC (the Lift Directive) in order to meet the Essential Health and Safety Requirements (EHSRs) defined in the Directive.
- 2.2 The Lifts Regulations 1997 require new lift installations to conform to the EHSRs. These requirements apply to the entire lift installation including the building fabric and supporting building services. Compliant installations carry a CE-mark in the lift car, which denotes that:

- either the entire installation conforms in full to harmonised standards or to a type-tested model standard;
- or the installation meets the minimum EHSRs approved by a notified body.

These are known as the 'routes to conformity'. The most common routes to conformity are:

- the installation of model lifts; and
- lift installations meeting harmonised standards.

**Note:** A model lift means a representative lift whose technical dossier shows the way in which the EHSRs will be met for lifts which conform with the model lift.

- 2.3 The harmonised standards that are deemed to satisfy the EHSRs include most of, but not all of, the BS EN 81 series of safety standards. Other harmonised lift standards also apply (see [paragraph 3.3](#)).
- 2.4 Where a healthcare facility requires a lift to deviate from the harmonised standard in any way, a lift installer must seek approval for the design from a notified body. This may increase the cost of providing the lift installation, and should be avoided wherever possible.
- 2.5 The regulations do not apply to lifts installed and put into service before 1 July 1999 or to a number of specialist lifts listed in Schedule 14 of the regulations.

### Two important regulations affecting lifts

#### Lifting operations and lifting equipment regulations 1998

- 2.6 The Lifting Operations and Lifting Equipment Regulations 1998 (LOLER) give effect to Directive 89/655/EEC on the health and safety requirements for the use of work equipment by persons at work as amended by Directive 95/63/EC.
- lifting operations mean an operation concerned with the lifting or lowering of



a load;

- lifting equipment means work equipment for lifting or lowering loads and includes its attachments for anchoring, fixing or supporting it;
- an accessory for lifting means work equipment for attaching loads to machinery for lifting;
- work equipment means any machinery, appliance, tool or installation for use at work;
- load includes a person, and the regulations include passenger lifts.

2.7 The regulations require that a thorough examination be carried out every six months (or as determined by risk assessment) by a Competent Person and a report issued. The report has to notify any defect that in the opinion of the competent person (as defined by LOLER) could be, or could become, a danger to persons. Where there is a serious risk of personal injury, a report has to be sent as soon as reasonably practicable to the relevant enforcing authority (the Health and Safety Executive (HSE) or local authority).

**Note:** For guidance on thorough examinations, see LOLER Regulation 9 in HSE's 'Safe use of lifting equipment: Lifting Operations and Lifting Equipment Regulations 1998: Approved Code of Practice and guidance L113'.

### Provision and Use of Work Equipment Regulations 1998

2.8 The Provision and Use of Work Equipment Regulations 1998 (PUWER) require risks to people's health and safety, from equipment they use at work, to be prevented or controlled by ensuring that the equipment is:

- suitable for use;
- maintained in a safe condition; and
- inspected at suitable intervals and in certain circumstances.

'Work equipment' covers all equipment used by an employee or a self-employed person at work. It includes tools, static and mobile machinery, and, in most cases – installations and lift equipment.

### Other relevant regulations

2.9 This list is not exhaustive:

- Building (Scotland) Regulations 2004, Section 4;
- Health and Safety at Work etc Act 1974;
- Management of Health and Safety at Work Regulations 1999;
- Management of Health and Safety at Work (Amendment) Regulations 2006;
- Disability Discrimination Act 2005;
- Construction (Design and Management) Regulations 2007;



- Control of Substances Hazardous to Health Regulations 2002;
- Electricity at Work Regulations 1989;
- Electromagnetic Compatibility Regulations 2005;
- Personal Protective Equipment Regulations 2002;
- Supply of Machinery (Safety) Regulations 2008;
- Workplace (Health, Safety and Welfare) Regulations 1992.

2.10 These are summarised in [Appendix A](#).

## Professional roles and responsibilities

### Management

2.11 Management is defined as the owner, occupier, employer, general manager, chief executive or other person in a healthcare organisation, or their appointed responsible contractor, who is accountable for the premises and who is responsible for issuing or implementing a general policy statement under the Health and Safety at Work etc Act 1974.

### Designated Person (Lifts)

2.12 The Designated Person (Lifts) is an individual appointed by a healthcare organisation (a Health Board member or a person with responsibilities to the NHS Board) who has overall authority and responsibility for lifts and their safe operation. They have a duty to prepare and issue a general policy statement in relation to lifts and their safe operation, including the organisation and arrangements for carrying out that policy. The policy should include reference to mandatory examinations, record-keeping, emergency procedures and training of personnel.

2.13 The Designated Person (Lifts) is responsible for ensuring that an Authorising Engineer (Lifts) and Dutyholder are appointed.

### Designated Person (Electrical)

2.14 The Designated Person (Electrical) is an individual appointed by a healthcare organisation (a Health Board member or a person with responsibilities to the NHS Board) who has overall authority and responsibility for the low voltage electricity system within the premises and who has a duty under the Health and Safety at Work etc Act 1974 to prepare and issue a general policy statement on health and safety at work, including the organisation and arrangements for carrying out that policy. This person should not be the Authorising Engineer (LV).

2.15 The Designated Person (Electrical) is responsible for appointing the Authorising Engineer (LV). See also Scottish Health Technical Memorandum 06-02: 'Electrical safety guidance for low voltage systems'.

## Dutyholder

- 2.16 The Dutyholder (as defined in HSE's INDG339 – 'Thorough examination and testing of lifts') is legally responsible for ensuring that the lift is safe to use and that it is thoroughly examined. These responsibilities include:

- maintaining the lift so that it is safe to use;
- selecting and instructing the Competent Person;

**Note:** Competent Person in this context is the person or organisation carrying out the statutory inspections/examinations.

- ensuring that the lift is examined at statutory intervals (every 6 or 12 months) or in accordance with an examination scheme drawn up by a Competent Person;
- keeping the Competent Person informed of any changes in the lift operating;
- conditions which may affect the risk assessment;
- making relevant documentation available to the Competent Person (for example the manufacturer's instructions and maintenance records) and, where applicable, a copy of the owner's information manual provided with every new lift;
- acting promptly to remedy any defects;
- ensuring that all documentation complies with the regulations;
- record-keeping.

## Authorising Engineer (Lifts)

- 2.17 The Authorising Engineer (Lifts) is a Chartered Engineer with appropriate experience, whose appointment is the responsibility of the Designated Person (Lifts). The person appointed should possess the necessary degree of independence from local management to take action within this guidance including the implementation, administration and monitoring of the safety arrangements defined in BS7255.
- 2.18 The Authorising Engineer (Lifts) will act as assessor and make recommendations for the appointment of Authorised Persons (Lifts), monitor the performance of the service, and provide an annual audit to the Designated Person (Lifts). To carry out this role effectively, particularly with regard to audit, the Authorising Engineer (Lifts) should be independent of the operational structure of the NHS Board (see also Scottish Health Technical Memorandum 06-02).

## Authorised Person (Lifts)

- 2.19 The Authorised Person (Lifts) is nominated by the Authorising Engineer (Lifts) and has the key operational responsibility for the specialist service. The person will be qualified and sufficiently experienced and skilled to operate fully the

specialist service. The person nominated should be able to demonstrate a thorough familiarisation with the system by having attended appropriate professional courses.

- 2.20 The Authorised Person (Lifts) is responsible for overseeing the duties carried out by Lift Stewards. The Authorised Person (Lifts) is also responsible for overseeing the annual training exercises involving Lift Release Wardens and assisting the Authorising Engineer (Lifts) in ensuring sufficient personnel are trained and available at all times for the rescue of passengers who may become trapped in lifts.

### Authorised Person (Electrical)

- 2.21 The Authorised Person (Electrical) is a person possessing adequate technical knowledge and having received appropriate training. He/she will be appointed in writing by the Authorising Engineer (LV) to be responsible for the practical implementation and operation of management's safety policy and procedures on defined electrical systems (see also Scottish Health Technical Memorandum 06-02).

### Competent Person (Lifts)

- 2.22 A Competent Person (Lifts) is a person, suitably trained and qualified by knowledge and practical experience, and provided with the necessary instructions to enable the required work to be carried out safely (from BS7255).
- 2.23 It is unlikely that healthcare staff will have the necessary practical experience and theoretical knowledge to carry out this role, and it would normally be carried out by a specialist contractor. Specialist contractors appointed by management should only use trained and competent persons to carry out the maintenance of lifts. If this person is to carry out electrical work on lifts, they may also need to be authorised to carry out this work by an Authorised Person (Electrical).

### Lift Steward

- 2.24 A Lift Steward is a person nominated by the Authorised Person (Lifts) to undertake simple daily monitoring of lifts in order to check their correct operation.

### Lift Warden

- 2.25 Appointed by management, a Lift Warden will help to evacuate occupants during emergencies by using an escape lift. There are three types of lift warden:
- Lift Warden (Floor);
  - Lift Warden (Control); and
  - Lift Warden (Car).
- 2.26 Training in the use of equipment will be by the Authorised Person (Lifts) and by the site Fire Safety Adviser in relation to the emergency evacuation duties. This training (where applicable) should take into account the description of the

operation of the lift and its features as described in the lift owner's manual provided for each new lift (see Scottish Health Technical Memorandum 81, Part 1 and Scottish Fire Practice Note 3: 'Escape Bed Lifts', for full details).

### Lift Release Warden

2.27

A Lift Release Warden is a person, suitably trained and qualified by knowledge and practical experience, and provided with the necessary instructions to enable the safe release of passengers from lifts. They should be recommended by the Authorised Person (Lifts), be formally appointed by management, and should undergo refresher training annually.

**Note:** If, under the terms of the maintenance contract, the release of trapped passengers is always to be carried out by the lift maintenance contractor, rather than by in-house staff, this post may not be required.

### 3. Lift provision

---

#### Regulatory environment

- 3.1 All new lifts that carry passengers should meet the requirements of the Lifts Regulations 1997. In addition, some aspects of the requirements of the Supply of Machinery (Safety) Regulations 2008, LOLER and PUWER also apply (see [paragraphs 2.1 – 2.8](#) and [Appendix A](#)).
- 3.2 Lifts installed in conformity with the harmonised standards BS EN 81-1 for electric traction lifts or BS EN 81-2 for electric hydraulic lifts are deemed to meet these EHSRs.
- 3.3 In addition to the base standards (BS EN 81-1/2), other harmonised standards may also apply including:
- BS EN 81-28 (remote alarms);
  - BS EN 81-58 (fire rating of lift landing doors);
  - BS EN 81-70 (accessibility);
  - BS EN 81-73 (behaviour of lifts in the event of fire);
  - BS EN 12015 (EMC emission);
  - BS EN 12016 (EMC immunity);
  - BS EN 13015 (maintenance).
- 3.4 Where a lift carries out a specialised function, other harmonised standards may apply: for example, for vandal resistance BS EN 81-71; for fire-fighting BS EN 81-72. Other guidance is also available: for example, for evacuation prCEN/TS 81-76 and BS 9999.

#### Circulation and location of lifts

- 3.5 Health Building Note 00-04: 'Circulation and communication spaces' gives guidance on the circulation spaces required to accommodate the usage of single lifts.
- 3.6 The location of lifts can be based on clinical function or a service function such as goods, fire-fighting etc.
- 3.7 Lifts should be located away from sensitive areas. Guidance may be found in Scottish Health Technical Memorandum 08-01: 'Acoustics'.
- 3.8 Wherever possible, lifts should be provided, at least, in pairs to provide service in the event of breakdown or unavailability for maintenance or inspection. Where this is not possible, an alternative lift should be available from the same level in a nearby location.

- 3.9 Where larger groups of lifts are provided, they should be provided in line – up to a maximum of four units (see Figure 1).

**Note:** Groups larger than four units are unusual in healthcare buildings, but may occur.

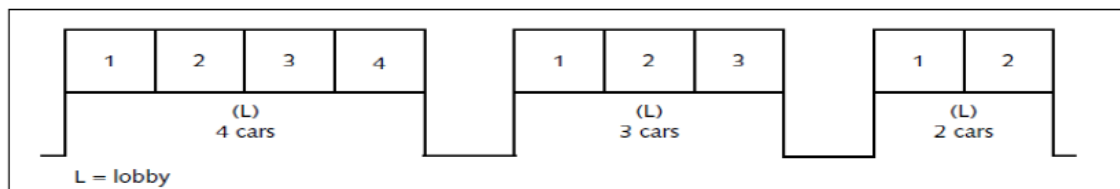


Figure 1: Lift groups (reproduced by kind permission of CIBSE)

- 3.10 All the lifts described below assume a single lift entrance. Where dual-entry lifts are provided, the minimum platform sizes and clear door openings should be maintained, resulting in a larger well size being required.

**Note:** Dual-entry lifts aid circulation, particularly the movement of passengers with reduced mobility and patients on stretchers, trolleys and beds.

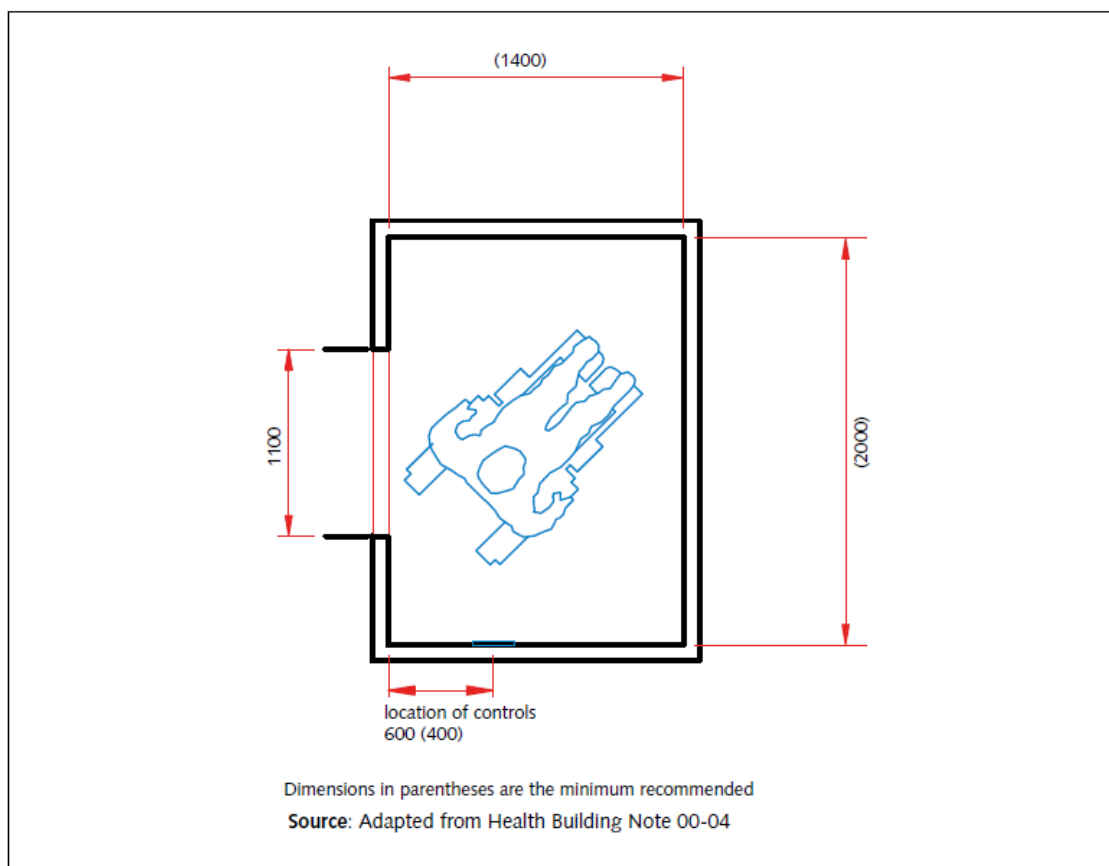
## Types of lift in healthcare buildings

- 3.11 For healthcare buildings, lifts fall into one of the following categories:

- general passenger lifts;
- trolley/stretchers lifts;
- bed lifts;
- goods lifts;
- service lifts; and
- housekeeping lifts.

## General passenger lifts

- 3.12 These lifts carry general passenger traffic including ambulant passengers, semi-ambulant passengers using mobility aids and wheelchair users (see Health Building Note 00-04 and BS8300 for further information). In general, standard industry products are suitable.
- 3.13 The recommended size for a general passenger lift is one having a rated load of 1,275kg.; a car floor area of 2,000mm wide by 1,400mm deep and a clear door-opening width of 1,100mm (see Figure 2). This lift ensures full accessibility to persons using a manual wheelchair described in BS EN 12183 or an electrically powered wheelchair of class A, B or C described in BS EN 12184 and all accompanying persons. It also provides sufficient turning space for persons using wheelchairs of class A or B and mobility aids (walking frames, rollators etc).



**Figure 2: Passenger lift rated load: 1,275kg**

- 3.14 Where traffic demands are lower, general passenger lifts with a rated load of 1,000kg, a car floor area of 1,600mm wide by 1,400mm deep and a clear door-opening width of 1,100mm may be considered (see [Figure 3](#)). This lift can accommodate a manual wheelchair and an accompanying person.
- 3.15 In smaller healthcare buildings (for example community hospitals, GP surgeries and walk-in health centres) or in other special circumstances, lifts with a rated load of 630kg or 800kg may be installed provided a clear door-opening width of 900mm is maintained. The 630kg lift has a car floor area of 1,100mm by 1,400mm deep (see [Figure 4](#)). This lift ensures accessibility to persons using a manual wheelchair described in BS EN 12183 or an electrically powered wheelchair of class A or B described in BS EN 12184 and an accompanying person. The 800kg lift is slightly bigger, with a car floor area of 1,350mm wide by 1,400mm deep.
- 3.16 All general traffic passenger lifts should conform to the requirements of BS EN 81-70 and BS EN 81-73.
- 3.17 In unsupervised locations where vandalism can occur, lifts may need to conform to BS EN 81-71.

### Trolley/stretchers lifts

- 3.18 These lifts are intended for the carrying of a passenger (patient) on a trolley (dimensions: 800mm by 2,375mm) or a patient on a stretcher together with the necessary staff and equipment, or an empty extended standard hospital bed.

- 3.19 A trolley/stretchers lift should have a rated load of 1,600kg with clear car floor area of 1,400mm wide by 2,400mm deep and clear door-opening of 1,400mm (see [Figure 5](#)).

**Note:** Where these lifts are used for general passenger traffic, any handrails fitted should not intrude into the clear platform area.

- 3.20 Trolley/stretchers lifts should conform to BS EN 81-70, except where they may conflict with clinical requirements. For example, handrails (if any) should be only provided on the side and rear walls when used for general passenger traffic. They should be arranged so as not to encroach on the vertical space of 2,400mm by 1,400mm. They may also need to be recessed into the car walls or the car walls may need to be returned back to provide the necessary clearances. A roof trapdoor may also be required (see [paragraphs 5.124 to 5.125](#)).

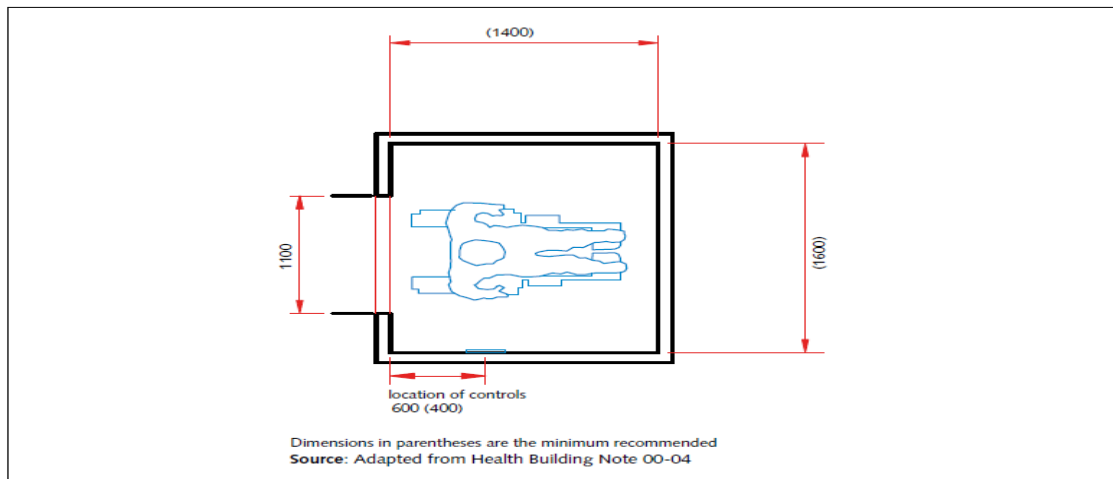


Figure 3: Passenger lift rated load: 1,000kg

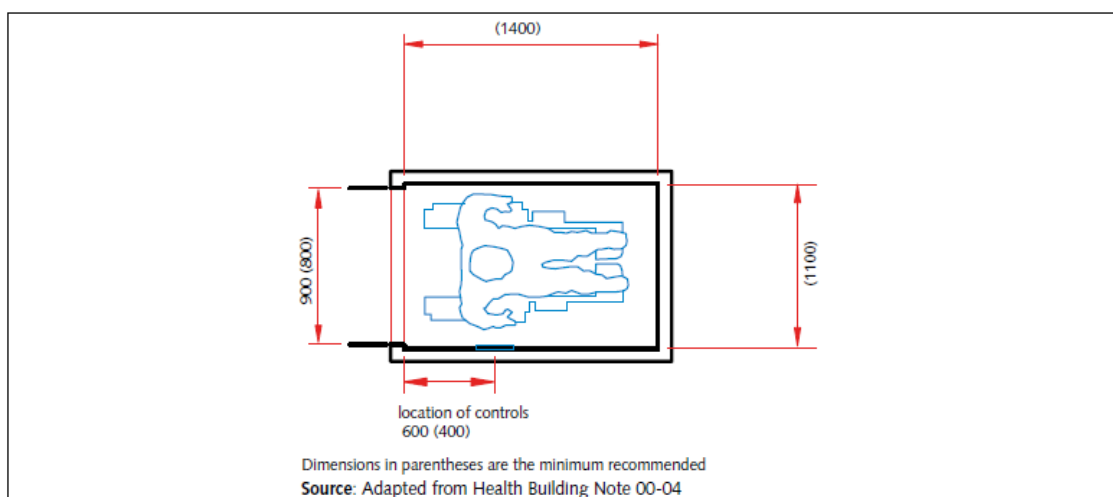
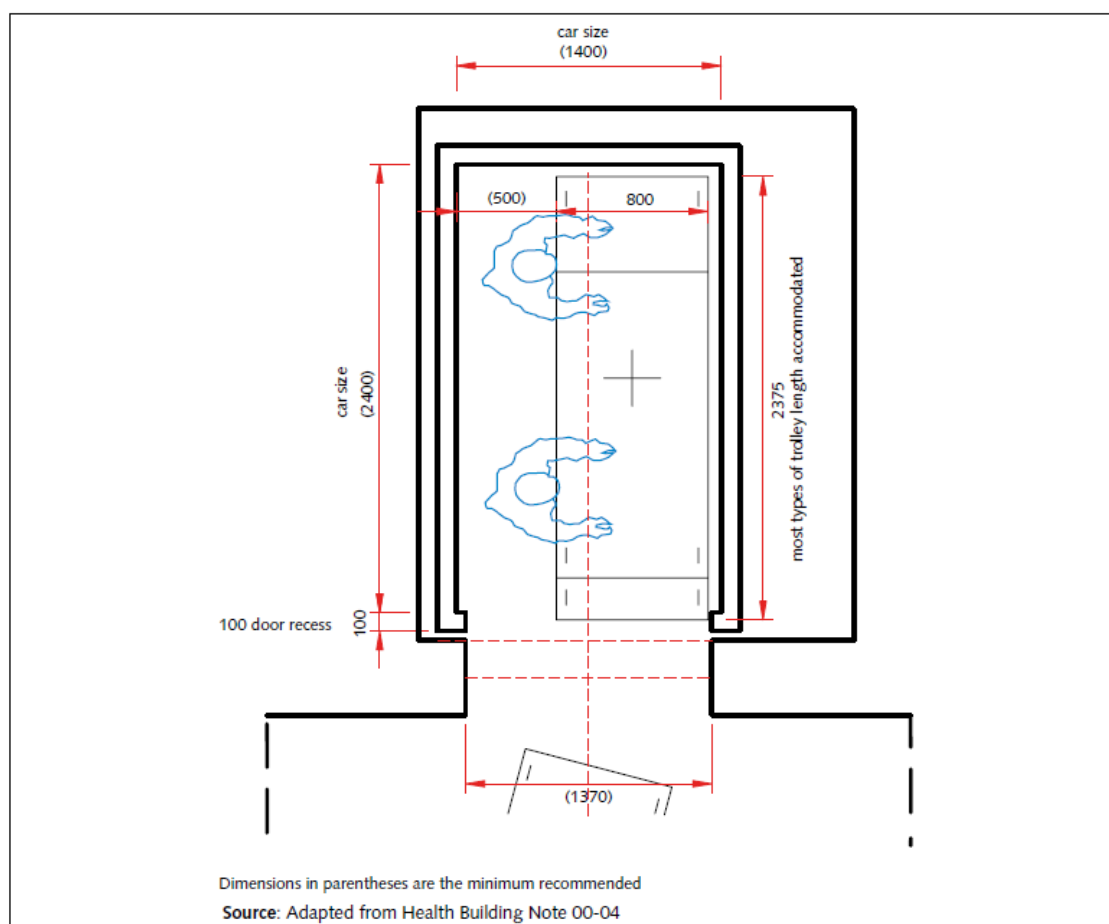


Figure 4: Passenger lift rated load: 630kg



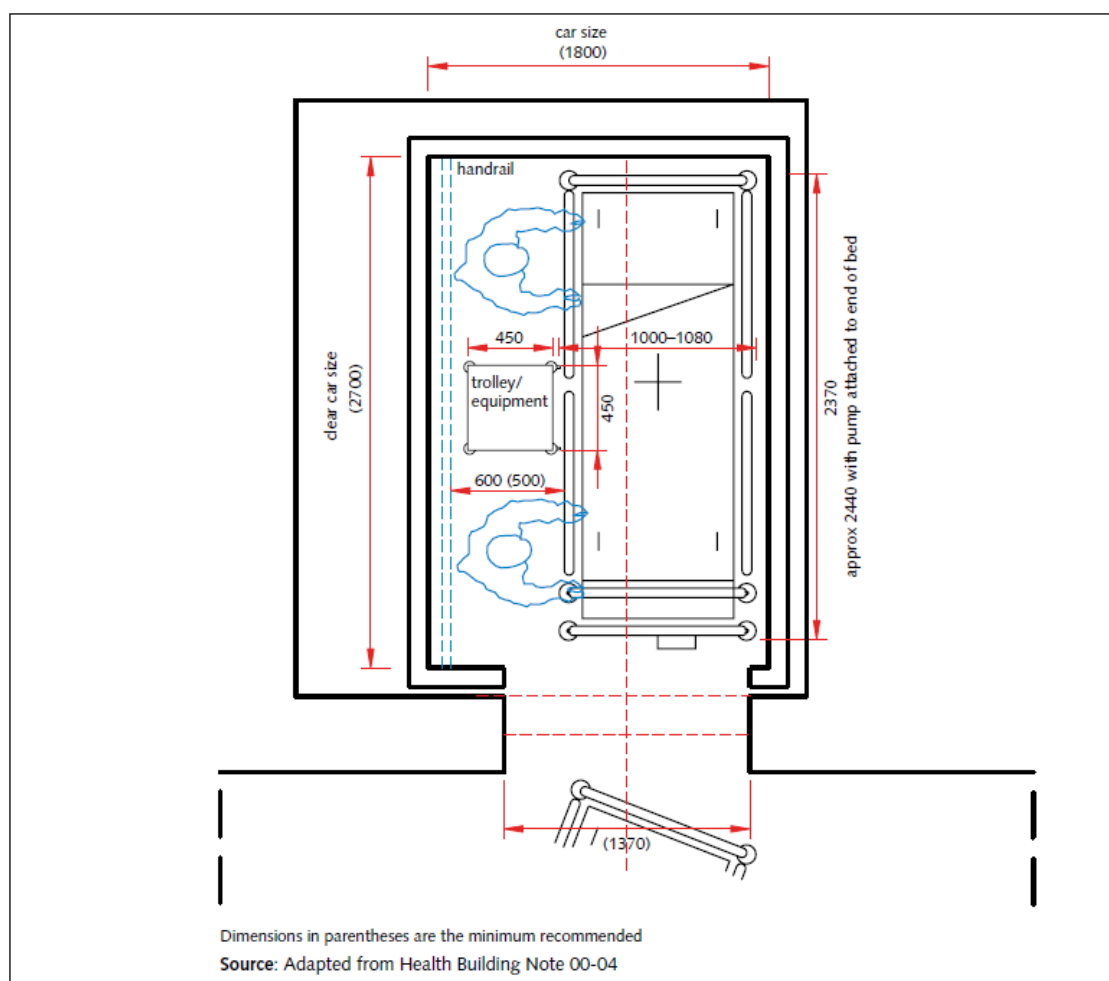


**Figure 5: Trolley/stretcher lift, rated load 1,600kg**

- 3.21 Where above-average usage is foreseen, fixtures meeting the requirements of BS EN 81-71 category 1 should be used. In areas of heavy usage, category 2 fittings should be considered.

### Bed lifts

- 3.22 These lifts are intended for the carrying of a patient on a standard extended bed together with the necessary staff and equipment.
- 3.23 This lift should have a rated load of 2,500kg, with clear car floor area of 1,800mm wide by 2,700mm deep and clear door-opening width of 1,400 mm (see Figure 6).
- 3.24 Wherever possible, bed lifts should conform to BS EN 81-70, except where they may conflict with clinical requirements. A roof trapdoor may also be required (see [paragraphs 5.124 – 5.125](#)).



**Figure 6: Bed lift, rated load 2,500kg**

- 3.25 Where above-average usage is foreseen, fixtures meeting the requirements of BS EN 81-71 category 1 should be used. In areas of heavy usage, category 2 fittings should be considered.

### Goods lifts

- 3.26 These lifts are intended for the movement of conventional goods and dirty items (for example furniture, equipment, building materials, equipment maintenance supplies, waste etc). Consideration should be given to providing a passenger goods lift.
- 3.27 The recommended rated load of a goods lift is 2,500kg with car floor area of 1,800mm wide by 2,700mm deep and clear door-opening width of 1,800mm (note that the door-opening width is equal to the car platform width – that is, no car returns).
- 3.28 In smaller healthcare buildings (see [paragraph 3.15](#)), the rated load may be reduced to 1,600kg with car floor area of 1,400mm wide by 2,400mm deep and a clear door-opening width of 1,400mm.
- 3.29 In healthcare buildings, where, for example, it is known that large equipment is to be frequently transported, goods lifts up to a rated load of 5,000kg with car

floor area of 2,500mm wide by 3,500mm deep and a clear door opening of 2,500mm may be required.

- 3.30 All goods lifts should conform to the requirements of BS EN 81-70, except that handrails should be restricted to one wall or be recessed to avoid damage and intrusion into the loading area.
- 3.31 Where heavy usage is foreseen, fixtures meeting the requirements of BS EN 81-71 category 1 should be used, or in areas of extreme abuse, category 2.

### Service lifts

- 3.32 Service lifts are not designed to carry passengers. They are arranged to be called and despatched externally, normally by a call point adjacent to each hatch or access door. Their size should be selected for each specific purpose.
- 3.33 Service lifts are Machinery Directive (2006/42/EC) lifting devices. A relevant standard is BS EN 81-3 for non-accessible goods-only lifts (NAGOL) and prEN 81-31 for accessible goods-only lifts (AGOL).
- 3.34 The prEN 81-31 standard applies to new electric accessible goods-only lifts with traction, and new hydraulic accessible goods-only lifts that:
- are permanently installed in restricted areas and/or only used by authorised and instructed persons (users);
  - serve fixed and permanent landing levels;
  - have a load-carrying unit made of a single load-carrying area with a minimum rated load of 300kg and a rated speed not exceeding 1 m/s.
- 3.35 Where small loads are to be carried, a 'dumbwaiter' style of device may be appropriate, either as a table-top or as a floor-standing unit conforming to BS EN 81-3. This Scottish Health Technical Memorandum does not provide further guidance on the provision of small service lifts; specialist advice should be sought.

### Housekeeping lifts

- 3.36 These lifts are intended for the movement of 'clean' items such as mail, stationery supplies, medical supplies, food, linen etc.
- 3.37 The recommended rated load of a housekeeping lift is 1,600kg with car floor area of 1,400mm wide by 2,400mm deep and a clear door-opening width of 1,400mm (note that the door-opening width is equal to the car platform width – that is, no car returns). This lift can accommodate two 30-trays catering trolleys and accompanying attendants.
- 3.38 Housekeeping lifts may be part of a group of general passenger lifts. However, housekeeping activities should be scheduled not to coincide with general passenger demands.
- 3.39 All housekeeping lifts should conform to the relevant parts of BS EN 81-70.

- 3.40 Where above-average usage is foreseen, fixtures meeting the requirements of BS EN 81-71 category 1 should be used. In areas of heavy usage, category 2 fittings should be considered.

## Lifts for emergency purposes

- 3.41 Lifts used in emergencies are fire-fighting and escape lifts (see Scottish Health Technical Memorandum 81, Part 1 and Scottish Fire Practice Note 3: Escape Bed Lifts).

### Fire-fighting lifts

- 3.42 In certain circumstances fire-fighting lifts are provided as a facility for the fire-and-rescue service for their exclusive use during a fire or any other emergency that they attend. They are provided as the primary means of access to upper floors for fire-fighters and their equipment in the event of fire or other emergency.

**Note:** A fire-fighting lift may be used for evacuation purposes under the control of Lift Wardens until the arrival of the fire-and-rescue service.

- 3.43 A fire-fighting lift is a lift that is primarily intended for general passenger use, but which is equipped with fire protection measures including controls and signals that enable it to be used under the direct control of the fire-and-rescue service in fighting a fire.
- 3.44 When not used for fire-fighting activities, a fire-fighting lift may be used as a general passenger lift by the occupants of the building. It is sometimes part of a group of passenger lifts, and in these circumstances it may be fitted with dual-entry doors, one set leading to the passenger lobby and the other set leading to the fire-fighting shaft.
- 3.45 Making a fire-fighting lift available for regular passenger use has the benefit of reducing the cost of lift provision (a separate lift is not required) in a healthcare building. It also has the additional advantage that it is more closely monitored regarding its service availability than a fire-fighting lift, which is rarely used and is located in a fire-fighting shaft (which is hardly ever visited).
- 3.46 Unlike a normal passenger lift, a fire-fighting lift is designed to operate for as long as is practicable (often up to two hours) when there is a fire in parts of the building. It is used to transport fire-fighters and their equipment to a floor of their choice. It may also be used for evacuation activities by the management of a healthcare building prior to the arrival of the fire-and-rescue service, **although such additional uses should be discussed with the fire-and-rescue service.**
- 3.47 The provision of fire-fighting lifts shall be in accordance with 'Practical fire safety guidance for Health care premises' and 'The evacuation of disabled persons from buildings' both published by Safer Scotland. Further details, requirements and approvals that need to be obtained may be found in BS9999 and the requirements of the Building Standards (Scotland) Regulations 2004:

Non-Domestic Technical Handbook; Sec 2: 2.1.11 in regard to compartmentation and 2.14.4, fire fighting generally.

- 3.48 It is essential that a designated fire-fighting lift is not used for moving waste, goods, equipment etc, in order to prevent the risk of the lift being occupied or its entrance being obstructed when the lift is required for fire-fighting activities.
- 3.49 Fire-fighting lifts should be specified to conform with BS EN 81-72 and also to either BS EN 81-1 for electric traction lifts or BS EN 81-2 for electric hydraulic lifts, as appropriate. These standards are harmonised European standards, and a lift conforming to them is deemed to meet the requirements of the EHSRs of the Lift Directive.
- 3.50 BS EN 81-72 defines the minimum requirements for rated load, rated speed, dimensions, door configurations, power supply requirements, control system etc for a fire-fighting lift.

**Note:** An electrical engineer should be consulted to ensure that the secondary supply has the same characteristics as the primary supply to all fire-fighting lifts together with automatic switchover operation. Guidance on emergency electrical requirements is given in Scottish Health Technical Memorandum 06-01: 'Electrical services: supply and distribution'.

- 3.51 Local fire-and-rescue services having jurisdiction over a healthcare building may have particular local needs to satisfy their operational strategies, for example whether a fire-fighter trapped in a lift may self-rescue or be required to await assisted rescue. If these special needs do not change any of the requirements of BS EN 81-72 (or indeed the underlying BS EN 81-1/2), a standard industry product may be provided. However, should a local fire-and-rescue service require any deviation at all from BS EN 81-72 (or BS EN 81-1/2), a design examination certificate from a notified body is required. This may increase the cost of provision, and hence consideration should always be given to installing a standard lift industry product.
- 3.52 A fire-fighting lift switch at the fire and emergency service access level should be provided to enable the fire-and-rescue service to obtain immediate control of the fire-fighting lift. Access to the fire-fighting switch should be controlled.
- 3.53 All fire-fighting lifts should be clearly identified. Lifts in the fire-fighting shaft should operate normally until the fire-fighting lift switch is activated.
- 3.54 Fire-fighting lifts exposed to the risks of vandalism should conform to BS EN 81-71.

### Escape lifts

- 3.55 Escape lifts are provided for the evacuation of in-patients or persons with reduced mobility, under the direction of either healthcare facilities management or the fire-and-rescue service (in conformity with BS9999).
- 3.56 When not used for emergencies, escape lifts may be used for general duties by the occupants of the building. They are sometimes part of a group of passenger

lifts, and in these circumstances may be fitted with dual-entry doors, one set leading to the passenger lobby and the other set leading to a refuge space.

- 3.57 Making an escape lift available for regular passenger or clinical use has the benefit of reducing the cost of lift provision (a separate lift is not required) in a healthcare building.
- 3.58 Unlike a normal passenger lift, an escape lift is designed to operate for as long as is practicable (often up to two hours) when there is a fire in parts of the building.
- 3.59 The control, requirements and mode of operation of an escape lift are determined by the fire strategy of the healthcare building as contained in Scottish Health Technical Memorandum 81 Part 1 and Scottish Fire Practice Note 3: Escape Bed Lifts.
- 3.60 The minimum requirements (for rated load, rated speed, dimensions, door configurations, power supply requirements, control system etc) are specified in BS9999 and in prTR 81-76. The basic lift requirements are similar to those lifts that conform to BS EN 81-72, except in some respects (for example no roof trapdoor and a different communications system).

**Note:** An electrical engineer should be consulted to ensure that the secondary supply has the same characteristics as the primary supply to all escape lifts together with automatic switchover operation.

**Note:** Guidance on emergency electrical requirements is given in Scottish Health Technical Memorandum 06-01.

- 3.61 It is essential that a designated escape lift is not used for moving waste, goods, equipment etc, in order to prevent the risk of the lift being occupied or its entrance being obstructed when the lift is required for evacuations.
- 3.62 Escape lifts should be specified to conform with BS EN 81-70 (where clinical requirements permit), BS EN 81-71 (where necessary), BS EN 81-72 (with some exceptions), BS EN 81-73 and also to either BS EN 81-1 for electric traction lifts or BS EN 81-2 for electric hydraulic lifts, as appropriate.
- 3.63 The smaller escape lifts accommodate ambulant passengers and wheelchair users. However, in healthcare buildings there may be a requirement to evacuate in-patients. In this case the platform size of any escape lift should conform to those for a standard bed lift.

### Standard healthcare lifts

- 3.64 [Table 1](#) overleaf indicates the range of lifts that have been standardised for use in healthcare buildings.
- 3.65 During preliminary design planning, other dimensions may be taken from BS ISO 4190-1 (passenger lifts) and BS ISO 4190-2 (goods lifts) regarding car floor area, well headroom, pit depth, well width, well depth, and machine room sizes (if any). These dimensions should be considered as initial values, especially

where machine-room-less equipment is to be installed. They should be confirmed with selected lift suppliers, who may be able to offer smaller dimensions.

Rated load (kg)	Car floor area width by depth (mm)	Clear door-opening width (mm)	Application
630 (see <a href="#">Figure 4</a> )	1,100 x 1,400 (Area = 1.66 m <sup>2</sup> )	900	General passenger lifts in small healthcare buildings. Fire-fighting lifts Escape lifts
800	1,350 x 1,400 (Area = 2.00 m <sup>2</sup> )	900	General passenger lifts in small healthcare buildings. Fire-fighting lifts Escape lifts
1,000 (see <a href="#">Figure 3</a> )	1,600 x 1,400 (Area = 2.40 m <sup>2</sup> )	1,100	General passenger lifts Fire-fighting lifts Escape lifts
1,275 (see <a href="#">Figure 2</a> )	2,000 x 1,400 (Area = 2.90 m <sup>2</sup> )	1,100	General passenger lifts Fire-fighting lifts Escape lifts
1,600 (see <a href="#">Figure 5</a> )	1,400 x 2,400 (Area = 3.56 m <sup>2</sup> )	1,400	Trolley/stretchers lifts Housekeeping lifts
2,500 (see <a href="#">Figure 6</a> )	1,800 x 2,700 (Area = 5.00 m <sup>2</sup> )	1,400	Bed lifts Escape lifts
2,500	1,800 x 2,700	1,800	General goods lifts
5,000	2,500 x 3,500	2,500	Large goods lifts

**Table 1: Types of lift used in healthcare facilities**



## 4. Lift planning

---

- 4.1 The architectural form of a healthcare building – that is, whether the building has a small footprint and is high-rise or has a large footprint and is low-rise – is important.
- 4.2 In high-rise buildings, lifts are a primary circulation route and their proper operation is vital, particularly when dealing with operating-theatre emergencies.
- 4.3 Most hospitals are designed on a two-to-three-storey, low-rise principle (although many inner-city hospitals have high-rise elements). In low-rise buildings, lifts are provided mainly as a means of moving patients on beds or trolleys from floor to floor, as much of the pedestrian circulation route comprises stairs.

### Lift traffic design

- 4.4 Specialist advice should be sought for lift traffic design.
- 4.5 An effective traffic design can only be achieved if the operating requirements of the healthcare facility are understood. Factors to be considered include:
- numbers of staff and shift patterns;
  - numbers of visitors and visiting hours;
  - location of theatres, X-ray, CT/MRI scanning equipment etc;
  - ward rounds and operating lists;
  - distribution and deliveries of food, beverages, supplies;
  - waste disposal;
  - evacuation of occupants during an emergency;
  - portage etc.
- 4.6 Should operating requirements change, the lift design could be invalidated and therefore the design should make some provision to accommodate such changes.
- 4.7 Because a healthcare environment has a higher percentage of ill and vulnerable people – many with reduced mobility – consideration needs to be given in the traffic design process to an over-provision in the number and size of the lifts in healthcare facilities.
- 4.8 Additionally, the need to guarantee a continuity of lift service may mean installing more lifts than normal. For example, the provision of a single theatre lift is inadvisable, as access to theatres would be compromised should the lift not be in service owing to breakdown or maintenance.



- 4.9 This illustrates the complexity of developing an exact traffic design which is optimum in terms of capital and costs.
- 4.10 The guidance given in the rest of this chapter should be used to establish a preliminary traffic design. Thereafter specialist advice should be sought.

### Basic principles of lift provision

- 4.11 Where lifts are required for the movement of patients, at least one lift should be installed in each section of a healthcare complex.

### Low-rise, two-storey healthcare buildings

- 4.12 At least one general passenger lift should be installed in healthcare buildings of two storeys. This lift should meet the needs of wheelchair users and have a rated load of 1,275kg (see also [paragraph 3.15](#)). Ideally, two general passenger lifts, each with a rated capacity of 1,275kg, should be installed in healthcare buildings of two storeys to ensure security of service. This decision would result from an impact assessment to determine the consequences of the failure of a single lift installation.
- 4.13 Where two general passenger lifts are installed, they should be placed together wherever possible. If this is not possible, there should be a pedestrian route between the two lifts to provide a facility in the event of breakdown, maintenance or inspection.
- 4.14 For smaller healthcare buildings, lift provision may be met by lifts with a smaller rated load, as detailed in [paragraph 3.15](#). Lifts with a rated load of 630 kg should be restricted to those healthcare buildings where an impact assessment shows a low demand from patients or passengers with reduced mobility. The installation of a lift with a rated load of 630kg may also compromise future usage (for example increased patient access to the upper storey).

### Low-rise, three-storey healthcare buildings

- 4.15 At least three general passenger lifts of rated capacity 1,275kg should be installed in healthcare buildings of three storeys, particularly those with a 'street' on the middle storey and facilities above and below the street. These lifts are best located together, but may be located as a duplex and simplex, provided a pedestrian route is available between them.
- 4.16 The number and size of the general passenger lifts installed may be reduced provided that an impact assessment has been carried out regarding provision for passengers with reduced mobility (rated load) and security of service (number).

### Medium-rise, four-to-eight-storey healthcare buildings

- 4.17 In healthcare buildings with four to eight storeys, at least four general passenger lifts of rated capacity 1,275kg should be installed. These lifts are best located together, but may be located as two duplexes, provided a pedestrian route is available between them.

- 4.18 The number and size of the general passenger lifts installed may be reduced provided that an impact assessment has been carried out regarding provision for passengers with reduced mobility (rated load) and security of service (number).

### High-rise (eight or more storeys) healthcare buildings

- 4.19 In healthcare buildings with eight or more storeys (but fewer than 16), four general passenger lifts of a rated capacity of at least 1,275kg should be installed.
- 4.20 An impact assessment should be carried out to determine whether any additional general passenger lifts may be required to meet the peak demands in a high-rise healthcare building.

### Dual-role lift requirements

- 4.21 General passenger lifts in small- to medium-sized healthcare buildings may also be used to carry trolleys/beds (see [Section 5](#) for details of special control systems) and for fire-fighting activities, evacuation, goods service etc.
- 4.22 These extra roles complicate the prediction of traffic demand and special requirements. For example, when general passenger lifts are used to provide a trolley/bed service, this can add to the demand and result in lifts becoming unavailable for general passenger service.
- 4.23 In larger healthcare buildings, trolley/bed lifts should always be provided, at least as duplex pairs, either to provide security of service against the unavailability of a lift that is out of service or to meet the demands of theatre lists and ward schedules.

**Note:** The use of general passenger lifts for moving goods should be avoided, as this use disrupts service.

### Lift dynamics

- 4.24 The selection of an appropriate speed is dependent on building height. [Table 2](#) indicates typical values. However, speed has very little effect on the handling capacity of lifts in healthcare buildings owing to the prolonged loading and unloading times; therefore, rated speeds can be lower than would normally be required in office buildings.
- 4.25 An advantage to selecting a lower rated speed is that this should improve stopping accuracies, thus permitting the easier transfer of wheeled vehicles and appliances into and out of lifts.
- 4.26 The drive system should be capable of providing at least the typical floor-to-floor times shown in Table 2. The lift installer should be asked to provide flight times for the drive system to be supplied.

**Note:** Flight time is defined as the time measured from the instant the car doors are closed at the departure floor until the doors are 800mm open at the next adjacent floor.

Rated speed (m/s)	Typical travel (m)	Flight time (s) <sup>a</sup> over 3.5 m <sup>b</sup>	Flight time (s) <sup>a</sup> over 4.5 m <sup>b</sup>	Flight time (s) <sup>a</sup> over 5.5 m <sup>b</sup>
0.63	18m	8.0	9.5	11.0
1.0	30m	6.5	7.5	8.5
1.6	48m	6.0	6.5	7.0
2.5	75m	5.7	6.3	6.7
3.5	100m	5.6	6.2	6.6
4.0	120m	5.5	6.1	6.5
5.0	150m	5.4	6.0	6.4

**Table 2: Recommended rated speeds for different travel distances and typical flight times for different floor-to-floor heights**

**Notes:**

a. Using modest mid-range dynamics for acceleration and jerk values;

b. Interpolate for intermediate values. Seek expert help for other values.

4.27 Door times are dependent on door configuration (centre-/side-opening), width, height and construction (weight, finish etc) and whether advance door opening (this enables the lift doors to start to open as the lift levels to the landing floor) has been provided.

4.28 Centre-opening doors are recommended where good traffic performance is required (for example on the main (front of house) general passenger lifts). Side-opening doors, which are slower in operation, may be used on 'back of house' passenger lifts, goods lifts and dedicated fire-fighting/escape lifts.

4.29 [Table 3](#) gives typical operating times for a limited range of centre-opening door widths using a medium-speed door operator installed on a general passenger lift. The lift installer should be asked to provide the operating times for the lift doors that are to be supplied.

Door size (mm)	Opening time(s)	Closing time(s)
900	2.4	2.6
1,000	2.5	2.7
1,100	2.7	3.3

**Table 3: Door operating times: (medium-speed door operator) centre-opening doors**

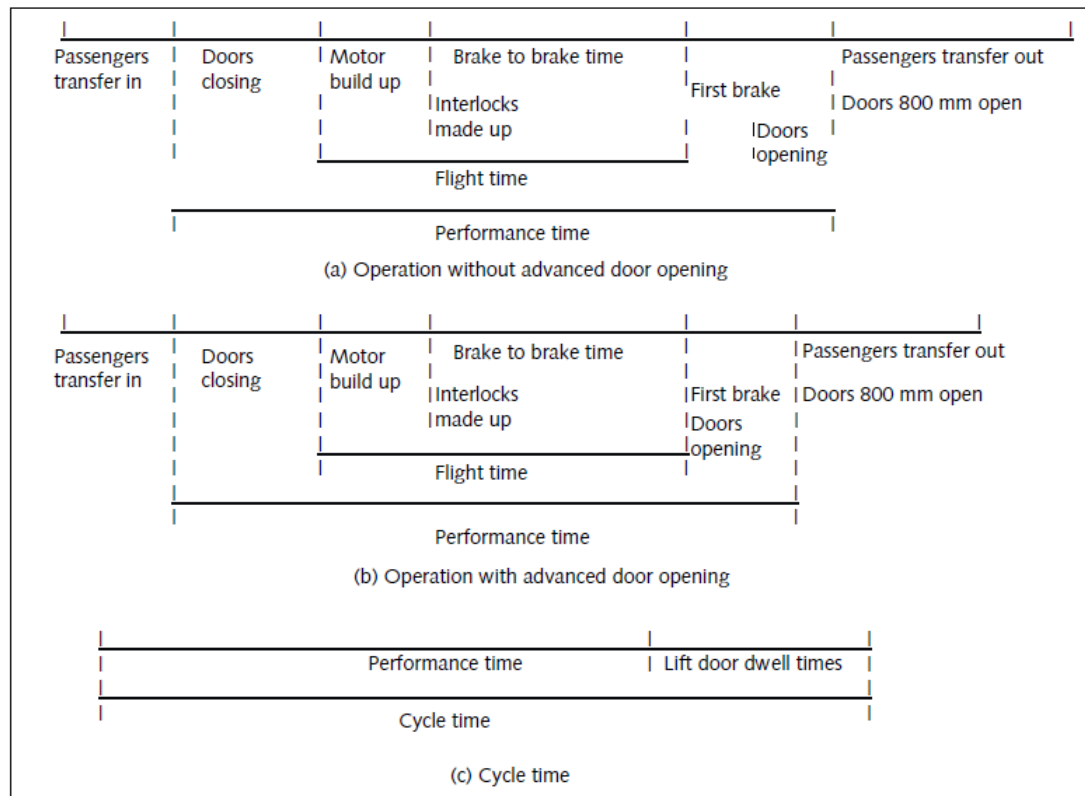
Source: CIBSE Guide D (2005)

4.30 A performance time should be obtained from the lift installer. This is defined as 'the time between the lift doors starting to close at the departure floor until they are 800mm open at the next adjacent floor, having travelled a standard interfloor distance'.

- 4.31 This time includes all door operating times, flight times, start-up delays etc, and is more accurate to define. It is easily measured and confirmed after the lifts have been put into service, by an Authorised Person (Lifts) using a stopwatch.
- 4.32 Door dwell times (that is, the time the lift doors remain open at a landing if no further pushbuttons are pressed) should be set to five seconds (5 secs) for general passenger lifts and seven seconds (7 secs) for all other lifts or where general passenger lifts are used for other traffic types. The dwell time should shorten to 0.5 secs whenever the door-close or a push-button is operated.
- 4.33 Passenger transfer times (to enter or leave a lift) in a healthcare building are normally longer than in an office building, and should be assumed to be two seconds per person transferred. [Figure 7](#) illustrates the various times involved in a lift moving from one floor to another.

### Lift traffic design

- 4.34 The number and size of lifts provided should be determined by clinical need and overall traffic volumes.
- 4.35 The number of escape lifts should be determined by the healthcare facility's fire evacuation strategy.
- 4.36 The number of goods lifts should be determined by considering the number of goods transfers likely to be made during a working day.
- 4.37 It is difficult to determine the number of general passenger lifts to be provided as, unlike an office building, there are no well-established traffic patterns. Each healthcare building is different. An estimation of building population may be made by multiplying the number of beds by three; this estimation takes into account all the staff caring for the patient plus visitors to the patient. If the building has a large number of office staff, the estimation should be increased accordingly.



**Figure 7: Times associated with a lift moving from one floor to the next adjacent floor**

- 4.38 The maximum traffic demand is difficult to estimate, but practice indicates a range of 8% to 12.5% of the likely maximum building population.

**Note:** The likely maximum building population is measured as the maximum number of persons present in the healthcare building at the same time, and not the theoretical occupancy of the building based on persons per square metre.

- 4.39 The average interval of the lift (that is, the time between successive lift arrivals at the main (entrance) floor) can be longer than that tolerated in an office building. A range of 30 secs to 50 secs is acceptable.
- 4.40 In healthcare buildings, lift car occupancy is lower than the traditional 80% of rated capacity used in other traffic calculations. The maximum capacity of a general passenger lift should be estimated as the platform area ( $m^2$ ) divided by 0.25. The likely average car load should be taken as 80% of this value.
- 4.41 BS5655-6 defines a method for the calculation of lift traffic-sizing for an individual lift or group of lifts. (This method is elaborated upon in CIBSE Guide D (2005).) This calculation only provides a value for the underlying handling capacity and average interval for a unidirectional up-peak traffic demand. It does not provide any indication of the likely performance in service.
- 4.42 There are many software programs available to simulate lift passenger traffic in office buildings. However, these cannot be easily applied to hospitals, where traffic is multi-way and flows for longer periods.

- 4.43 Software programs are available that enable complex traffic patterns to be input. However, in hospitals there is insufficient data available to develop standard demand templates.

### Lift installation management

- 4.44 At the design stage of a healthcare building, the number, sizes and details of lift provision should be established and should form part of the specification.
- 4.45 BS5655-6 gives guidance for the selection and installation of new lifts, and its procedures should be used for all healthcare lift projects. See also the checklist in [Appendix B](#), which can be used at the return-of-tender stage.

## 5. Lift equipment

---

### Introduction

- 5.1 The complete design of a lift is the responsibility of the installer (the installer may not be the manufacturer or supplier). This responsibility includes ensuring all components and systems meet either the harmonised standards or a design examination certificate for a model lift (see [paragraph 2.2](#)) and that information is passed to other designers, for example structural engineers and electrical services engineers. This Scottish Health Technical Memorandum assumes the lift installer understands these responsibilities.
- 5.2 This section specifies the technical requirements that should be provided by an installer for each component part that is applicable to healthcare buildings as the result of a clinical need or procurement policy.
- 5.3 It is not intended to describe in detail the various pieces of lift equipment, as the descriptions can become dated or even irrelevant owing to innovations and technology changes.

### Types of lift drive

- 5.4 Two types of lift drive are considered in this Scottish Health Technical Memorandum: electric traction drive and electric hydraulic drive. Both types of drive move a car up and down a lift well.
- 5.5 The electric traction drive comprises an electric motor turning a sheave (also known as a pulley), which in turn moves a counterweighted lift car up and down the lift well.
- 5.6 The electric hydraulic drive comprises an electrically-driven hydraulic pump, which pumps oil into a hydraulic cylinder, which in turn moves a lift car up. The lift car moves down under gravity. There are two types: a direct-acting drive (borehole or side-acting) and an indirect-acting drive.
- 5.7 Traction lifts are most commonly used in high-rise buildings. The weight of the lift car is counterbalanced throughout its full travel in the lift well.
- 5.8 Traction lifts are versatile and can be designed to operate at very fast speeds, such as those required in high-rise buildings. Passenger lifts can typically carry rated loads of 630–2,000kg at rated speeds of 0.5m/s to 5.0m/s, although in a healthcare facility, lift speeds are unlikely to exceed 3.0m/s.
- 5.9 Hydraulic lifts are more suitable for applications in low-rise buildings with up to 18m of travel.
- 5.10 Hydraulic lifts operate at lower rated speeds than traction lifts in the range 0.3 m/s to 1.0m/s. However, they can carry larger rated loads up to 5,000kg.



- 5.11 For healthcare buildings, the installation of indirect-acting hydraulic lifts is preferred, unless special circumstances apply.
- 5.12 Consideration should be given to the running (energy and maintenance) costs incurred over the lifespan of the lift installation when comparisons are made between traction and hydraulic lifts. This should also include any cooling or air-conditioning systems required for the reliable operation of the lift.
- 5.13 Wherever possible, a machine room should be provided. However, for economic or architectural reasons, machine-room-less arrangements may be considered, and in those circumstances additional features should be provided.

### Life expectancy

- 5.14 All lift installations in healthcare buildings should be designed for continuous duty operation and with a minimum life expectancy of 20 years, when suitably maintained. It is important that spare parts (or suitable alternatives) are available for 20 years. This could be verified at the tendering stage.

### Energy saving

- 5.15 Lifts should be installed to meet energy-saving criteria, in particular BREEAM Healthcare (Building Research Establishment's Environmental Assessment Method). Two credits are available in the overall energy classification of a building by the provision of energy-efficient lifts. This can be achieved by specifying variable-voltage variable-frequency (VVVF) regenerative drives, together with other measures (see also BREEAM Healthcare 2008 and Scottish Health Technical Memorandum 07-02: 'EnCO<sub>2</sub>de').
- 5.16 Lift-car lighting should be of a low-energy type. To meet the recommendations of ISO/DIS 25745-1, the lighting should be reduced to a lower level of energy consumption when a lift is parked for more than five minutes at a floor with its doors closed.
- 5.17 In the event of a breakdown between floors, the lighting should be maintained at normal level.
- 5.18 The lighting should be restored to the normal level as the result of:
- the lift starting to move;
  - the doors opening;
  - a destination push-button being operated; or
  - any other push-button on the operating panel being operated.
- 5.19 Once the normal lighting has been dimmed/switched off, the lift car should remain illuminated by a low-energy luminaire providing a lumen output equivalent to that provided by an 8 W fluorescent lamp. This lighting could be provided by the emergency lighting unit required by BS EN 81-1/2.



- 5.20 Lift controllers should be placed in standby mode after five minutes of inactivity to meet the recommendations of ISO/DIS 25745-1. In practice, only the basic control should remain in operation. (See also [Appendix C](#) for examples of energy efficiency in relation to lifts.)

## Drive systems

### Electric traction drives

- 5.21 Electric traction drives should use VVVF technology. Wherever possible, the drive should also be regenerative in order to contribute to the energy classification of the healthcare building (see BS5655-6).

### Hydraulic drives

- 5.22 Hydraulic drive lifts are sometimes suitable for low-rise buildings (less than 18m travel). The use of hydraulic lifts is not recommended where:

- the number of starts exceeds 45 up-starts per hour;
- the speed exceeds 0.8m/s.

**Note:** The maximum permitted speed for an hydraulic lift is 1.0m/s in conformity with BS EN 81-2.

- 5.23 Hydraulic drives, wherever possible, should be as energy-efficient as possible by using VVVF-controlled valves, accumulators or counterbalances (see BS5655-6).

**Note:** The use of accumulators is subject to the Pressure Equipment Regulations 1999, and this can result in ongoing inspection costs.

### Acceleration/deceleration restrictions

- 5.24 So as not to impose undue pressure on patients, particularly those on trolleys who may have just had surgery, the acceleration and deceleration values of lifts used in surgical/clinical areas should not exceed  $0.6\text{m/s}^2$ . The rate of change of acceleration and deceleration (termed 'jerk' and measured in  $\text{m/s}^3$ ) should not exceed  $1.0\text{m/s}^3$ .

### Stopping and levelling accuracy

- 5.25 All lift drives should provide a stopping accuracy of  $\pm 5\text{mm}$  under all conditions of load, direction of travel and position in the well. This may be a reason to select a lower rated speed than is the case in other building types.
- 5.26 The levelling (or re-levelling) accuracy of  $\pm 20\text{mm}$  should be provided in order to conform to the requirements of BS EN 81-1 (traction) and BS EN 81-2 (hydraulic).

## Rescue equipment

### Machine brake (on traction drive)

- 5.27 A means should be provided to release the machine brake during maintenance and rescue operations. This can take the form of either a manually-operated mechanical system or an electrically-operated system powered either by a battery where the battery status is continuously monitored, or by an uninterruptible power supply (UPS).

### Hand-winding wheel on (traction drive) machine-roomed installations only

- 5.28 A permanently fixed and guarded hand-winding wheel should be fitted and painted yellow.
- 5.29 Direction arrows should be fixed to the end of the drive motor to indicate clearly in which direction the motor should be turned, to raise or lower the lift car.

### Manually-operated lowering valve (on hydraulic drive)

- 5.30 A manually-operated emergency lowering valve should be provided in an accessible place and prominently signed. The operating position should be arranged so that the oil-pressure gauge and lift-position indicator can be easily viewed.

### Oil-pressure gauge (on hydraulic drive)

- 5.31 An oil-pressure gauge should be fitted on all hydraulic lifts, with a full-scale deflection allowing the working pressure to be accurately observed. This gauge should be easily visible from the manual lowering position and indelibly marked to show the normal working pressure.

### Hand pump (on hydraulic drive)

- 5.32 All hydraulic lifts should be fitted with a manually-operated hand pump.

### Lift-position indicator during passenger rescues

- 5.33 When carrying out either emergency hand-winding on a traction lift or manual lowering on hydraulic lifts on lift installations with three or more floors, it should be possible to identify the position of the lift in relation to the floor level with a reasonable degree of accuracy (typically  $\pm 100\text{mm}$ ) from the rescue position (in a machine room or landing).
- 5.34 The lift-position indicator should be provided in an easily-viewed position. The power for this indicator should be derived from a maintained battery-powered source. Both visual and audible signals should be provided. The signalling system should be activated by a switch mounted in a prominent position in the machine room, controller cabinet or rescue panel where provided.

## Machine-roomed lifts

- 5.35 Machine rooms can be located above, to the side or at the bottom of the well. Drives, controller equipment, overspeed governors etc are typically located in these rooms.
- 5.36 Access to the rooms is restricted to trained and authorised persons, allowing a well-controlled and safe working environment to be obtained. All machine rooms should be kept locked, and an appropriate warning sign should be displayed on the door.
- 5.37 Machinery in machine rooms should conform to BS EN 81-1/2 and the recommendations of BS7255.

## Floors and walls

- 5.38 The walls and ceilings of machine rooms should be sealed and painted white in non-flake paint. The floor/wall interfaces of machine rooms, machine spaces and pulley rooms should be so constructed as to reduce the opportunity for dust and dirt build-up. All machine-room, machine-space and pulley-room floors should be sealed with rubberised or acrylic floor paint, applied in accordance with the manufacturer's instructions. All metalwork should be painted.

## Lighting

- 5.39 General lighting should be provided in the lift machine room to provide a level of illumination at floor level and on control panels in all areas where work is carried out (see CIBSE LG2).

## Emergency lighting

- 5.40 Non-maintained emergency lighting of sufficient intensity and duration should be provided in the machine room and pulley room (if applicable) to allow personnel to exit hazardous areas. Where lift rescue operations are to be performed, the lighting should be enhanced above emergency levels to permit the operations to be carried out safely (see also BS5266-1).

## Environment

- 5.41 The ambient temperature of the machine room should be maintained in the range 5°C to 40°C as required by BSEN 81-1/2. Hydraulic lifts are more heat-sensitive, and the temperature range for the pump room may be set in a narrower range of 15°C to 35°C.
- 5.42 Any machine-room ventilation should be to the outside of the building.
- 5.43 The lift installer has the responsibility to ensure that the correct operating and working environment for the lift installation has been provided (by others) in accordance with the guidance given in paragraph 5.41.
- 5.44 Lift machine rooms may require heating if they are in an exposed location or to prevent the temperature in the machine room dropping below the prescribed

limits. It may be necessary to provide additional cooling for hydraulic lifts, especially where the room has no external walls. The cooling unit should not discharge heat into the machine room, but to the outside of the building. Alternatively, the heat can be exchanged into a chilled water facility or recovered as part of an energy plan.

### Control cabinets

- 5.45 Control panels should be enclosed in a drip-proof steel cabinet (a minimum rating of IP21). Machine-room control cabinets should be labelled to indicate the lift they serve. The labels should be secured by rivets or screws.
- 5.46 As access to lift machine rooms should be restricted to authorised persons, control cabinets should not be locked.
- 5.47 All air ventilation input ports should be protected with renewable dust filters.
- 5.48 To avoid electromagnetic coupling and signal degradation, the control signal wiring should be segregated from any power supply wiring.
- 5.49 The incoming supply and motor supply terminals should be shrouded and identified in their respective group of terminals. Any exposed electrical terminals presenting voltages larger than 100 Volts a.c. should be shrouded. Control panel doors should be hinged.

### Fire prevention

- 5.50 Machine rooms/spaces and pulley rooms should be fitted with appropriate fire protection including smoke detectors and manual call-points connected to the main fire panel, incorporating audio-visual warning devices.
- 5.51 Machine rooms/spaces and pulley rooms should not be fitted with sprinklers. Refer to the Scottish Health Technical Memorandum (Firecode) series and BS5839 for guidance.

### Room sizes

- 5.52 The machine room sizes given in [Tables 4 and 5](#) follow BS ISO 4190-1 and BS ISO 4190-2 and should only be used for preliminary planning until confirmation can be obtained from a selected supplier.
- 5.53 The values given are the maximum sizes likely, and are for guidance only for single lifts, as factors such as access arrangements, split levels, machine-room height, machine position, position of counterweight, multiple lifts in well, equipment in the well etc would require confirmation from the lift installer.

Rated speed (m/s)	Rated load (kg)									
	630		1000		1275		1600		2500	
	Width	Depth	Width	Depth	Width	Depth	Width	Depth	Width	Depth
0.63, 1.00, 1.60	2,500	3,700	3,200	4,900	3,200	4,900	3,200	4,900	3,300	5,600
2.50	2,700	4,700	2,700	5,100	3,000	5,300	3,000	5,300	3,400	5,700
3.15, 4.00, 5.00			3,000	5,700	3,000	5,700	3,000	5,700	3,500	5,800

**Table 4: Width and depth of machine room sizes (mm) for all traction lifts**

Rated speed (m/s)	Rated load (kg)					
	630	1,000	1,275	1,600	2,500	5,000
0.50, 0.63, 1.00	Well width or well depth x 2,000 mm					

**Table 5: Width and depth of machine room sizes (mm) for all hydraulic lifts**

- 5.54 For multiple lifts (side-by-side or facing), see the formulae given in BS ISO 4190.
- 5.55 The machine room should have a clear height of at least 2m at working areas. For other areas, the clear height should be at least 1.8m.

### Machine-room-less (MRL) lifts

- 5.56 The development of machine-room-less (MRL) lifts has removed the need for a dedicated machine room. As a result, the drive system, controller equipment, overspeed governors etc are accommodated elsewhere. Generally the drive system and overspeed governor are located at the top of the well, although in some installations they may be located at the bottom of the well. The controller cabinets are often located at the top or bottom landings or in a small machinery space nearby.
- 5.57 The development of MRL systems has resulted in changes to working procedures such as:
- access to the equipment in the well has to be carefully managed;
  - there is less control of the working environment at locations where controller cabinets are installed;
  - additional facilities are required to rescue trapped passengers.

**Note:** The rescue of passengers trapped in lifts is an important part of the training provided by lift installers to NHS Boards on completion of the contract works. In older installations this operation was relatively simple using the brake and hand winding equipment located in the lift motor room. The construction arrangements of an MRL lift make this procedure impossible and so different procedures are required.

It is now recommended that:

1. All new MRL lift installations should be fitted with an uninterruptible power supply (UPS) to facilitate trapped passenger rescue.
2. All new MRL lift installations should include a requirement that the UPS is linked to the Building Management System (BMS) to monitor the condition of the UPS, especially the battery, and raise alarms where necessary. The linking of the BMS and UPS may require a collaborative approach by both parties when should be resolved pre-tender to ensure any costs are included in contracts.
3. If the building, such as a Health Centre, does not use a BMS then it will usually be possible to link the UPS to a designated PC such as that in reception. Again, collaboration may be required.
4. For existing MRL lifts NHS Boards should liaise with the lift installer to determine whether or not a link can be installed from the BMS/PC to the lift UPS.
5. For emergency planning reasons the lift installer and/or maintainer should confirm at handover that they have a procedure on record for rescuing trapped passengers in the very unlikely event that mains power is unavailable, the generator has failed (or does not exist, for example, in some primary care buildings) and the UPS has also failed.
6. The lift installer should provide confirmation from the UPS manufacturer that the UPS is suitably protected against the conditions present in the lift shaft.

5.58 Machinery inside the well and outside the well should conform to BS EN 81-1/2.

### Access to equipment in the top of the well

5.59 An access door/trap should be provided at the top of the well. Authorised personnel should be able to reach the door/trap safely in conformity with BS EN 81-1/2. The door/trap should be kept locked and the keys should be stored in the machinery cabinet.

## Machinery cabinets

- 5.60 Control panels should be enclosed in a drip-proof steel machinery cabinet (a minimum rating of IP21). Machinery cabinets should be labelled to indicate the lift they serve. The labels should be secured by rivets or screws.
- 5.61 Access to machinery cabinets should be restricted to authorised persons, and control cabinets should be kept locked and an appropriate warning sign should be displayed on the door.
- 5.62 All air ventilation input ports should be protected with renewable dust filters.
- 5.63 To avoid electromagnetic coupling and signal degradation, the control signal wiring should be segregated from any power supply wiring. Any exposed electrical terminals presenting voltages larger than 100 Volts a.c. should be shrouded.
- 5.64 An easily-accessible and prominently-labelled isolator switch rated to overload capacity should be provided.
- 5.65 The incoming supply and motor supply terminals should be shrouded and identified in their respective group of terminals.
- 5.66 Control panel doors should be hinged.

## Fire prevention

- 5.67 Machinery cabinets should be fitted with appropriate protection such as smoke detectors connected to the main fire panel, incorporating audio-visual-warning devices (see the Scottish Health Technical Memorandum (Firecode series) and BS5839 for guidance).

## Safe working space at machinery cabinets

- 5.68 If access to a machinery cabinet is from a circulation area used by persons and where medical equipment is used, a safe working space should be provided to meet the requirements of BS EN 81-1/2. This should be achieved by erecting robust temporary barriers to create a safe working space.

**Note:** These barriers should be provided as part of the lift supply contract following consultation with the lift supplier/installer. One set may be sufficient for a building with several similar lift installations.

The storage of barriers is not permitted in lift pits or on the top of lift cars.

- 5.69 An impact assessment should be carried out at the design stage to identify whether extra circulation space is required in the area immediately adjacent to the machinery cabinet (for example to allow maintenance activities to be carried out on the lift without compromising healthcare activities and clinical functions).
- 5.70 At the machinery cabinet, the level of illumination at floor level and on control panels should comply with the guidance given in CIBSE LG2. This may be



provided by the normal lighting at the access area. This local lighting, whether additional or existing, can be controlled by a switch located adjacent to or within the lift control panel and within the working enclosure created by the temporary barriers.

- 5.71 Non-maintained emergency lighting of sufficient intensity and duration should be provided to allow personnel to exit the area safely. Where lift rescue operations are to be performed at the controller cabinet, the lighting should be enhanced above emergency levels to permit the operations to be carried out safely.

## Hydraulic lifts

### Hydraulic tank

- 5.72 The oil tank of hydraulic lifts should be fitted with a gauge to indicate the oil level. The tank should be situated in a tray large enough to collect and contain any leakages. In certain circumstances, determined by risk assessment, the machine space may need to be provided with a bund wall to contain extensive oil spillages from the tank.

### Oil cooler

- 5.73 If the number of starts is anticipated to exceed 30 per hour, a calculation should be carried out to determine whether an oil cooler is required. Where oil coolers are provided, cooling of the machine room should be considered.

## Well

### Well walls and ceiling

- 5.74 Lift wells penetrate all floors of a healthcare building and therefore pose a risk for the transmission of infection. To reduce this risk, all lift wells (walls, ceiling etc) should be dust-sealed and painted white with non-flake paint. Lift pits should be sealed and painted with oil-based floor paint or an equivalent product.

### Well work lighting

- 5.75 Well lighting should, at least, be controlled at multi-way switch points in the machine room, from the top landing and from the bottom landing.

### Well emergency lighting

- 5.76 Non-maintained emergency lighting should be provided on the car top and in the pit. It should be of sufficient intensity and duration to allow personnel to exit hazardous areas.

### Well ventilation

- 5.77 Lift wells typically do not require ventilation additional to that naturally provided through and around the landing doors, unless required by the healthcare



organisation or specifically recommended by the local planning authority or fire service.

### Car-top controls

- 5.78 Car-top controls should conform to BS EN 81-1/2 and the recommendations of BS7255.
- 5.79 An alarm device to BS EN 81-28 should be provided on the car top.

### Pits

- 5.80 Lift pits should conform to BS EN 81-1/2 and the recommendations of BS7255.
- 5.81 An alarm device to BS EN 81-28 should be provided in the pit area.

### Ropes

- 5.82 Rope-tension equalisation should be provided in conformity with BS EN 81-1/2.
- 5.83 A rope data plate should be permanently displayed on the crosshead of all traction lifts or on the pulley frame of all roped hydraulic lifts, providing all the necessary information to ensure safe replacement.

### Rope compensation cable

- 5.84 Compensation, when provided, should conform to BS EN 81-1.

### Overspeed governors

- 5.85 Overspeed governors should be installed to ensure accessibility for maintenance and resetting, when required.
- 5.86 The wiring to the overspeed governor should be arranged such that it does not cause a tripping hazard and is suitably mechanically protected.
- 5.87 Overspeed governors should be fitted with guards that do not hinder inspection or maintenance.
- 5.88 A readily-accessible and visible data plate should be fitted.
- 5.89 Exposed moving parts should be guarded and painted yellow.

### Safety gears

- 5.90 Instantaneous safety gears are not recommended for use on healthcare lifts that are intended to carry patients (for example bed lifts used for theatre service).

## Guide rails

- 5.91 The size, alignment, position and surface finish of guide rails have a significant effect on ride quality. Therefore, great care should be taken to ensure that they are correctly installed.

## Buffers

- 5.92 Wherever possible, buffers should be positioned in line with, and symmetrically between, the car and counterweight guide rails. They should be mounted on steel piers so as to conform to the over-travel distances specified in BS EN 81-1/2.
- 5.93 For hydraulic buffers, a readily-accessible and visible data plate should be permanently fitted providing details of the type, grade, viscosity and quantity of oil to be used.

## Counterweights

- 5.94 Each traction lift should include a counterweight. Conventionally, the counterbalancing ratio is 50%. However, wherever a large car is installed which is known rarely to carry the rated load of the lift, for example theatre lifts, this ratio may be reduced to as low as 40%, provided traction can be maintained. This reduction will contribute to energy efficiency.

**Note:** Load weighing to avoid overloads is a requirement of BS EN 81-1.

- 5.95 The counterweight's metal filler weights should be securely contained in a frame.

## Fire prevention

- 5.96 Lift wells should be fitted with appropriate fire protection such as smoke detectors connected to the main fire panel, incorporating audio/visual warning devices. Lift wells should not be fitted with sprinklers (see Scottish Health Technical Memorandum Firecode series).

## Lifting equipment

- 5.97 A lifting beam, painted yellow, should be provided at the top of the well with a permanent label displaying its safe working load (SWL) and a unique identification number.
- 5.98 It should be subjected to a routine thorough examination as per LOLER.

## Landings

### Landing doors and entrances

- 5.99 All landing entrance door panels should be mechanically and electrically interlocked. It should be possible to inspect the locking mechanism through a

transparent cover from within the well without removing any protective cover assemblies.

- 5.100 Landing doors should be robust and reinforced at a height that will help to minimise damage from trolley impacts. The door guidance pieces (spuds) should be reinforced with a steel flange to prevent the door being forced out of the bottom track.
- 5.101 The exposed face of the landing door panels, whilst providing a decorative finish, should be practical enough to receive a serviceable finish in order to withstand the rigours of use in healthcare buildings. Typical finishes for lift landing doors are rolled, patterned or brushed stainless steel.
- 5.102 The under-door guidance pieces should be capable of easy replacement whenever necessary.
- 5.103 Vision panels should not be fitted.

**Note:** The height of landing doors may be larger than the standard 2,100mm to accommodate equipment movement.

### Emergency opening of landing doors

- 5.104 It should be possible to open the landing doors in an emergency using a landing-door release key to BS EN 81-1/2. The aperture to receive this key should not be provided on the sliding panels of the landing doors, but fitted to a fixed part of the landing entrance.

### Landing fixtures

- 5.105 Landing fixtures should be provided in conformity with BS EN 81-70. Where heavy usage is foreseen, fixtures meeting the requirements of BS EN 81-71 category 1 should be used, or in areas of extreme abuse, category 2.
- 5.106 Lift-arrival landing indicators should be provided at all floors and be capable of being viewed from any position along the length of the lift lobby. Their most suitable location is above each landing entrance.
- 5.107 For lifts serving the main entrance, or other areas subject to high traffic levels, car position indicators should be provided above each landing entrance. In some circumstances, for example service lifts, it may be beneficial to provide them at other floors

## Lift car

### Doors

- 5.108 Car doors operate more frequently than landing doors and therefore should have durable finishes. Car doors are also less likely to be subjected to impacts from large loads, but nevertheless should comply with the requirements of category 2 lifts in BS EN 81-71.

- 5.109 The under-door guidance pieces (spuds) should be capable of easy replacement whenever necessary.
- 5.110 Car doors should be centre-opening for all lifts serving passenger traffic (staff, patients, visitors) as this improves lift performance. Side-opening doors may be fitted on other lifts (see also [paragraph 4.28](#)).
- 5.111 The height of car doors may need to be greater than the standard 2,100mm in order to accommodate equipment movement. Increased car door height can impact on internal car height. These requirements should be given in a specification.
- 5.112 Vision panels should not be fitted.

### Door operators

- 5.113 Car doors should be power-operated.
- 5.114 Door operators should be of the closed-loop variable-frequency a.c. type in order to provide well-controlled and safe performance.
- 5.115 The operating times (opening, closing, dwell, quick door close, nudging etc) should be adjustable.
- 5.116 Heavy-duty operators should be fitted to lifts likely to be subject to intensive traffic demands (for example goods lifts).
- 5.117 Car doors should be fitted with multi-beam (contact-less) passenger detection to minimise the risk of car/landing door collisions with persons, beds or equipment working in conjunction with the door operator.

### Sling

- 5.118 The car sling should be of a robust construction. The car sling of larger lifts (for example bed/passenger lifts) should be reinforced with diagonal bracing between the platform and the uprights.

### Platform

- 5.119 Passenger lifts require a platform that is insulated from the car sling to reduce the amount of vibration transmitted to the lift car. The lift platform of healthcare passenger or bed/passenger lifts should be manufactured from steel, not wood. The steel platform may be covered by materials to reduce noise.

### Construction

- 5.120 The lift car is constructed on the car platform and should provide a rigid enclosure. Additional bracing should be provided to ensure that rigidity is maintained over the whole service life.
- 5.121 As healthcare lifts are subject to trolley and bed traffic, car-wall finishes should be protected by a bump rail on three sides of the lift car. Where a combined handrail and bump rail is provided, the height should be sufficient to support

passengers and to protect the car when trolleys are in use. It should be fitted to three sides of bed/passenger lifts. However, for smaller lift cars, a handrail on three sides of the car may restrict the available car area. In this situation, the handrail should only be mounted on the car wall that is adjacent to the operating panel.

- 5.122 Where necessary, the car floor should have a watertight one-piece floor-covering that is coved and attached to the car walls. The floor-covering should be slip-resistant and have a surface that allows wheeled trolleys to be easily steered. It should also meet the requirements of BS EN 81-70.
- 5.123 The roof of the enclosure should be strong enough to accommodate all necessary tools and at least two persons wherever there is space to stand.
- 5.124 A trapdoor may need to be provided in the roof of the car:
- in the event of a trolley/stretcher/bed lift breaking down between floors; and
  - where the floor-to-floor distance is too great to provide medical assistance (not rescue) from a landing.
- 5.125 The need for such a trapdoor should only be provided after a rigorous risk assessment. The trapdoor should be held locked by a manual bolt accessible from the lift car roof, be interlocked electrically with the lift machine and comply with BS EN 81-1.

### Guide shoes

- 5.126 To ensure a smooth ride, all passenger, trolley and bed lifts should be fitted, whenever possible, with roller guide shoes. The number and position should be chosen to ensure the lowest amount of vibration.

### Internal finishes

- 5.127 Some people may experience feelings of claustrophobia when travelling in a lift car. Lift-car interiors should therefore give the impression of space and be well-lit. Mirrors on the rear wall and soft pastel tones for car interior finishes can help to give an impression of greater space and tranquillity.
- 5.128 Where mirrors are fitted, they should be as tamper- and vandal-proof as possible.
- 5.129 Internal wall finishes should be robust and applied to the inside of the steel sheet panels. These panels should be easily demountable so that damaged panels may be removed for repair without rendering the lift out-of-service for a prolonged period.
- 5.130 The ceiling of the car should fit from wall to wall with no crevices. Any lighting fittings should be easily maintained (see also Health Building Note 00-04).

## Lighting

- 5.131 The car should be illuminated to, at least, 100 Lux at floor level and on all control panels using a method of illumination that will not cause sensory discomfort to those patients lying on a trolley or bed (see also [paragraphs 5.15 to 5.19](#)).

## Emergency lighting

- 5.132 In case the main lighting supply fails, all lift cars within healthcare buildings should be provided with an automatically-operating and self-contained emergency lighting system.
- 5.133 The luminance should be greater than that required by BS EN 81-1/2:
- for a passenger lift, one self-contained emergency luminaire should be provided, which should give off the illumination equivalent to an 8 W fluorescent lamp for a minimum period of three hours;
  - for a bed lift, two similar luminaires should be provided, located near or on the wall and opposite each other on the centre line of the long axis of the car.
- 5.134 The luminaire(s) should be mounted at high level in the lift car, and a key-operated test switch should be provided. This should not turn off the main car lighting.

## Ventilation

- 5.135 All lift cars should be naturally ventilated by providing ventilation apertures at the upper and lower parts of the car in accordance with BS EN 81-1/2. These ventilation apertures should be vandal-resistant.
- 5.136 For bed lifts, especially those serving theatres, an electrically-driven fan (scavenging) may need to be provided. This should be installed in the car ceiling and should operate quietly while the lift is running and for a short time afterwards. The ventilation apertures should be via concealed slots.
- 5.137 Any electric fan fitted in bed lifts should be provided with a back-up supply in case of power failure.

## Fixtures

- 5.138 Car fixtures should conform to BS EN 81-70. Where heavy usage is foreseen, fixtures meeting the requirements of BS EN 81-71 category 1 should be used, or in areas of extreme abuse, category 2.
- 5.139 It may be necessary to provide two operating panels within the car. This may be required in large cars or where through cars are provided.
- 5.140 In-car indicators should indicate the floor position of the lift and its direction.

## Drapes

- 5.141 Where drape fitting points are provided, potential ligature points should be eliminated.

## Emergency alarm system

- 5.142 The emergency alarm system should conform to BS EN 81-28 and should be connected to a permanent rescue service, which may be provided by the lift installer or maintainer. In a hospital with 24-hour supervision, the first point of contact may be the 24-hour telephone switchboard, provided it meets all the requirements of BS EN 81-28. In particular, the telephone circuits used should be permanently allocated, regardless of usage (see also [paragraphs 8.12 to 8.14](#)).

**Note:** The rescue service should be adequately resourced to provide a secure 24-hour service according to BS EN 81-28.

- 5.143 Proper attention should be paid to the exchange of information required by BS EN 81-28.
- 5.144 Whenever the alarm button in the car is operated, a local alarm bell fitted to the car should sound.
- 5.145 The emergency alarm system should conform to the protocol described in DD 265:2008.

## Special passenger controls

- 5.146 In some locations, lifts may be fitted with special controls to meet the needs of particular users. Where special controls are provided, the designer should clearly specify the required operation with respect to all operating devices so that the lift installer can confirm their provision. BS ISO 4190-5 gives guidance on control fixtures.

## Special access controls

- 5.147 Some healthcare buildings may require special lift control features to restrict access in secure areas. It is normally sufficient to restrict access to the lift lobby. However, where high security is required, for example in mental health wards, it may be necessary to provide special facilities on the control panel to prevent unauthorised use of the lift. This can be achieved by replacing landing-call pushes with key switches or swipecard-reader switches.
- 5.148 In some cases, however, there is a risk that an authorised user may inadvertently press the incorrect push, alight at the wrong floor level, leaving the lift to travel to the secure ward empty and thereby allowing an unauthorised person to enter the lift without operating the landing key switch. The installation of key switches or swipe cards in the lift car itself should prevent such a breach of security.



## Lift control

### Traffic control systems

- 5.149 All passenger lifts should operate under full collective control (see BS5655-6). All groups of lifts (that is, two or more lifts sharing the same lift lobby) should be interconnected with one riser of landing-call push-buttons. The supervisory control algorithm can be relatively simple except in multi-storey healthcare buildings where a modern group traffic supervisory control system should be provided (see BS5655-6).
- 5.150 Where a single goods lift is installed, it can be simply controlled as a single automatic pushbutton (SAPB) system (see BS5655-6).

### Emergency bed service (code blue control)

- 5.151 An emergency bed service (EBS) facility should be available in any lift that serves a theatre area and is also available for general use. The facility should also be provided in emergency care areas where the entrance level is above or below the reception.
- 5.152 The standard EBS system enables the users (for example ambulance technicians/paramedics) to become familiar with one system and also to allow lift installers to produce a standard traffic control system or software algorithm.
- 5.153 To aid standardisation, the following system is suggested for healthcare buildings:
- the EBS facility should be operated from key switches or card readers on each landing and within the lift car;
  - upon operation of any landing key switch or card reader, the corresponding lift should respond in the following manner:
    - if the lift is travelling away from the EBS control that has been operated, the lift should stop at the next landing and, without opening its doors, return immediately to the floor level where the EBS key switch was operated;
    - as soon as the lift has been summoned on EBS, the speech synthesis unit should announce the following:
 

***“Lift on emergency bed service please exit on arrival”***
    - the car position indicator should display an ‘E’ if the indicator is a single digit unit or, if more digits are available, a more descriptive notation should be used;
    - upon arrival at the floor where the EBS switch was operated, the lift should park with its doors open awaiting operation of the key switch on the car’s operating panel;
    - when the key switch on the car control station has been operated, the lift should respond only to car calls on a non-collective arrangement, stopping at the nearest call placed in the direction of travel of the lift;



- an indicator should be provided in the faceplate above the EBS switch to indicate that the lift is engaged on emergency bed service, thereby preventing calls at other landings being placed on that lift.

### Bed lifts used for theatre service

- 5.154 Where possible, a dedicated lift (or lifts) should be provided to serve an operating theatre in order to segregate occupants from theatre patients.
- 5.155 Where this is not practical or economical, a lift for general public use should be provided, with controls to remove the lift from normal service and temporarily dedicate its use to the theatre staff.
- 5.156 This can be achieved by having a large pushbutton (50mm × 50mm) painted red, above which is mounted a notice stating:

#### ***Theatre lift service only***

- 5.157 Theatre control may be provided on the landing at the theatre floor, if this is a restricted-access floor, or within the theatre area. The control should be initiated by a push-button that is clearly labelled to indicate that it is not part of the normal lift controls:
- when the theatre-service push-button is operated, the lift should complete the call in the direction in which it is travelling at that time;
  - it should then return directly to the theatre floor/area;
  - upon arrival at the theatre floor/area, the lift should park with its doors open for a sufficient time to allow the theatre staff to take control of the lift via an independent service-key switch or a card reader mounted on the car's operating panel;
  - the lift should then be controlled using the operating panel's push-buttons – all landing calls should be bypassed.
- 5.158 If, after operation of the theatre-service pushbutton, the lift is not taken into independent service within a period of 60 secs, the lift should return to normal service.

### Lift monitoring systems

- 5.159 The aim of monitoring is to assist in maintaining a high standard of lift availability. Each lift should be provided with a simple monitoring system which indicates whether the lift is in service or not. This system should link with the healthcare facility's building management (BMS) system, rather than be a stand-alone system. Costs and operational procedures should be taken into consideration.

### Special tools

- 5.160 Any special tools, whether hardware or software, required in order to ensure the safe operation, setting up and maintenance of lifts should be provided with each

lift, or group of lifts, and should remain on site. They remain the property of the healthcare organisation and should be provided to any maintainer requiring them.

## Electrical

- 5.161 All electrical installation work should comply with the latest edition of BS7671 (IEE Wiring Regulations). Lift wiring should comply with BS EN 81-1/2 (see also BS5655-6).

## Power supplies

- 5.162 Lift power supplies should always be provided on a dedicated supply cable direct from the switch-room of the healthcare building as near to the supply transformer as possible. The supply to each lift should be provided in LSF (low smoke or fume) cable terminated at an isolator in the lift machine room or at an agreed position in the case of MRL lifts. A diversity factor may be applied according to the recommendations of BS5655-6 (see also Scottish Health Technical Memorandum 06-01).

## Emergency power operation or standby generation

- 5.163 It is sometimes not possible to connect all lifts to the essential services supply simultaneously owing to power limitations. For groups of lifts, at least one lift in the group should be supplied from the essential service supply. A method of manually switching the essential services power supply can be incorporated in the lift switchboard to allow each lift to be recovered in turn. However, during periods of emergency power supply, the engineering/maintenance staff will have a number of priorities to attend to, such as releasing trapped passengers from lifts. It is therefore recommended that an automatic system be provided that can recover each lift in turn to the nearest landing or to the main floor.
- 5.164 The supply provided by the emergency/standby generator should exhibit the same characteristics as the normal supply (see also BS5655-6).

## Earthing

- 5.165 An earth bus bar should be provided adjacent to the main incoming isolator. It should have enough suitably-rated connection points to allow the incoming earth in the power supply cable and all metal parts of the lifts (including control panels, machine bed plates, machines, guide rails, machine room equipment, lifting beams etc) to be bonded to it.
- 5.166 No direct connection to the building's lightning protection system should be made. The lift's earth connection should be provided in the healthcare facility's switchroom in order to conform to BS EN 62305.

## Harmonic distortion and interference

- 5.167 All lifts should conform with the electromagnetic compatibility requirements of BS EN 12015 (emission) and BS EN 12016 (immunity). Non-sinusoidal currents

and harmonic currents should be suppressed (see also Scottish Health Technical Memorandum 06-01).

### Small power

- 5.168 All socket-outlets in the machine rooms, machine spaces, pulley rooms, pit, car top and well should be RCD-protected in conformance with the recommendations of BS7255 and BS7671. RCD protection should be applied at individual socket-outlets, and not at a remotely located distribution board, so that it can be reset locally (see BS EN 61009-1).

### Wiring

- 5.169 All external wiring entering the control panel should be identified by the use of an approved cable marker and terminated in a modular terminal rail assembly.

### Terminals

- 5.170 Each terminal should be identified to correspond to the terminal reference on the wiring and schematic diagrams.
- 5.171 All terminals used for voltages in excess of 110 Volts a.c. should be of the shrouded pattern and fitted with a printed warning label.

## Noise and vibration (acoustics)

### Noise

- 5.172 Lifts can be a source of noise (for example the lift travelling in the well, the opening/closing of doors etc). The recommendations of BS5655-6 for quiet operation should be observed. In particular, there should be no discernible noise from shaft equipment such as vanes, ramps, switches etc while travelling in the lift car or while on landings or in surrounding occupied areas. (See [Appendices D and E](#) for suggested permitted noise values.)

**Note:** See also Scottish Health Technical Memorandum 08-01 and CIBSE Guide D (2005).

### Vibration

- 5.173 Lift equipment may cause low-frequency vibration in either the building fabric or the lift car. Vibration caused by the drive machine should be minimised by dynamic balancing of the equipment and by providing insulating mountings
- 5.174 The maximum vibration levels should be less than  $0.15\text{m/s}^2$  peak to peak.
- 5.175 Machine vibration is transmitted to the lift car via the suspension ropes. Therefore, suitable isolation of the rope hitch to the lift car should be provided. The lift car should also be isolated from the sling so that vibrations from the movement of the car running on the guide rails may be prevented from being transmitted to the car.

- 5.176 The construction and finishes of the lift car should be selected to attenuate noise; for example, sheet-metal finishes amplify vibration, but properly-secured laminates on backing boards can attenuate the vibrations.

### Ride quality

- 5.177 The occupant's perceived ride quality is a combination of the lift's dynamics (speed, acceleration, jerk), vibration and noise.
- 5.178 As indicated in [paragraphs 1.9–1.13](#), acceleration and jerk should be smoother in a healthcare building than in, for example, office buildings. Typical values are given in [paragraph 5.24](#). Item 8.3 in each of [Appendices D and E](#) entitled “Measured performance times” provide a means of specifying and documenting values for these parameters.

### Safety signs

- 5.179 Safety signs and warning notices should comply with BS7255.

### Drawings and labelling

- 5.180 A durable set of as-wired drawings should be permanently provided in the machine room. All text should be in English. An abbreviations list should be provided.
- 5.181 Each item of lift equipment and each control panel component, including wiring terminations, should be clearly and permanently identified by suitable labelling. Any abbreviations used should be identical to those on the engineering drawings and wiring diagrams.

### Lift identification signs

- 5.182 All lifts should display their identification at each landing, in each car and in the machine space on all control equipment and machines.

## 6. Commissioning, validation and checks

---

### Commissioning principles

- 6.1 In this Scottish Health Technical Memorandum, commissioning is defined as *“all the activities that are undertaken prior to the lift going into service which ensure that the lift complies with the specified requirements and that optimum performance is achieved”*.
- 6.2 Lift manufacturers have a responsibility to ensure that the delivered goods are in accordance with the contract specification.

### Validation of tender/specification

- 6.3 The required inspection, testing and commissioning to be carried out should be clearly stated in the contract specification so that adequate provisions can be made by all parties.
- 6.4 As a prerequisite to commissioning, all relevant contract documents, including contract specifications, detailed drawings and details of all variations agreed or instructed since the original order was placed, should be made available.
- 6.5 The documentation supplied by the lift installer should be checked for compliance with the contract specification and subsequent variations. All errors, deviations and omissions should be notified in writing to the manufacturer via the contractual route.
- 6.6 Once the contract is in place and the supply of the lift is in progress, a programme of checks should be undertaken as defined in the contract specification. Historically the programme of checks would have comprised the following:
- off-site: checks during manufacture of major pieces of equipment;
  - on-site: checks during installation.
- 6.7 However, most lifts, and the equipment associated with them, are manufactured outside the UK; therefore it may be necessary to invoke the use of third-party organizations in the country of manufacture to carry out quality checks.

### Checks during manufacture

- 6.8 A lift installation can comprise a combination of the lift manufacturer's own equipment and bought-in components.
- 6.9 Compliance with the specified requirements should be assured by the lift installer's quality assurance system (to the latest revision of BS EN ISO 9000) and be assessed by a UKAS-accredited notified body under the Lifts Regulations 1997.

- 6.10 Under the Lifts Regulations 1997, some items of equipment should be type-tested. Type-test certificates should be provided.
- 6.11 Normally, representatives of the healthcare organisation's management board do not need to be present during manufacture or during works tests, but reserve the right to be present.

### Checks during installation

- 6.12 Prior to the delivery of equipment to site, the builder and lift manufacturer should carry out checks on the lift well to ensure that the dimensions, plumbness, location of fixings etc comply with the builder's agreed work drawings.
- 6.13 Normally, representatives of the healthcare organisation's management board do not need to be present during the installation process or during installer's site tests, but reserve the right to be present.

### Management during installation or modernisation

- 6.14 The design, installation and maintenance of any lift should always be subject to a risk assessment and the installation itself should be compliant with the Construction (Design and Management) Regulations 2007.
- 6.15 During all works, contractors should comply with any mandatory code of conduct issued by the healthcare organisation's management.
- 6.16 Lifts/lift installations are finished and handed over at different times during capital projects. Suitable precautions should be made to protect the equipment such that when it is finally put into service it has not suffered any deterioration.
- 6.17 When conditions do not permit a lift to be taken into normal service immediately following its completion and acceptance, it can be immobilised. 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.
- 6.18 A separate service contract should be made with the lift contractor to make regular visits during this period, to inspect, lubricate and report on the condition of the lift. During the inspection, the lift should be moved under power. A date should also be agreed with the lift contractor from which the guarantee period will commence.
- 6.19 If it is intended to permit temporary use of a lift by some other party, such as the building contractor, before taking it into normal service, but after the acceptance procedures have taken place, the responsibilities of those concerned should be clearly defined and agreed.
- 6.20 Such usage should be considered at an early stage, having regard to the conditions under which it is likely to take place. In particular, a permanent two-way voice communication with a rescue service should always be available.

- 6.21 When finally the lift is available for service, it should be fully cleaned back to its original condition and any damaged or work-worn parts replaced.

## 7. Testing

---

- 7.1 All lifts should be fully witness-tested prior to being put into service.
- 7.2 The installer may carry out various tests as the installation proceeds, and there is no reason why these should be witnessed by members of the healthcare organisation's management board, unless either the lift installer or management request to do so.
- 7.3 When the lift installer has completed all adjustments, checks and internal tests and has all the relevant documentation available, reasonable notice should be given to the healthcare organisation's management board of the date to witness the final tests.
- 7.4 Before any final test is witnessed by representatives of the healthcare organisation, the following documentation should be available, on request, on site (in paper or electronic format):
- a register in conformity with BS EN 81-1/2;
  - an operating and maintenance instruction manual in conformity with BS EN 81-1/2;
  - the technical dossier in conformity with BS EN 81-1/2;
  - calculations in conformity with BS EN 81-1 and specific pressure calculations in conformity with BS5655-11 for electric traction lifts.
- 7.5 The tests may be witnessed by Authorised Person(s) (Lifts) or by a third party, for example a consultant, appointed to act on behalf of the healthcare organisation's management board.
- 7.6 To avoid confusion, all healthcare lifts should be contracted to be tested and documented using the standard format of BS8486-1 (for traction lifts) or BS8486-2 (for hydraulic lifts).
- 7.7 On completion of the tests, the signed and dated original of the complete test document should be included in the technical file and handed over to the Authorising Engineer (Lifts). The lift installer should retain a copy.
- 7.8 It is important that all the records of the lifts installed should be available to enable comparisons to be made between the original commissioning figures and any subsequent routine test results. These comparisons enable any deterioration or excessive variations beyond the commissioning parameters to be identified.
- 7.9 BS8486-1/2 does not record the performance and other data needed to ensure conformity with the contract. [Appendices D and E](#) of this Scottish Health Technical Memorandum provide additional proforma templates, which should be filled in at the time of the final testing. The original should be handed to the responsible healthcare officer and copies retained by the lift installer.



## 8. Management of lift installations

---

- 8.1 The healthcare organisation's management board should ensure that their lift installations comply with all the statutory regulations applicable to lifts on their premises. Other functional guidance in terms of standards and codes of practice should also be noted in this Scottish Health Technical Memorandum.
- 8.2 Management should ensure that their operational procedures include, as a minimum:
- the nomination of individuals to keep lifts in the required safe condition;
  - the completion of thorough examinations and inspections as determined by LOLER (either at six-monthly intervals or to a scheme of examination). The thorough examination and inspection must be carried out by a competent person as defined in LOLER;
  - an appropriate maintenance regime, for example in accordance with the Safety Assessment Federation's (SAFed) lifting guidelines ([www.safed.co.uk/Publications/Lifting.htm](http://www.safed.co.uk/Publications/Lifting.htm));
  - safe working procedures for controlling all work associated with lifts.
- 8.3 The dutyholder should ensure that all documentation and records are kept up-to-date, available for inspection and are safely stored. These documents and records include:
- operating and maintenance manuals;
  - machine-room log cards;
  - maintenance audit reports;
  - LOLER thorough examination and inspection reports;
  - records of any supplementary tests;
  - records of repairs;
  - actions from LOLER reports etc.
- 8.4 Only competent persons should be allowed to work on or near lift installations. The healthcare organisation's management board should ensure that all persons employed by lift installers, maintainers, inspectors, consultants etc are competent.
- 8.5 During all works, contractors should comply with any mandatory code of conduct issued by the healthcare organisation's management board.
- 8.6 All work carried out by lift industry personnel should be in conformity with BS7255.
- 8.7 Open landing doors should be protected at all times by suitable landing entrance barriers that comply with BS7255. During maintenance activities,

these are simple portable barriers provided by the healthcare organisation, but extensive installation or remedial work may require the use of fixed hoardings.

- 8.8 Healthcare management should ensure that any healthcare staff who are required to perform duties with respect to lifts (see [Section 2](#)) are competent to carry out those duties.
- 8.9 Any work carried out by 'non-competent' persons (for example builders) should be supervised by the Authorising Person (Lifts) or a competent person from the lift maintenance contractor at all times.
- 8.10 Electrical wiring and circuits in lift cars should be securely enclosed to prevent unauthorised access.
- 8.11 Lift motor rooms and hydraulic machine rooms should be kept locked and inaccessible to unauthorised persons.

### Emergency alarms

- 8.12 It is a requirement of the Lifts Regulations and a recommendation of BS EN 81-80 that lifts may not be placed in service unless a remote alarm facility is available and operational in conformity with BS EN 81-28.
- 8.13 BS EN 81-28 requires that a trapped passenger be able to speak to a permanently available rescue centre within five minutes of operating the alarm push-button, to have a person present at the installation within one hour, and to be rescued in the shortest possible time.
- 8.14 To achieve these requirements, all alarms from healthcare lifts should be routed to a permanently attended rescue service (either on the healthcare premises or off-site) with at least one back-up service (see BS EN 81-28).

**Note:** The rescue service should be adequately resourced to provide a secure 24-hour service according to BS EN 81-28.

### Emergency release of trapped passengers

- 8.15 Emergencies involving lifts are totally unpredictable. Management should bear this in mind in terms of an organised and well-prepared response.
- 8.16 A written operational plan covering emergency procedures should be in place to ensure that all emergencies are dealt with in a positive and well-rehearsed manner.
- 8.17 Emergency-release procedures may be carried out on contract by the lift maintenance contractors, by a third-party organisation, for example the fire-and-rescue service, or by in-house healthcare staff.
- 8.18 Management should ensure that adequately trained staff are available at all times to rescue passengers who may be trapped in lifts. Where these staff members are not available at all times on the healthcare organisation's premises, for example at small clinics, a response time to attend site should be

agreed. BS EN 81-28 recommends that this should not exceed one hour in normal circumstances.

8.19 Management (via the Designated Person) should ensure adequate financial provision is made for the operation and maintenance of lifts, including the training of personnel to undertake the emergency procedures safely.

8.20 To achieve an acceptably rapid response to emergencies, the following preparations should be considered by management (this list is neither exhaustive nor prioritised):

- a schedule should be available to the emergency teams, which details the location of all lifts, their identifying references, their functions in the healthcare building, sources of normal and emergency electrical supplies;
- the lift maintenance contractor's name and emergency telephone number should be displayed beside the lift;
- a list of all Competent Persons (Lifts) and Lift Release Wardens should be readily available;
- a record should be made of the training received by the emergency teams at the healthcare building;
- a schedule of envisaged incidents and emergencies requiring abnormal operational procedures should be prepared;
- procedures to be followed by the emergency teams for the safe recovery and counselling of trapped lift passengers should be prepared;
- the local fire-and-rescue authority should be consulted to ensure that its operational crews are familiar with the working procedures of lifts in case of emergency.

8.21 Where healthcare staff are designated to carry out emergency-rescue procedures to release trapped passengers (as Lift Release Wardens – see [Section 2](#)), they should receive appropriate training to act in such an emergency. Sufficient numbers of healthcare staff members should be trained in such procedures so that at least two or more personnel are available on the same shift to perform this function if the need should arise.

8.22 The emergency procedures for the safe hand-winding of electric traction lifts and hand-lowering of hydraulic lifts should be displayed prominently in the lift machine room (for machine-roomed lifts) and in the control cabinet (for MRL lifts) and a copy should also be contained within the lift service manual.

8.23 The emergency procedures should be tailored specifically to each installation and not be of a generic type. These should conform to the installer's release instructions.

**Note:** Examples are shown in [Appendix F](#) (for machine-roomed electric lifts), [Appendix G](#) (for a hydraulic lift) and [Appendix H](#) (for a machine-room-less lift).

- 8.24 The training should be provided by an instructor, who has received instruction in training methods or can demonstrate a training competence following relevant experience.
- 8.25 The training course should be structured and include at least:
- formal classroom instruction;
  - supporting notes and written procedures;
  - a demonstration of the procedure by the trainer, individual practice of the procedure and a written test.
- 8.26 All lift installations where the trainees may be required to carry out rescues should be visited, and the differing physical and logistical arrangements indicated.
- 8.27 Staff who successfully demonstrate competence in the rescue procedure should be given a certificate (valid for one year) recording the date of the training and the lift installations where they can carry out rescues.

**Note:** The trainer should fail, without hesitation, any person who, in the trainer's opinion, might not safely carry out the procedure.

- 8.28 The limits of the procedures should be emphasised. Under no circumstances should staff attempt to release any safety gear that may have operated. Every three years or more frequently, or where there may be doubt, all designated staff should undertake a full training session.
- 8.29 To verify their continuing competence, trained staff will need to demonstrate the procedure annually.
- 8.30 All annual exercises should be undertaken in the presence of an Authorised Person (Lifts) and with the participation of the lift maintenance contractor or third-party trainer.

### Risk assessment, method statements and permits to work

- 8.31 BS7255 gives guidance on risk assessments, permits to work and other instructions and information to be provided when carrying out work.
- 8.32 For maintenance activities, BS EN 13015 specifies rules for the provision of maintenance instructions and gives general guidance regarding risk assessments with respect to maintenance activities. It also provides examples of elements to be taken into account in risk assessments for maintenance operations.
- 8.33 As part of maintenance activities on MRL installations where the brake mechanism is located in the well, a check of its correct operation should be carried out at every service visit.
- 8.34 Alarm systems should be tested fully at every service visit.

## 9. Maintenance

- 9.1 It is a statutory duty of the duty holder of a lift under the Health and Safety at Work etc Act to ensure that it is safe to use. The proper maintenance of a lift to the installer's instructions discharges some of this duty.
- 9.2 For maintenance and other work activities, LOLER and PUWER also apply. All work activities should also conform to the recommendations of BS7255.
- 9.3 Maintenance is a continuous process and involves different personnel at the various stages. It is not just a function of the appointed lift maintenance contractor but should also be undertaken, to some degree, by appointed estates maintenance staff.

**Note:** A more comprehensive definition of maintenance and other terms concerned with maintenance is given in BS EN 13015.

- 9.4 All maintenance is to be carried out to the manufacturers' and installers' instruction manual.
- 9.5 Lift maintenance is carried out primarily to ensure safe operation and, second, to provide a reliable and comfortable service. It divides into four aspects:
- regular checks;
  - preventive maintenance;
  - maintenance audits;
  - repairs.

### Regular checks

- 9.6 A lift that is out of service, operating below proper efficiency or has gone out of service unnoticed by users is a lost asset. A regular check can detect these conditions and by simple observations detect potential faults before they occur.
- 9.7 Healthcare staff, for example Lift Stewards, maintenance personnel, should carry out regular checks of all lifts in each healthcare building to ensure serviceability. The periodicity of the checks depends on:
- the importance of the lift to the operation of the healthcare building; and
  - the availability of staff to carry them out.
- 9.8 Typical items to be checked to ensure that they are in place, undamaged and functioning correctly include:
- riding the lift in both directions to check operation;
  - listening for any squeaks or scraping sounds;
  - checking smoothness of starting and stopping of the lift car;

- ensuring that the lift stopping levels are within the normal tolerances;
- ensuring car lighting is fully functional;
- checking the emergency lighting systems (this requires a keyed test switch);
- testing the emergency alarm system;
- checking for any judder as doors operate;
- testing the operation of car door passenger (detection) safety devices;
- checking a selection of push-button controls are operative;
- checking that car and landing push-button lights illuminate;
- checking that indicators are showing the correct displays;
- ensuring that the car and landing-door bottom tracks are free of obstructions and are clean;
- checking the cleanliness of car doors, car interior and landing fixtures;
- recording any reports from users as to any unusual behaviour (however odd);
- safety signs and pictograms.

9.9 A log of the checks carried out and any resulting actions should be made.

9.10 A record should be made of the checks. This record should be provided to the lift maintenance contractor at each routine service visit.

9.11 Staff members should not attempt to make any repairs to a lift, but should report all deficiencies to the Authorised Person (Lifts) for action. The installer's user manual should provide instructions for work that can be carried out by healthcare facility staff such as:

- cleaning of surfaces;
- cleaning bottom tracks;
- replacing lighting units etc.

9.12 If any faulty item might, in the opinion of the staff member, affect safety, the staff member should take all necessary precautions, remove the lift from service and report their actions to the Authorised Person (Lifts) immediately.

9.13 Cleaning deficiencies should be reported for immediate rectification. The cleaning of fixtures, lift doors and car interiors should be carried out to the manufacturer's instruction.

## Preventive maintenance

9.14 Preventive maintenance of lifts is not an optional extra; neither should a breakdown-only approach be adopted. In addition to equipment being required to be of good mechanical construction, of sound material and adequate strength, the statutory provisions extend to requiring proper maintenance.

Preventive maintenance is required to preserve the operational integrity and life of the installation.

- 9.15 Preventive maintenance and regular site visits:
- ensure continued safe functioning of the equipment;
  - minimise the time that equipment might otherwise be out of service;
  - secure the availability of trained personnel able to respond promptly in the event of breakdown;
  - prolong the life and performance of the installation;
  - provide the benefit of protecting the value of the healthcare asset;
  - spread the life-cycle cost more evenly over a longer period of time.
- 9.16 Lifts should be maintained by a lift contractor rather than by estates engineering staff. A lift contractor will have specialist training, support and equipment, and will be able to deal with complex modern lift equipment.
- 9.17 Before appointment, a maintenance contractor should be able to demonstrate staff competence and awareness of changes to legislation etc, and provide details of their training programmes and continuous professional development (CPD) arrangements relating to staff working on the contract. This should include competence to work on lifts installed by other lift companies.
- 9.18 Preventive maintenance should always be carried out when the traffic demands are scheduled to be low (that is, the avoidance of peak periods such as theatre lists, visiting hours, shift changeovers, domestic activities). The frequency of scheduled preventive maintenance should be agreed in a service contract with the healthcare organisation's management board.

## Maintenance contracts

- 9.19 All lifts should be placed under either a fully comprehensive or a performance-guaranteed maintenance contract (PGMC).

### Typical elements required of a fully comprehensive maintenance contract

- 9.20 This contract should include:
- 24-hour breakdown (callout) visits;
  - 24-hour emergency rescues;
  - all routine maintenance visits;
  - all attendances required for, or as a result of, statutory thorough examinations (LOLER);
  - the carrying out of rectifications resulting from supplementary tests;
  - all consumable materials except car lighting lamps, and door and car cleaning materials;



- all minor repairs/replacements, including re-roping.

9.21 It does not include:

- the carrying out of any supplementary tests required;
- any major repairs/replacements of components (for example drive motors, gears, pulleys, sheaves etc);
- any misuse or abuse.

9.22 Advantages of this type of contract include:

- invoicing is simplified (one account per quarter, paid in arrears), thus considerably reducing management time; and
- there is no decision to be made regarding meeting the cost of any necessary attendances (attendances owing to vandalism would attract additional charges).

### Performance-guaranteed maintenance contract (PGMC)

9.23 Where it is essential that a lift is always available, for example bed lifts used for theatre service, a PGMC should be considered.

9.24 This type of contract is based on a fully comprehensive maintenance contract and guarantees a percentage availability of a lift during agreed periods of time. For example, if bed lifts for theatre service are required from 10.00 to 13.00 and 14.00 to 17.00 every day, the PGMC might specify a 99% availability. This equates to up to 22 hours of lost service in a contract year.

9.25 If availability is not provided, the service charge is reduced by an agreed amount, for example, 5% of the monthly service charge for every hour lost above the agreed percentage.

9.26 This type of contract can be more expensive.

### Maintenance contractor management

9.27 The standard work schedule of the lift contractor should be agreed by the healthcare organisation's management board, as each company usually has a different set of terms and conditions for their service provision.

9.28 Routine maintenance visits should be made each calendar month (12 per year). At each visit, the service mechanic should report to an Authorised Person (Lifts).

9.29 In practice, this means that – although each unit should be visited each month, a complete service of the whole installation does not necessarily have to be carried out at every visit. A systematic approach is more practical, with the number and frequency of maintenance checks to be adjusted to suit the use and condition of the lift system.



- 9.30 However, all lift pits, car tops and machine rooms should be inspected and cleaned of detritus, waste, dirt etc every month.
- 9.31 Discarded materials should be removed from machine rooms, pits and car tops. Machine rooms and car tops should not be used to store surplus materials.
- 9.32 A safety sign conforming to BS7255 should be displayed whenever a lift is taken out of service.
- 9.33 Whenever
- (a) a lift is taken out of service and landing doors are opened or
  - (b) work is carried out on controller cabinets positioned on lift landings, adequate and suitable barriers must be erected (see also [paragraphs 5.68 to 5.71](#)).
- 9.34 A report should be submitted after each visit and an entry made on the machine room log card, which remains the property of the healthcare building.

### Maintenance audits

- 9.35 It is the duty holder's responsibility to check periodically the competence and effectiveness of the lift maintenance company contracted to carry out maintenance on the lifts. While not an absolute confirmation, the thorough examination report under LOLER can give an indication as to whether maintenance is being carried out properly (see HSE's INDG 339).
- 9.36 At least once a year, the Authorising Engineer (Lifts) should carry out, or have carried out by a third party, a maintenance audit of each lift. This should comprise:
- physical check of maintenance work (includes assessment of housekeeping, lubrication, replacement/repair, adjustments);
  - measurement of operating times (includes individual door-operating times, flight times, performance times and cycle times against an agreed schedule);
  - subjective evaluation of lift ride quality and general appearance;
  - identification of any works required under health and safety legislation;
  - identification of any works completed under health and safety legislation.
- 9.37 The Authorising Engineer (Lifts) should discuss with the maintenance contractor any recommendations provided within the audit report and ensure that an action plan is devised to rectify any necessary remedial work.

## 10. Modernisation and upgrading

---

- 10.1 New lifts eventually age, and may require refurbishment to improve their appearance and efficiency, or to take advantage of technological change.
- 10.2 Some changes do not affect safety, such as car refurbishments, but others such as changing the drive system do.

### Safety audit and upgrading of existing lifts

- 10.3 When undertaking modifications to an existing lift, the overarching consideration should be the retention of at least the existing level of safety. Under no circumstances should the lift installation be less safe after the modifications have been made. Where a lift is being replaced, a structural survey should be carried to ensure that the structural integrity and design of the lift shaft and openings are sufficient for the type of lift being installed.
- 10.4 BS EN 81-80 gives recommendations for improvements to the safety of existing lifts.
- 10.5 An audit should be carried out in accordance with BS EN 81-80 in order to assess the existing level of safety and determine what changes are necessary to bring the level to today's state of the art.
- 10.6 BS EN 81-80 also provides a numbered list of 74 significant hazards and gives recommendations for risk reduction measures.
- 10.7 The results of this audit are expected to give a clear indication of which items are of most concern. A list of priorities should be established and a dated programme of work agreed.

### Modernisation of CE-marked lifts

- 10.8 All modernisations should conform to BS5655-11 for traction lifts or BS5655-12 for hydraulic lifts.
- 10.9 BS5655-11 and BS5655-12 summarise the 74 significant hazards considered in BS EN 81-80.
- 10.10 BS5655-11 lists the following changes as important modifications to existing CE-marked traction lifts:

#### Change of:

- rated speed;
- rated load;
- travel (increase);
- mass.

**Change or replacement of:**

- travel (decrease);
- control system;
- type of door (or the addition of one or more landing or car doors);
- safety component, including:
  - overspeed governor;
  - ascending car overspeed protection means;
  - buffers;
  - safety gear;
  - type of locking devices (the replacement of a locking device by a device of the same type is not regarded as an important modification);
  - electronic safety devices;
- electric safety devices;
- machine, brake or traction sheave;
- car enclosure;
- door operator;
- guide rails or the type of guide rails.
  - pressure relief valve;
  - emergency lowering;
- car enclosure;
- door operator;
- guide rails or the type of guide rails.

10.11 Where any changes relating to rated speed or load, increase in travel or changes in mass are made, a full test of the complete lift installation should be carried out under the modernisation contract to BS8486-1. Where any of the other listed changes or replacements are made, there might be consequential changes. It is essential that tests be conducted to ensure that the main changes and any consequential changes result in a safe installation.

10.12 BS5655-12 lists the following changes as important modifications to existing CE-marked hydraulic lifts:

**Change of:**

- rated speed;
- rated load;

- travel (increase);
- mass.

Change or replacement of:

- travel (decrease);
- control system;
- type of door (or the addition of one or more landing or car doors);
- safety component including:
  - overspeed governor;
  - buffers;
  - safety gear;
  - type of locking devices (the replacement of a locking device by a device of the same type is not regarded as an important modification);
  - electronic safety devices;
  - clamping device;
  - pawl device;
  - rupture valve;
  - restrictor/one way restrictor;
- electric safety devices;
- the machine, including:

- 10.13 Where any changes in rated speed, load, travel (increase) of mass are made, a full test of the complete lift installation should be carried out under the modernisation contract to BS8486-2. Where any of the other changes or replacements are made, there might be consequential changes. It is essential that tests be conducted to ensure that the main changes and any consequential changes result in a safe installation.

### **Modernisation of non-CE-marked lifts**

- 10.14 Lifts installed before 1 July 1999 may not be CE-marked; however, the provisions of either BS5655-11 or BS5655-12 may be used as a basis for the modernisation of or modification to such lifts.
- 10.15 There is no legal requirement to bring the level of safety of an existing lift up to modern requirements. However, it would be prudent to carry out an audit to BS EN 81-80 to establish by risk assessment those measures which should be applied.

- 10.16 Any changes carried out on an existing lift should be tested at completion using the test document appropriate to the date of installation, where items have been changed on a one-to-one basis.
- 10.17 Where modern replacement equipment is used, the test should be to BS8486-1/2.

### Improving the accessibility of existing lifts

- 10.18 Where existing lifts do not conform to the requirements of the Disability Discrimination Act, they should be upgraded.

## Appendix A: Relevant statutory regulations

**Note:** This Appendix highlights specific lift requirements. Further general guidance can be found in Appendix 1 of Scottish Health Technical Memorandum 00: 'Policies and principles'.

### Health and Safety at Work etc Act 1974

Persons concerned with lifts have duties under the Health and Safety at Work etc Act 1974, which include the following:

- Employers have a duty to ensure, so far as is reasonably practicable, the health and safety of their employees while at work. This includes:
  - the provision of plant and systems of work that are safe and without risk to health;
  - the means safely to use and handle articles and substances;
  - all necessary information, instruction, training and supervision;
  - a safe means of access and egress;
  - a safe working environment.
- Employers, the self-employed and employees have a duty to conduct their undertakings in such a way as to ensure, so far as is reasonably practicable, that all persons who might be affected by the work activity are not exposed to risks to their health and safety;
  - Manufacturers, suppliers etc of articles for use at work have a duty to ensure, so far as is reasonably practicable, that the articles are so designed and constructed that they will be safe and without risk to health when they are being set, used, cleaned or maintained;
  - Erectors and installers of articles for use at work have a duty to ensure, so far as is reasonably practicable, that nothing about the way articles are erected or installed is unsafe or a risk to health;
  - Persons concerned with premises have a duty to persons other than employees who use non-domestic premises made available to them as a place of work. It is the duty of the person who controls the premises to take such measures as it is reasonable for them to take to ensure, so far as is reasonably practicable, that the premises, the means of access and egress to and from the premises, and any plant or substances on the premises, are safe and without risk to health.

### Management of Health and Safety at Work Regulations 1999

These regulations include a requirement (Regulation 3) for every employer and self-employed person to make a suitable and sufficient assessment of the risks to health and safety of themselves and others arising out of, or in connection with, the conduct of the undertaking. The regulations require the significant findings of the assessment to be recorded. The purpose of the assessment is to

identify and quantify the risk. Employers are required to implement preventative and protective measures to eliminate risk, and to put in place effective control measures to address residual risks and hazards.

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

## Disability Discrimination Act 2005

The Disability Discrimination Act 2005 gives disabled people rights in such areas as access to goods, facilities and services. It requires goods and services to be accessible to disabled people; this can include the removal of physical barriers, but does not impose specific requirements.

Businesses and service providers have a duty to make “reasonable adjustments” to the physical features of their premises in order to overcome barriers to access.

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

‘Reasonable adjustments’ take account of: practicality; financial and other costs; disruption; resources available; availability of financial assistance.

Lifts are included in the examples of ‘physical features’.

**Note:** The Equality and Human Rights Commission has published a number of codes of practice relating to duties applicable under the Disability Discrimination Act 2005; these are available from their website at [www.equalityhumanrights.com/en/Pages/search.aspx?k=dda](http://www.equalityhumanrights.com/en/Pages/search.aspx?k=dda).

## Construction (Design and Management) Regulations 2007

The Construction (Design and Management) Regulations 2007 (CDM) place duties on the client, CDM co-ordinator, designer, principal contractor and contractors to coordinate and manage the health and safety aspects of a construction project with the aim of controlling and reducing the risks involved.

The design, installation and maintenance of lifts and escalators are always subject to risk assessments being carried out, and their installation and continued operation will be subject to the CDM Regulations.

## Control of Substances Hazardous to Health Regulations 2002

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

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

Hazardous substances include chemicals, dust, gases and fumes. Asbestos is excluded from the Control of Substances Hazardous to Health Regulations 2002 as it is covered by separate regulations.

## Electricity at Work Regulations 1989

The Electricity at Work Regulations 1989 set out requirements for all electrical systems used at work, including construction, integrity, maintenance and isolation. They apply to employers and self-employed persons. Guidance on electrical safety to meet the Electricity at Work Regulations 1989 is given in Scottish Health Technical Memorandum 06-02 and Scottish Health Technical Memorandum 06-03: Electrical safety guidance for low and high voltage systems, (respectively)

## Electromagnetic Compatibility Regulations 2005

The Electromagnetic Compatibility Regulations 2005 deal with the two elements of electromagnetic compatibility: emission and immunity.

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

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

Guidance on the reduction of electrical interference is given in Scottish Health Technical Memorandum 06-01.

## Personal Protective Equipment Regulations 2002

In the Personal Protective Equipment Regulations 2002, personal protective equipment is defined as:

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

Personal protective equipment includes: helmets; eye protection; ear protection; safety footwear; gloves; safety harness; protective clothing; high-visibility clothing.

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

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



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

## **Supply of Machinery (Safety) Regulations 2008**

The Supply of Machinery (Safety) Regulations 2008 implement the requirements of the Machinery Directive 2006/42/EC and amend Directive 95/16/EC (the Lift Directive). The Machinery Directive applies to a wide range of machines that includes chainsaws, power presses, tractors etc. Annex 1 of the Machinery Directive lists the essential health and safety requirements that apply to all machines.

## **Workplace (Health, Safety and Welfare) Regulations 1992**

The Workplace (Health, Safety and Welfare) Regulations 1992 aim to ensure that workplaces meet minimum standards of health, safety and welfare.

## **The Building (Scotland) Regulations 2004, Non-domestic Technical Handbook 2010**

The Building (Scotland) Regulations 2004 Non-domestic Technical Handbook 2010 is concerned, in Section 4 Safety, with access to and use of buildings other than dwellings. It provides guidance in clause 4.2.7 on vertical circulation between storeys, for the provision of lifting devices, particularly lifts. Many of the requirements are also given in BS EN 81-70. An 'access statement' should be provided at the planning stage.

## **The Health and Social Care Act 2008: Code of Practice for Health and adult social care on the prevention and control of infections and related guidance**

This code of practice sets out criteria by which managers of healthcare organisations are to ensure that patients are cared for in a clean environment and where the risk of healthcare-associated infections is kept as low as possible.

## Appendix B: Project stages according to BS5655-6: 2002

### Typical checklists for return with tender documents

Client		Client reference:	
Project name:			
Project description:			
Client details:			
Contact name:			
Postal address:			
Email:			
Tel no.:		Fax no.:	
		Mobile:	
GBA Contact:		NHS reference:	
Observations:			
Date:		Signature:	
		Print name:	

## Exchange of information (prior to invitation to tender)

✓	Item	Comment
	Customer's identification of lift	
	The number, capacity, speed and disposition of the lifts necessary to give adequate lift service in the projected building	
	The special requirements of local authorities and other requirements set out in the planning permit	
	The provision of safe and convenient access to the machine room, where provided	
	The loads that the lift will impose on the building structure, the holes to be left in the machine-room floor and the cut-outs for wall boxes for push-buttons and signals	
	The necessity for and type of isolation to minimise the transmission of vibration and noise to other parts of the building	
	Machine-room heating and ventilation	
	The need for the builder to maintain accuracy of building in relation to dimensions, vertical alignment and agreed tolerances	
	The time required for preparation and approval of relevant details and drawings for the manufacture and installation of the lift equipment	
	The requirements for fixing guide brackets to the buildings structure	
	The time at which electric power will be required before completion of the lift contract	
	The requirements for electrical supply, feeders, associated switchgear etc	
	The requirements for scaffolding in the well and protection of the well prior to and during installation and testing of equipment	
	Delivery and storage of equipment	
	The means of escape in the event of fire or other emergency	

**Note:** Attention should also be drawn to the requirements of the Lifts Regulations 1997 and the Construction (Design and Management) Regulations 2007.

## Lift enquiry or invitation to tender

### General

A non-exhaustive list of the basic data needed by the lift contractor for each lift:

✓	Item	Comment
	Customer's identification of lift	
	Installation arrangement (see BS ISO 4190)	
	Rated load and speed	
	Lift travel and floor-to-floor heights	
	Net lettable floor area and population per floor	
	Location and designation of levels served	
	Arrangement of a multiple lift installation	
	Electricity supply (including emergency power supp): voltage, frequency, capacity, tolerance etc	
	Lift drive system and duty cycle	
	Ride quality	
	Control system and indicators	
	Additional items	
	Facilities for access by disabled people	
	NB: Attention is drawn to disability Discrimination Act 2005 and to the Building (Scotland) Regulations 2004, Section 4.	
	Fire-fighting lifts (see BS EN 81-72)	
	Fire detection systems to be used	
	Finishes	
	Vandal-resistant requirements (see BS EN 81-71)	
	Inclusions and exclusions	
	Building contract programme	
	Pre-tender health and safety plan	
	Building construction method	
	Capacity and availability of carnage facilities	
	Lift priority recall (see BS EN 81-72)	

## Finishes

Examples of finishes that might need to be considered include:

✓	Item	Comment
	Car enclosure	
	Car ceiling	
	Car floor	
	Car light fitting	
	Car trims (including decoration, mirrors, handrails, tip-up seats etc)	
	Car and landing doors and sills	
	Landing architraves, door frames	
	Push-button and indicator fittings in the car and at the landings	

## Other items normally supplied by the lift contractor

The lift contractor normally supplies the following items:

✓	Item	Comment
	Guide brackets	
	Buffers and metal stools for the buffers (where applicable)	
	Pit screen for counterweight	
	Machine and pulley subframes	
	Sound and vibration isolation for the machine, where required	
	Sill support member (with toe guard and/or fascias) for all except general-purpose goods lifts	
	Interlocks for access, inspection and emergency doors	
	Power supply for emergency lighting and alarm signals	
	Electrical wiring and cables for the lift, terminating in the main switch furnished by the purchaser	
	Alarm push-button and bell (if any) or other intercommunication system (which may be limited to that part of the system contained within the well)	
	Accessories for lifting, and small electric tools for use during the actual installation	
	Services of personnel to install, wire and test	
	Test instruments and weights	

## Other items normally supplied by the principal contractor

The principal contractor normally supplies the following items:

✓	Item	Comment
	Builders' work, such as forming the well, pit and machine room, which should be in accordance with any appropriate British Standard specifications or codes of practice	
	<b>NB:</b> Attention is drawn to local by-laws and legislation, eg the Construction (Design and Management) Regulations and the Health and Safety at Work etc Act regarding any work carried out	
	Building in of wall inserts, cutting away, making good and site painting	
	Forming the machine-room floor, including any reinforcement necessary for load bearing	
	Supplying or fixing lifting equipment in machine room, including proof testing, certifying and marking	
	Supplying or fixing of structural steelwork for machine and buffer supports	
	Provision of safe and adequate access to the machine room and well	
	Supplying or fixing of steel surrounds for vertical bi-parting sliding doors	
	Supplying or fixing of sill support members (with toe guards) for general-purpose goods lifts	
	Carrying out any necessary tanking, lining or reinforcement of the pit	
	Supplying or fixing of dividing beams for multiple wells and inter-well screens	
	Supplying or fixing of access doors to machine room, pit and pulley room, emergency doors and inspection doors and their locks	
	Guarding of opening and other measures necessary to ensure the safety and convenience of personnel within the building	
	Provision of temporary protection (over and above the additional protective skin) of finished lift equipment on landings, surrounds, surfaces, finishes and access routes and if necessary in the car	

Continued overleaf

✓	Item	Comment
	Supplying or fixing of scaffolding, planks and ladders	
	Off-loading and storage in a protected area of list materials and equipment delivered by the principal contractor	
	Painting of site steelwork supplied by other parties	
	Supplying or installation of any electrical wiring external to the well and machine room	
	Supplying or installation of working lights, temporary and permanent electricity supplies etc	
	Providing of a 3-phase electrical supply for a mobile platform or hoist fitted in the well, if required	

✓	Item	Comment
	Provision of mess-rooms, sanitary accommodation and welfare facilities for personnel	
	Boring the hole and provision of the liner (where required) for the jack on hydraulic lifts	
	Provision of carnage facilities	
	Supplying and fixing of permanent access ladders, steps and guard rails	
	Cleaning, renewing or replacing lift equipment damaged by dust produced from such processes as dry grinding of mosaic and other building work	
	NB: Cleaning should only be performed by, or under the supervision of, the lift contractor	
	Provision of permanent ventilation or other arrangements to ensure a machine-room temperature between 5°C and 40°C for electric traction lifts and between 15°C and 35°C for hydraulic lifts in operation prior to testing	
	Provision of reinforcement of pavements and floors, making suitable access, and trucking, carnage and unskilled labour for handling equipment to its final position	
	Provision of calculations with respect to the building, or the obtaining of any necessary permissions and the issue of relevant notices	
	Carrying out any role specified in the Construction (Design and Management) Regulations 2007 other than that of 'contractor'	
	Provision of telephone utility services	

**Note:** The principal contractor is also generally responsible for meeting extra costs due to surveyor's fees or special requirements of government departments, local authorities, insurance companies, consultants, other bodies or officials.



## Coordination of site work

Preparatory work on site can include:

✓	Item	Comment
	Making the pit dry and watertight, including tanking if necessary, and clearing it of rubbish	
	Making the well complete and watertight and equipping it with lighting (permanent if possible)	
	Making the machine room complete and watertight, with full lighting, clearing it of rubbish, dust-proofing it and securing access against unauthorised entry, including temporary warning notices and lock, with a key available exclusively to authorised personnel	
	Completing preparation for lift fixings in the pit, well and machine room, including the accurate placing of built-in wall inserts if these are used, and the thorough cleaning out of the associated slots	
	Final grouting or fixing in position of steel work items (eg well trimmers and machine beams) after checking for correct position by the lift contractor	
	Erecting the scaffolding, as agreed with the lift contractor	
	Completing entrance preparations, including preparations for door frames, architraves, push-button boxes and indicators. In many cases progress can be facilitated by omitting the front walls of the well at some floors, until the car, doors etc are installed	
	Establishing the datum-line (in elevation) at each floor to enable the lift contractor to set metal sills and frames in relation to finished floor levels	
	Planning the dimensions in accordance with the relevant clause in BS5655	

List of associated documents.

## Appendix C: Considerations for energy-efficient lift design

The table lists actions that can be applied to most lifts, which may substantially lower the energy consumption of the unit. Existing lifts can benefit from some of the recommendations.

Action	For new equipment	For existing equipment
<b>Equipment design</b>		
Drive type: traction/hydraulic	Traction almost always produces significant energy savings	Modernise
Drive type: hydraulic	If hydraulic drives are selected, use counterbalancing or energy accumulation systems	Install counterbalancing or modernise to energy accumulation system
Drive type: technology	Select an energy-efficient drive for the lift and consider regeneration systems, eg VVVF	Replace older drives with energy-efficient motors
Starting current	Use soft start technologies	Modernise
Geared/gearless	Gearless recommended over geared machine	May be possible
Machine position	Select top drive in preference to bottom or side drive	n/a
Roping	Select 1:1 roping, where possible	n/a
Door system	Select door system that does not rely on stalled motor to keep doors closed	Modernise
Guide shoes	Use roller guide shoes for both car and counterweight in preference to slipper or swivel guide shoes	Modernise
Guide rail fixings	Ensure guide rails are stiff and do not flex	Modernise
Guide rail plumbness	Ensure guide rails are plumb and fixed at the shortest spacing	Modernise
Counterbalancing	Select the lowest possible (safest) counterbalancing ratio Use a high average-to-peak torque ratio motor	Consider changing the value of counterbalancing and using a high-average-to peak torque ratio motor and/or install a smaller drive motor
Counter-weight balance	Optimise in accordance with building traffic pattern	Optimise in accordance with building traffic pattern
Car balance	Ensure the car is balanced against the guide shoes	Ensure the car is balanced against the guide shoes
Air resistance	For high-speed lifts ensure lift cars present low air resistance	Check air resistance
Rope diameter	Select as large a diameter rope as possible to reduce levelling operations due to rope stretch	Modernise

*Continued overleaf*

Action	For new equipment	For existing equipment
<b>Equipment design</b>		
Did ratio	Select the lowest possible sheave and pulley diameters to reduce inertial effects	n/a
Brake	Ensure the brake is not energised when the lift is stationary	Ensure the brake is not energised when the lift is stationary
Tank heaters/coolers	Automatic control to minimum temperature required	Automatic control to minimum temperature required
Lift well heaters	Automatic control to minimum temperature required	Automatic control to minimum temperature required
Hydraulic oil cooler	Where up-starts exceed 30 per hour, install an oil cooler	Where up-starts exceed 30 per hour, install an oil cooler
Oil cooler location	Install oil coolers outside the machine room and recover waste heat	Install oil coolers outside the machine room and recover waste heat
<b>Operation</b>		
List traffic strategy	Review the traffic patterns and select the lift control strategy to minimise the number of journeys	Review the traffic patterns and select the lift control strategy to minimise the number of journeys
Parking feature	Consider omitting the parking feature	Consider omitting the parking feature
Automatic shut-down	Initiate standby after lift idle for five minutes	Initiate standby after lift idle for five minutes
Car lights	Turn off when on standby	Turn off when on standby
Car fan/HVAC	Turn off when on standby	Turn off when on standby
Car fan	Ensure any car fans only operate when car temperature exceeds 25°C	Ensure any car fans only operate when car temperature exceeds 25°C
Machine-room temperature	Provide automatic temperature control	Provide automatic temperature control
Waste heat	Recover waste heat from lift motor rooms if the lifts are used intensely	Recover waste heat from lift motor rooms if the lifts are used intensely
Machine-room energy loss	Provide sufficient insulation	Provide sufficient insulation
Lift well vent (where provided)	Automate opening on fire only	Automate opening on fire only
<b>Maintenance</b>		
Routine maintenance	Ensure proper, thorough and regular maintenance is carried out	Ensure proper, thorough and regular maintenance is carried out
Adjustments	Ensure all critical parameters are adjusted during maintenance	Ensure all critical parameters are adjusted during maintenance
Drive profile	Set up the acceleration/deceleration profile to the lowest acceptable values	Set up levelling/creep distance to be as small as possible

Action	For new equipment	For existing equipment
<b>Maintenance (cont.)</b>		
Motor blowers	Ensure any motor blowers are switched to operate on demand	Ensure any motor blowers are switched to operate on demand
Machine-room heating	Ensure any machine-room heating (including tank heaters) does not operate until the temperature drops below 6°C	Ensure any motor blowers are switched to operate on demand
Machine-room cooling/ventilation	Ensure machine-room cooling/ventilation does not operate until temperature exceeds operating conditions	Ensure machine-room cooling/ventilation does not operate until temperature exceeds operating conditions
Guide-rail lubrication	Ensure guide rails are adequately lubricated	Ensure guide rails are adequately lubricated
Top of car lights	Turn off when mechanic leaves	Turn off when mechanic leaves
Lights lift well	Turn off when mechanic leaves	Turn off when mechanic leaves
Tie down	Ensure compensation/tie-down systems are properly adjusted	Ensure compensation/tie-down systems are properly adjusted
<b>Handling capacity</b>		
Select rated speed	Select the lowest rated speed commensurate with traffic design criteria	n/a
Select appropriate rated speed	Select lift speeds that are appropriate to the task, eg slower speeds for goods lifts	n/a
Select rated load	Select smallest rated load commensurate with traffic design criteria	n/a
Select number of lifts (elevators)	Locate lifts (elevators) together to minimise the number of journeys	n/a
Location of lifts (elevators)	Locate lifts (elevators) together to minimise the number of journeys	n/a
Location of lifts (elevators)	Locate lifts (elevators) in the most appropriate positions, i.e. locate stairs before lifts (elevators)	n/a
Location of population served	Ensure symbiotic activities are located together, eg sales/marketing, personnel/training	Consider relocation of activities
Motion dynamics	Select the lowest values for acceleration/deceleration and jerk commensurate with traffic design criteria	Re-evaluate motion dynamics

## Appendix D: Supplement to BS8486-1: 2007

### Additional witness tests and putting into service: new traction lifts

Client	Site
Contractor	
Lift reference	
Present during test:	Name (in CAPITALS)
	Signature
	Date of test
Comments, items for immediate attention, deficiencies etc:	

Continue on additional sheets if required

**Note:** When attending site for witness tests, all design entries and site measured values should be entered on a copy of BS8486-1 and this Supplementary Form (except those in Sections 7 and 8, which should be left blank and will be witnessed), and both documents should be available for final completion by the lift contractor at the time of the tests. The original signed and dated copies will be provided to the officer witnessing the tests for transmission to the healthcare management, and copies should be retained by the lift installer.

Items indicated 'Confirm' are to be filled in by the contractor in the third column.

Items marked 'X' do not apply. Items marked 'L' require a covering letter.

<b>1.0</b>	<b>Basic characteristics</b>	
1.1	Confirm reeving ratio	
<b>2.0</b>	<b>Machine and pulley rooms</b>	
2.1	Confirm fuse rating of main switch	
2.2	Confirm measured standing supply voltage	
2.3	Confirm that the hand winding/lowering arrangement accords with instruction chart displayed	
2.4	Confirm that less than 400 N is required to conform with clause 12.5.1.1 of BS EN 81-1	
2.5	Confirm that a hand-winding wheel electric safety device is fitted to conform with clause 12.5.1.2 of BS EN 81-1 (if required)	
2.6	Confirm that it is possible to check when the car is in an unlocking zone to conform with clause 12.5.1.3 of BS EN 81-1 and that the car position is indicated (NB switch lift off first)	
2.7	Confirm that the entrance doors can be physically opened in door zone	
2.8	Confirm that an Up/Down direction label is fitted to motor casing	
2.9	Confirm the selector resets if its position is falsified	
2.10	Confirm rubber mats in place at controller access	
2.11	Confirm there is a complete set of circuit diagrams provided on site	
2.12	Confirm that rope hole upstands and felts are in place	
2.13	Confirm that guard rail provisions and access to machine plinth are satisfactory	
2.14	Confirm that all parts are accessible, where required, for maintenance and are adequately illuminated	
2.15	Confirm that all conduits, trunking etc are correctly routed to avoid tripping or head contact hazard	
2.16	Confirm that operating noise levels comply with specification	
2.17	Confirm that a warning notice is fitted to machine-room access door	
2.18	Confirm that any heating and ventilation controls function correctly and at correct temperature settings	
<b>3.0</b>	<b>Well</b>	
3.1	Confirm that all lock circuits are broken through the positive side of control circuit	
3.2	Confirm that the control circuit breaker trips when bottom lock is earthed	
3.3	Confirm interlocks of hydraulic buffers stop the lift from operating unless fully extended	
3.4	Confirm maintenance limit switch is properly positioned	
3.5	Confirm that all conduits, trunking etc are correctly routed to avoid tripping or head contact hazard	
<b>4.0</b>	<b>Car, inspection operation and entrance clearances</b>	
4.1	Confirm car light is switched through live side	
4.2	Confirm inspection speed (m/s)	up down
4.3	Confirm local alarm bell is operative	
4.4	Confirm passenger detection operation operates correctly	

4.5	Confirm that operating noise levels comply with specification	
4.6	Confirm that the doors can be opened as defined in BS EN 81-1 clause 8.11.1	
4.7	Confirm car telephone and emergency dial out function correctly	
<b>5.0</b>	<b>Suspension, compensation, braking and traction</b>	
5.1	Confirm anti-rebound is fitted. If yes, confirm its correct operation	
5.2	Confirm brake sustains the static car in lower part of travel with rated load plus 25% (BS EN 81-1, 12.4.2)	
5.3	Confirm that emergency retardation of car is not excessive by initiating a braked stop at rated speed	
5.4	Confirm rope tension equalisers are fitted	
<b>6.0</b>	<b>Safety contacts and circuits</b>	
6.1	Confirm that no supplemental tests are required	

<b>7.0</b>	<b>Car and balancing weight safety gear and overspeed protection</b>	
7.1	Car and balancing weight test results	

Item	Car			Balancing weight		
Safety gear type:						
Maker:						
Load in car when tests made (kg):						
Governor type and marked tripping speeds electrical 1, electrical 2 and mechanical (m/s):	1	2	3	1	2	3
Electrical trip 1 (m/s):						
Electrical trip 2 (if applicable) (m/s):						
Mechanical trip (m/s):						
Condition of rope after test:						
Speed of the car when engagement occurred (m/s):						
Did the safety gear sustain with ropes slipping on drive?						
Did the safety gear release on moving lift upwards?						
Measure the slide marks on the guide rails L(mm)						
and observe uniform markings: R(mm)						

7.2	Confirm that no damage or distortion has occurred to the car or safety gear as a result of the test	
7.3	Confirm governor tension weight switch works in both directions	
7.4	Confirm safety gear switch works in a positive break manner	
7.5	Confirm that the rope data plate is fitted to the car crosshead	

8.0	Measurement system parameters								
8.1	Measure and record the following operational data when the car is at its mid-point of travel.								
Rated speed operation (with lift performing appropriately to its power system)									
Car loading condition		Lift motor speed <sup>1</sup> (rpm)	Lift speed <sup>1</sup> (m/s)	Lift motor input			System input <sup>2</sup>		
				Running		Start	Running		Start
				V	A	A	V	A	A
Empty	Up								
	Down								
Balanced	Up								
	Down								
Rated	Up								
	Down								
Rated +10%	Up								
	Down								
<div>1. Complete either of these columns in its entirety and make one entry only in the alternative column for the rated up condition.</div> <div>2. Energy converter or equivalent. Measure the system input to the controller from the main supply.</div>									

8.2	Duty cycle and motor temperature rise	
-----	---------------------------------------	--

Position thermometer against motor windings and record temperatures at the start and finish of one hour's continuous running on random calls.

Temperature	Start of test (°C)	Finish of test(°C)
Machine room		
Motor windings		

Note any malfunctions.



8.3	Measured performance times	
-----	----------------------------	--

Insert specified values in Column 3, obtained from specification.

**Lift reference:** .....

Area	Item	Specified	Measured result
1. Drive dynamics	Rated speed UP (m/s) Rated speed DOWN (m/s) Performance UP (s) Performance DOWN (s) Acceleration UP (m/s <sup>2</sup> ) Acceleration DOWN (m/s <sup>2</sup> ) Stopping accuracy (under any load) TOP floor (mm) BOTTOM floor (mm)	±10 (max) ±10 (max)	
2. Ride vibration control (Car max)	Horizontal (front/back) (m/s <sup>2</sup> ) Horizontal (side/side) (m/s <sup>2</sup> ) During door operation (m/s <sup>2</sup> ) Vertical (superimposed) (m/s <sup>2</sup> )	15 pk-pk 15 pk-pk 15 pk-pk 15 pk-pk	
3. Door operation	Opening time (s) Closing time (s) Onset of nudging (s) Dwell timing: car call stop (s) Dwell timing: hall call stop (s) Kinetic energy normal close (J) Kinetic energy nudging close (J) Door stall force (N)	<20  <10 <4 <150	

Area	Item	Specified	Measured result
4. Lighting levels	Lighting level in car (Lux) Lighting level by machine (Lux) Lighting level by controller (Lux)	>100 >200 >200	
5. Noise control (maximum under any condition)	Travel noise in car (dBA) Door operation (dBA) Outside machine room (dBA)	<55 pk <55 pk <55 pk	
6. System response (if applicable)	Average response time (s) Time to answer 75% of hall calls (s) Time to answer 98% of hall calls (s)		

NB: A copy of this sheet will be needed for each lift tested.

<b>9.0</b>	<b>Documentation</b>	
9.1	Confirm that maintenance logbooks are placed in machine room	
9.2	Confirm that all items listed in BS EN 81-1 Annex C are available on site for inspection	
<b>10.0</b>	<b>Additional information</b>	
10.1	Introduction	

A technical dossier is to be available (as defined in BS EN 81-1) at the time of witness testing in addition to a partly filled-in BS8486-1 (this will be completely filled in during the witness tests) together with this Supplement. The tables below represent a checklist of the minimum required documents. Unless these minimum requirements are met, the lift installer cannot “put the lift into service” under the Lifts Regulations 1997 and a Certificate of Practical Completion under the contract condition should not be issued.

All spaces in the second column are to be filled in and not left blank. The legend will be:

- ‘n/a’ means not applicable, eg there are no pulley rooms;
- ‘Information attached’ eg outline electric schematic diagrams of: the power circuits;
- ‘See Register attached’ eg the plans of installation in the building;
- ‘Information forwarded with our letter of dd/mm/yy’ eg calculation of the safety factor;
- ‘A narrative statement’ eg the user is the owner.

10.2	General	
------	---------	--

Item	Response
Name of the installer	
Address of the installer	
Name of the owner	
Address of the owner	
Name of the user	
Address of the user	
Address of the installation premises	
Type of equipment	
Rated load	
Rated speed	
Number of passengers	
Travel of the lift	
Number of the lift	
Number of landings served	
Mass of the car	
Mass of the counterweight or balancing weight	
Means of access to the machine room	
Means of access to the pulley room	

10.3	Technical details and plans	
------	-----------------------------	--

Item	Response
GA plans and sections of: <ul style="list-style-type: none"> <li>the lift installation</li> <li>rooms for machines</li> <li>rooms for pulleys</li> <li>rooms for other apparatus</li> </ul>	
Clearances at the top of the well	
Clearances in the pit	
Guards between lifts	
Provision for holes for fixings	
Position and principal dimensions of the machine room	
Layout of the machine room and principal devices	
Dimensions of the traction sheave or the drum	
Ventilation holes	
Reaction loads on the building	
Reaction loads at the bottom of the pit	
Access to the machine room	

Item	Response
Position and principal dimensions of the pulley room	
Position and dimensions of pulleys	
Position of other devices in the pulley room	
Access to the pulley room	
Arrangement and principal dimensions of landing doors	
Arrangement and dimensions of inspection doors and inspection traps and emergency doors	
Dimensions of the car and of its entrances	
Distances from the sill and from the car door to inner surface of the well wall	
Horizontal distance between the closed car and landing doors	
Principal characteristics of the suspension: <ul style="list-style-type: none"> <li>• safety factor;</li> <li>• ropes (number, diameter, composition, breaking load);</li> <li>• chains (type, composition, pitch, breaking load);</li> <li>• compensation ropes.</li> </ul>	
Calculation of the safety factor	
Principal characteristics of the overspeed governor rope and/or safety rope: <ul style="list-style-type: none"> <li>• diameter;</li> <li>• composition;</li> <li>• breaking load;</li> <li>• safety factor.</li> </ul>	
Dimensions and proof of the guide rails	
Condition and dimensions of the rubbing surfaces (drawn, milled, ground)	
Dimensions and proof of energy accumulation type buffers with linear characteristics	

10.4	Electric schematic diagrams	
------	-----------------------------	--

Item	Response
Outline electric schematic diagrams of: <ul style="list-style-type: none"> <li>• the power circuits</li> <li>• the circuits connected with electric safety devices</li> </ul>	

10.5	Verification of conformity	
------	----------------------------	--

Item	Response
Copies of type examination certificate for safety components	
Copies of certificates for other components (ropes, chains, explosion-proof equipment, glass etc)	
Setting up certificate for the safety gear according to the instructions provided by the safety gear manufacturer and calculation of the compression of the springs in the case of progressive safety gear	

## Appendix E: Supplement to BS8486-2: 2007

### Additional witness tests and putting into service: new hydraulic lifts

Client	Site address:
Contractor	
Lift reference	
Present during test:	Name (in CAPITALS)
	Signature
	Date of test

Comments, items for immediate attention, deficiencies etc:

continue on additional sheets if required >

**Note:** When attending site for witness tests, all design entries and site measured values should be entered on a copy of BS8486-1 and this Supplementary Form (except those in [Sections 7 and 8](#), which should be left blank and will be witnessed), and both documents should be available for final completion by the lift contractor at the time of the tests. The original signed and dated copies will be provided to the officer witnessing the tests for transmission to the healthcare management, and copies should be retained by the lift installer.

Items indicated 'Confirm' are to be filled in by the contractor in the third column. Items marked 'X' do not apply, items marked 'L' require a covering letter.

<b>1.0</b>	<b>Basic characteristics</b>	
1.1	Confirm reeving ratio (if applicable)	
<b>2.0</b>	<b>Machine and pulley rooms</b>	
2.1	Confirm fuse rating of main switch	
2.2	Confirm measured standing supply voltage	
2.3	Confirm that the hand winding/lowering arrangement accords with instruction chart displayed	
2.4	Confirm that it is possible to check when the car is in an unlocking zone to conform with clause 12.9.3 of BS EN 81-2 and that the car position is indicated (NB switch lift off first)	
2.5	Confirm the selector resets if its position is falsified	
2.6	Confirm that the controller car and landing call buttons function properly	
2.7	Confirm rubber mats are in place at controller access	
2.8	Confirm there is a complete set of circuit diagrams provided on site	
2.9	Confirm that any guard rail provisions and access are satisfactory	
2.10	Confirm that all parts are accessible, where required, for maintenance and are adequately illuminated	
2.11	Confirm that all conduits, trunking etc are correctly routed to avoid tripping or head contact hazard	
2.12	Confirm that operating noise levels comply with specification	
2.13	Confirm that a warning notice is fitted to machine-room access door	
2.14	Confirm oil flow silencer is fitted	
2.15	Confirm that a minimum of 25% of system oil capacity remains in tank with car at top floor level	
2.16	Confirm tank is supported on rubber in shear mountings	
2.17	Confirm operation of minimum pressure switch	
2.18	Confirm car auto dispatches to lowest floor within five minutes of standing idle	
2.19	Confirm main switch displays notice – "Locate car at lowest floor prior to switching off"	
2.20	Confirm screened cable is used for electronic valve control (tank to controller)	
2.21	Confirm tank is marked with plate denoting fluid viscosity index number	
2.22	Confirm location of any external coolers is satisfactory and the unit works	

2.23	Confirm any heating and ventilation controls function correctly and at correct temperature settings	
2.24	Confirm tray present to contain any hydraulic oil leaks	
<b>3.0</b>	<b>Well</b>	
3.1	Confirm that all lock circuits are broken through the positive side of control circuit	
3.2	Confirm that the control circuit breaker trips when bottom lock is earthed	
3.3	Confirm governor tension weight switch works in both directions	
3.4	Confirm pit safety prop is provided	
3.5	Confirm rupture valve is incorporated at base of cylinder(s)	
3.6	Confirm operation of maximum pressure blow out valve	
3.7	Confirm ram gland overflow oil return tube is in place (cylinder to tank)	
3.8	Confirm ram surface for scoring, rust or damage	
3.9	Confirm (for exposed cylinders) that the upstand and horizontal support are adequately sized and secure	
3.10	Confirm (for telescopic cylinders) that all rams are synchronised	
3.11	Confirm (for telescopic cylinders) that ram yokes are in place at each stage	
3.12	Confirm on indirect acting lifts that the rope data plate is fitted to the car crosshead	
3.13	Confirm that all conduits, trunking etc are correctly routed to avoid tripping or head contact hazard	
<b>4.0</b>	<b>Car, inspection operation and entrance clearances</b>	
4.1	Confirm car light is switched through live side	
4.2	Confirm local alarm bell is operative	
4.3	Confirm the emergency lighting works adequately	
4.4	Confirm inspection speed (m/s):	up down
4.5	Check passenger detection operation operates correctly	
4.6	Confirm that operating noise levels comply with specification	
4.7	Confirm car telephone and emergency dial out function correctly	
<b>5.0</b>	<b>Suspension</b>	
5.1	Confirm anti-rebound is fitted. If yes, confirm its correct operation	
<b>6.0</b>	<b>Safety contacts and circuits</b>	
6.1	Confirm that no supplemental tests are required	



<b>7.0</b>	<b>Car and balancing weight safety gear and overspeed protection</b>	
7.1	Car and balancing weight test results:	

Item	Car			Balancing weight		
Safety gear type:						
Maker:						
Load in car when tests made (kg):						
Governor type and marked tripping speeds electrical 1, electrical 2 and mechanical (m/s):	1	2	3	1	2	3
Electrical trip 1 (m/s):						
Electrical trip 2 (if applicable) (m/s):						
Mechanical trip (m/s):						
Condition of rope after test:						
Speed of the car when engagement occurred (m/s):						
Did the safety gear sustain with ropes slipping on drive?						
Did the safety gear release on moving lift upwards?						
Measure the slide marks on the guide rails L(mm)						
And observe uniform markings: R(mm)						

7.2	Confirm that no damage or distortion has occurred to the car or safety gear as a result of the test	
7.3	Confirm governor tension weight switch works in both directions	
7.4	Confirm that the rope data plate is fitted to the car crosshead (if applicable)	

<b>8.0</b>	<b>Measurement system parameters</b>	
8.1	Measure and record the following operational data when the car is at its mid-point of travel.	

Rated speed operation (with lift performing appropriately to its power system)							
Car loading condition		Hydraulic pressure (Bar)*	Lift speed (m/s)	Motor input		Maximum levelling variance (± mm)	
				(V)	(A)		
Empty	Up						
	Down						
Rated	Up						
	Down						
Rated +10%	Up						
	Down						

\* Supply line to cylinder.

8.2	Duty cycle and motor temperature rise	
-----	---------------------------------------	--

Position thermometer against motor windings and record temperatures at the start and finish of one hour's continuous running on random calls.

Temperature	Start of test (°C)	Finish of test (°C)
Machine room		
Motor windings		

Note any malfunctions.

8.3	Measured performance times	
-----	----------------------------	--

Insert specified values in Column 3, obtained from specification.

**Lift reference** .....

Area	Item	Specified	Measured result
1. Drive dynamics	Rated speed UP (m/s) Rated speed DOWN (m/s) Performance UP (s) Performance DOWN (s) Acceleration UP (m/s <sup>2</sup> ) Acceleration DOWN (m/s <sup>2</sup> ) Stopping accuracy (under any load) TOP floor (mm) BOTTOM floor (mm)	       ±10 (max) ±10 (max)	
2. Ride vibration control (Car max)	Horizontal (front/back) (m/s <sup>2</sup> ) Horizontal (side/side) (m/s <sup>2</sup> ) During door operation (m/s <sup>2</sup> ) Vertical (superimposed) (m/s <sup>2</sup> )	15 pk-pk 15 pk-pk 15 pk-pk 15 pk-pk	
3. Door operation	Opening time (s) Closing time (s) Onset of nudging (s) Dwell timing: car call stop (s) Dwell timing: hall call stop (s) Kinetic energy normal close (J) Kinetic energy nudging close (J) Door stall force (N)	   <20  <10 <4 <150	
4. Lighting levels	Lighting level in car (Lux) Lighting level by machine (Lux) Lighting level by controller (Lux)	>100 >200 >200	
5. Noise control (maximum under any condition)	Travel noise in car (dBA) Door operation (dBA) Outside machine room (dBA)	<55 pk <55 pk <55 pk	
6. System response (if applicable)	Average response time (s) Time to answer 75% of hall calls (s) Time to answer 98% of hall calls (s)		

NB: A copy of this sheet will be needed for each lift tested.

<b>9.0</b>	<b>Documentation</b>	
9.1	Confirm that maintenance logbooks are placed in machine room	

9.2	Confirm that all items listed in BS EN 81-1 Annex C are available on site for inspection	
<b>10.0</b>	<b>Additional information</b>	
10.1	Introduction	

A technical dossier is to be available (as defined in BS EN 81-2) at the time of witness testing in addition to a partly filled-in BS8486-2 (this will be completely filled in during the witness tests) together with this Supplement. The tables below represent a checklist of the minimum required documents. Unless these minimum requirements are met, the lift installer cannot 'put the lift into service' under the Lifts Regulations 1997 and a Certificate of Practical Completion under the contract condition should not be issued.

All spaces in the second column are to be filled in and not left blank. The legend will be:

- 'n/a' means not applicable, eg there are no pulley rooms;
- 'Information attached' eg outline electric schematic diagrams of: the power circuits;
- 'See Register attached' eg the plans of installation in the building;
- 'Information forwarded with our letter of dd/mm/yy' eg proof of jack and piping;
- 'A narrative statement' eg the user is the owner.

10.2	General	
------	---------	--

Item	Response
Name of the installer	
Address of the installer	
Name of the owner	
Address of the owner	
Name of the user	
Address of the user	
Address of the installation premises	
Type of equipment	
Rated load	
Rated speed	
Number of passengers	
Travel of the lift	
Number of landings served	
Mass of the car	
Mass of the counterweight or balancing weight	
Means of access to the machine room	

10.3	Technical details and plans	
------	-----------------------------	--

Item	Response
GA plans and sections of: <ul style="list-style-type: none"> <li>the lift installation</li> <li>rooms for machines</li> <li>rooms for pulleys</li> <li>rooms for other apparatus</li> </ul>	
Clearances at the top of the well	
Clearances in the pit	
Any accessible spaces which exist below the well	
Access to the pit	
Guards between lifts	
Provision for holes for fixings	
Position and principal dimensions of the machine room	
Layout of the machine room and principal devices	
Dimensions of the traction sheave or the drum	
Ventilation holes	
Reaction loads on the building	
Reaction loads at the bottom of the pit	
Access to the machine room	
Position and principal dimensions of the pulley room	
Position and dimensions of pulleys	
Position of other devices in the pulley room	
Access to the pulley room	
Arrangement and principal dimensions of landing doors	
Arrangement and dimensions of inspection doors and inspection traps and emergency doors	
Dimensions of the car and of its entrances	
Distances from the sill and from the car door to inner surface of the well wall	
Horizontal distance between the closed car and landing doors	
Principal characteristics of the suspension: <ul style="list-style-type: none"> <li>safety factor;</li> <li>ropes (number, diameter, composition, breaking load);</li> <li>chains (type, composition, pitch, breaking load);</li> </ul>	

Declaration of precautions provided against free fall and descent with excessive speed	
Declaration of precautions provided against creeping	
Functional drawing of pawl device (if any)	
Evaluation of the reaction force from pawl device, if any, to fixed stops	
Principal characteristics of the overspeed governor rope and/or safety rope: <ul style="list-style-type: none"> <li>diameter;</li> <li>composition;</li> <li>breaking load;</li> <li>safety factor.</li> </ul>	
Dimensions and proof of the guide rails	
Condition and dimensions of the rubbing surfaces (drawn, milled, ground)	
Dimensions and proof of energy accumulation type buffers with linear characteristics	
Proof of full load pressure	
Proof of jack and piping according to Annex K	
Characteristics or type of hydraulic fluid	

10.4	Electric schematic diagrams	
------	-----------------------------	--

Item	Response
Outline electric schematic diagrams of: <ul style="list-style-type: none"> <li>the power circuits</li> <li>the circuits connected with electric safety devices</li> </ul>	

10.5	Verification of conformity	
------	----------------------------	--

Item	Response
Copies of type examination certificate for safety components	
Copies of certificates for other components (ropes, chains, explosion-proof equipment, glass etc)	
Setting up certificate for the safety gear	
Calculation of the compression of the springs in the case of progressive safety gear	
Setting up certificate for rupture valve	
Manufacturer's adjustment diagrams for rupture valve	

## Appendix F: Typical instructions for the safe release of passengers trapped in electric traction lifts

**Note:** There may be manufacturer's pictograms, which may also be consulted.

### **Do not attempt to move the lift in any other fashion**

The release is to be carried out by *trained and authorised persons* only. No other persons should attempt it.

### **To carry out the procedure safely:**

**Two** trained and authorised persons (the rescuers) and another person (the safety monitor) are required

- locate the nearest landing to the lift car where you can speak to the occupants from that landing and advise (a) that they are not in any danger; (b) they will be released as soon as possible; (c) they should not attempt to leave the lift until instructed to do so; (d) that the lift will move shortly;
- ask the occupants to confirm the car doors are closed and ask them stand away from the car doors. Leave the safety monitor (who does not need to be trained and authorised) on the nearest landing to the car to continue to talk to and reassure the passengers. It is advantageous to be able to communicate with this person;
- the two rescuers should check all landing doors are closed and go to the machine room, wearing proper clothing (no loose items, jewellery, etc.), with an electric torch (if necessary);
- Identify the lift to be moved, locate the Main Isolator and Turn it off [This is an awkward swing movement];
- the hand winding wheel and the brake lever are both loose. Fit them ready carefully for use (as trained);
- the means of floor level indication is by a buzzer/light unit on the front of the controller. Switch it on;
- one trained and authorised rescuer (the *braker*) should position themselves to safely operate the brake.

**Warning:** ensure that no part of their body or clothing can come into contact with any moving parts.

- the other trained and authorised rescuer (the *winder*) should take firm hold of the hand-wheel with both hands and in such a position to be able to see the floor level indicator and hear the buzzer.

**Warning:** ensure that no part of their body or clothing can come into contact with any moving parts.

- on instruction from the Winder, the Braker will take the brake *off* by moving

the lever down. At no time should the Braker operate the brake release lever, unless instructed to do so by the Winder;

- the Winder will turn the hand-wheel in the *up* or *down* direction (as marked on the machine casing) in the direction which requires the least effort, *without* taking their hands off the wheel or letting the wheel slip through their hands. When about a 90° turn has been accomplished the Braker will put the brake *on*.

**Warning:** the lift may suddenly move under its own weight and the Braker must put the brake on immediately.

- the Winder will move their hands to a new position and the process will be repeated until the floor level indicator/buzzer indicates a floor level is reached;
- the Braker will remove the loose brake lever, the Winder the loose hand wheel and both rescuers should then leave the motor room locking the door behind them;
- the Winder and the Braker should go to the floor indicated by the floor level indicator and open the landing doors using the door release key (see instructions below) to release the passenger(s);
- close all landing doors and check that they are locked shut. Wait for the lift service company to rectify the fault;

**Do not switch the lift back on.**

**Notes:** If the lift cannot be moved at all, *stop operations* and call out the lift service company/Fire Service.

If the lift has travelled above the top floor or below the bottom floor it can only be wound back to that floor, which may require much effort. If this is not possible call out the lift service company/Fire Service.

Once an entrapment has been confirmed the lift service company should be informed, provided it does not delay the rescue.

**Use of the landing door release key.** This procedure is hazardous and should *only* be undertaken by trained persons.

- at the landing the rescuers should ask all persons on the landing area to stand at least 3 metres away from the landing doors. The only persons by the landing doors should then be the rescuers;
- one rescuer should insert the release key in the aperture in the door and turn the key to operate the mechanical lock. At the same time push the landing doors in the opening direction. This should cause the landing doors to move;
- first only open the landing doors no more than 100mm (about fist size);
- check to see if the lift car interior can be seen through the opening. If necessary use a torch;



- if the car floor is seen to be substantially level, i.e. within 200mm of the landing floor level, then fully open the landing doors to release the passengers;
- if the lift car interior is visible, but not at the floor level *close* the landing doors fully and check they lock closed. Return to the motor room and lower/raise the lift to bring it substantially level;
- if the lift car interior cannot be seen at all, do not open the landing doors any further. Being careful to maintain your balance on the landing floor shine the torch up the hoistway to locate the lift car. If you can see where it is, close the landing doors, check they are locked, return to the machine room and continue to lower the lift.

## Appendix G: Typical instructions for the safe release of passengers trapped in an hydraulic lift

**Note:** There may be manufacturer's instructions & pictograms, which may also be consulted.

### **Do not attempt to move the lift in any other fashion**

The release is to be carried out by *trained and authorised persons* only. No other persons should attempt it.

### **To carry out the procedure safely:**

**One** trained and authorised person (referred to as the rescuer) are required

- 1) locate the nearest landing to the lift car and speak to the occupants from that landing and advise:
  - a) that they are not in any danger;
  - b) they will be released as soon as possible;
  - c) they should not attempt to leave the lift until instructed to do so;
  - d) that the lift will move shortly;
- 2) ask the occupants to stand away from the doors. Leave someone who does not need to be trained and authorised on the nearest landing to the car to continue to talk to and reassure the passengers. It is advantageous to be able to communicate with this person;
- 3) the rescuer should enter the machine room equipped with an electric torch (if necessary) and identify the **main isolator** and **Turn it off**;
- 4) observe the reading on the pressure gauge and note its value;
- 5) locate the landing position indicator on the side of the control cabinet. It lights when the lift is at a floor;
- 6) locate the hand lowering actuator. It is a push-button;
- 7) operate the hand lowering actuator. Observe the pressure gauge and the landing position indicator;

**Warning:** If the gauge drops to zero, release the actuator and see instructions overleaf.

- 8) provided positive pressure remains, continue to operate the actuator, until the landing position indicator lights up. The actuator should then be quickly released. The lift should have reached the lowest floor level;
- 9) go to the lift and open the lower landing doors by using the landing door release key (see instructions overleaf);
- 10) close all landing doors and check that they are locked shut. Call out the lift service company to rectify the fault;

## Do not switch the lift back on.

**Note:** If the lift cannot be moved at all, STOP OPERATIONS and call out the lift service company and/or Fire Brigade.

**Use of the landing door release key** This procedure has many potential hazards and should **only** be undertaken by trained persons.

- a) at the landing, where the lift is stopped the rescuer should ask all persons on the landing area to stand at least 3 metres away from the landing doors. The only person by the landing doors should then be the rescuer;
- b) the rescuer should insert the release key in the aperture in the door and turn the key to operate the mechanical lock. At the same time pull the landing doors in the opening direction (to the right) using the puller. This should cause the landing doors to move;
- c) open the landing doors no more than 100mm (about fist size);
- d) check to see if the lift car interior can be seen through the opening. If necessary use a torch;
- e) if the car floor is substantially level, i.e.: within 200mm of landing floor level, then fully open the landing doors to release the passengers;
- f) if the lift car interior is visible, but above the floor level, CLOSE the landing doors fully and check they are locked closed. Return to the motor room and lower the lift to bring it substantially level;
- g) if the lift car interior cannot be seen at all, **do not open the landing doors any further**. Being careful to maintain your balance on the landing floor shine the torch up the hoistway to locate the lift car. If you can see where it is, close the landing doors, check they are locked, return to the machine room and continue to lower the lift.

## In the case of zero pressure

This is an unusual occurrence and can be caused by a number of reasons. It may be possible to rectify it. Fit the hand pump lever, apply full strokes of the lever observing the pressure gauge, until it reads the value noted in 4) and then continue from 6) above. If after 50 full strokes no pressure is indicated *stop operations* and call out the lift service company and Fire Brigade for release.

## Appendix H: Typical instructions for the safe release of passengers trapped in a machine-room-less electric traction lift

### Do not attempt to move the lift in any other fashion

The release is to be carried out by **trained and authorised persons** only.

**No** other persons should attempt it.

### To carry out the procedure safely:

**One** trained and authorised person (the **rescuer**) and another person (the **safety monitor**) are required

- 1) locate the nearest landing to the lift car and speak to the occupants from that landing and advise
  - a) that they are not in any danger;
  - b) they will be released as soon as possible;
  - c) they should not attempt to leave the lift until instructed to do so;
  - d) that the lift will move shortly;
- 2) ask the occupants to confirm the car doors are closed and ask them to stand away from the car doors. Leave the **safety monitor** (who does not need to be trained and authorised) on the nearest landing to the car to continue to talk to and reassure the passengers. It is advantageous to be able to communicate with this person;
- 3) **Check** all landing doors are closed. The rescuer should go to the top landing, with an electric torch if necessary;
- 4) **Open** the control cabinet, situated in the left or right hand landing door architrave, with the panel key. Locate the **Main switch (Isolator)** at the very bottom of the cabinet and **turn it off**;
- 5) locate the brake release lever painted red at the top of the cabinet;
- 6) locate the **speed** LEDs, half way down the control panel. They are marked "Speed". Note they indicate up and down speeds;
- 7) locate the **door zone indicator** to the side of the *Speed* lights. They are marked "*Door zone indicator*";
- 8) observe the *Speed* LEDs and push the red handle of the brake lever against its spring to the left to release it from its lock. Pull the brake lever slowly down. When resistance is felt the lift should start to move in one direction. Put the brake back on to avoid high speed;
- 9) open and close the brake for no more than one second **always** observing the speed. **Stop** when the *Door zone indicator* illuminates as the lift is at a floor. This may take time – be patient;

- 10) the rescuer should then push the brake lever into its locked position, close and lock the panel door of control cabinet and go to the landing floor;
- 11) the rescuer should open the landing doors using the door release key (see instructions below);
- 12) **close** all landing doors and check that they are locked shut. **Do not switch the lift back on.** Wait for the lift service company to rectify the fault.

**Notes:** Once an entrapment has been confirmed the lift service company should be informed, provided it does not delay the rescue. If the lift cannot be moved at all, **stop operations** and wait for the lift service company or if urgent call the Fire Service.

If the lift has travelled above the top floor it may not be possible to rescue the passengers. Wait for the lift service company or if urgent call the Fire Service.

### Use of the landing door release key

This procedure has many potential hazards and should **not** be undertaken except by trained persons.

- a) at the landing the rescuer should ask all persons on the landing area to stand at least 3 metres away from the landing doors. The only person by the landing doors should then be the rescuer;
- b) a rescuer should insert the release key in the aperture in the door and turn the key to operate the mechanical lock. At the same time push the landing doors in the opening direction. This should cause the landing doors to move;
- c) open the landing doors no more than 100mm (about fist size);
- d) check to see if the lift car interior can be seen through the opening. If necessary use a torch;
- e) if the car floor is substantially level, i.e.: within 200mm of landing floor level, then fully open the landing doors to release the passengers;
- f) if the lift car interior is visible, but above the floor level and close the landing doors fully and check they lock closed. Return to the motor room and lower/raise the lift to bring it substantially level;
- g) if the lift car interior cannot be seen at all, do not open the landing doors any further. Being careful to maintain your balance on the landing floor shine the torch up the hoistway to locate the lift car. If you can see where it is, close the landing doors, check they are locked, return to the machine room and continue to lower the lift.

## Appendix J: Guidance in the provision of escalators

---

### Introduction

The principal means of vertical transportation in healthcare buildings is lifts. However, the use of escalators in the entrance/reception areas of the larger hospitals is increasing. Escalators have been in public use since the turn of the century and, unlike lifts, provide an immediate facility to persons wishing to move between adjacent floors. This can make them particularly appropriate to the two-/three-storey parts of healthcare buildings with large footprints.

This Appendix provides a very brief introduction to the use of escalators in healthcare buildings. Where they are considered for installation, specialist advice should be sought.

### Regulations

Escalator and passenger conveyors are machines under the Machinery Directive enacted as the Supply of Machinery (Safety) Regulations 2008, and as such the CE-marking is carried out by the supplier by compliance with a harmonised standard or with an EC-type examination certificate obtained for model equipment from a notified body.

They should be installed to the harmonised standard BS EN 115-1 and bear CE-marking.

Existing installations may have been installed under BS EN 115-1 or BS5656. Their selection and location should follow the recommendations of BS5656-2. They should be tested at installation to BS5656-1.

*Loler* does not apply to escalators, and there is no equivalent document requiring any thorough examinations to be carried out. However, the provisions of the Health and Safety at Work etc Act and associated legislation apply.

All work carried out on them should follow the recommendations of BS7801.

### Selection

Escalators are installed into a structural opening provided in the building, and occupy a significant horizontal footprint.

Escalators are unsuitable for the conveyance of wheelchairs, prams, pushchairs, shopping/baggage trolleys etc, as the risks are considered to be too high.

Escalators are factory-built equipment, and their characteristics can be closely defined. For healthcare buildings a suitable rated speed is 0.5 m/s at 30 degrees. The step size should be 1,000mm wide. This will allow persons who require assistance to have a helper to accompany them.

According to BS5656-2 there are four duty categories. The most likely category for healthcare buildings is Medium, which can serve up to 10,000 passengers/day.

Care should be taken in assessing the demand, in order to make an appropriate selection to meet the needs of a specific location. When deciding the duty category, account should be taken of:

- the peak demands that might be made on the equipment;
- the number of passengers using the escalator per day.

## Specifying the equipment

Although an escalator is factory-built equipment, there is a large amount of information that needs to be exchanged. General guidance is given in BS5656-2 on the procedure and overall chronological sequence to be adopted in obtaining an installation that is satisfactory from the aspects of operation, safety and maintenance.

BS5656-2 is a code of practice and also provides guidance on the exchange of information between the purchaser and the escalator/passenger conveyor supplier. A series of checklists for the various tender documents is given in BS5656-2 detailing the initial exchange of information prior to and at the time of the tender, and the contract inclusions and exclusions.

Specialist advice should be sought at the design stage, where unusual environments are likely to be encountered, for example:

- hosing-down for hygiene or decontamination (infection control);
- the need for quiet operation;
- vandal-prone installations.

The installation of equipment in these environments will increase the cost owing to the complications involved.

It should be borne in mind that the design, installation and maintenance of escalators is always subject to risk assessments being carried out, and their installation will be subject to the Construction (Design and Management) Regulations 2007.

## Location

Care must be taken to ensure that the alighting (landing) areas are not obstructed either by fixed furnishings or by alighted passengers whose departure from the alighting area is prevented because it is too small. Particular care should be taken not to obstruct the unrestricted area according to BS EN 115-1.



## Aesthetic design

Escalators are not enclosed like lifts, and most of the equipment is in the view of the public. They offer considerable scope to the designer by the imaginative use of glass, cladding and polished metal finishes. Careful design of the lighting may also enhance the appearance. However, consideration must also be given to the following:

- where glass balustrades are installed close to a wall, rubbish will collect in the space between the wall and the balustrade. This will be difficult and expensive to remove;
- stainless steel does not suffer damage by scratching from shoes, luggage etc and is therefore an appropriate material for intensive-duty applications;
- designs which create voids at the sides of the equipment or gaps between equipment should be avoided, as these present a risk of falling or entrapment to users.

## Safe use of escalators

The following are some of the safety features that should be included to assist passengers in their safe use of modern escalators:

- yellow lines on steps: the border of the step is painted with a yellow line. This enables visually-impaired passengers to see the step border and encourages passengers to keep their feet away from the step sides;
- brush guards: installed above the edges at the sides of the step, and fixed to the skirting. They are effective in reducing passenger entrapments.

**Note:** Brush guards are mandatory for BS EN 115-1 and should be retrofitted to any existing escalators where missing.

- yellow spots on handrails and coloured handrails. This helps visually-impaired passengers see the moving handrail;
- adequate permanent lighting at the landings of at least 100 Lux.
- safety signs and warning notices to BS5656-2;
- guards: end barrier, intersection, outer decking etc;
- the angle of inclination of balustrade panels should be greater than 25 degrees, and preferably greater than 27 degrees, to discourage children from climbing on the panels;
- any guard rails connecting to the escalator/passenger conveyor should be a similar height to the handrail height of the equipment;
- escalators are unsuitable for use as fixed stairs, and should not form part of an emergency exit route.

An assumption has been made that persons using the escalators are able to do so unaided. However, they are also likely to be used by persons with a range of disabilities. It is important that the healthcare building reception staff indicate the



location of nearby lifts to any such persons. Appropriate prominent signage indicating where lifts are located in relation to escalators will also provide assistance.

BS5656-2 gives specific recommendations and guidance intended to assist persons with disabilities. These recommendations can also improve the level of safety of other users and improve circulation efficiency.

## Electrical supply and electromagnetic compatibility

The supplier should provide details of the full load current, starting current, its duration, the maximum permissible voltage drop etc in order to enable the size of the main supply cable to be determined. The electrical installation should conform in all respects to the IEE Wiring Regulations (BS7671). The main supply from the intake room should be separate from other building services.

A temporary electricity supply may be required during installation, and its characteristics should be the same as the permanent supply. BS5656-2 gives further details.

The electrical installations should be in accordance with BS EN 12015 and BS EN 12016 to ensure electromagnetic compatibility.

## Noise

The location of escalators should be such as to cause minimum noise disturbance, although no equipment can be totally silent or vibration-free in operation. The design of the building is significant in noise and vibration reduction. If there is any doubt about the equipment, a similar installation should be checked. Specialist advice may need to be sought.

## Fire protection

Fire protection systems, such as smoke detectors, sprinklers and shutters, may be required by the relevant fire authority. Fire shutters are provided by specialist subcontractors. When such devices are installed it is necessary for the escalator to include control interfaces to ensure their correct and safe operation.

## Installing equipment

Generally an escalator is delivered and installed as a single unit. This allows for maximum pre-assembly and testing at the factory, including running-in, and will ensure rapid and efficient installation on site. A typical one-piece escalator unit may be more than 16m long, 1.6m wide and 3m high, and weigh up to 9,000kg. Thus careful planning is essential if costly installation difficulties are to be avoided. Therefore, consideration must be given to the following:

- a clear straight access route;
- police approval will be needed if unloading is to be carried out on a public highway;

- consideration must be given to permitted floor loadings along the access route;
- suitable hoisting points must be provided.

Early planning is essential, particularly in the case of installations in existing buildings.

## Energy usage

Manufacturers can provide figures for the energy consumed by an escalator. The type of operating control employed has an effect on energy usage. Slow-speed operation/auto-start control should be provided on all escalators installed in healthcare buildings. The escalator is available for use and automatically starts operating as a result of passenger demand. After a period of no passenger flow, the equipment stops automatically.

The starting is initiated by the use of a passenger detection system such as pressure mats, photocells or passive infrared beams.

This type of operation would be suitable for locations where there are long periods of time when there is no passenger demand.

## Appendix K: Guidance in the provision of lifting platforms and platform (wheelchair) stair lifts

### Introduction

The principal means of vertical transportation in healthcare buildings is lifts. However, there may be circumstances where for economic or practical reasons a conventional lift as described in this guidance may not be appropriate (see section 4.2.7 of Building (Scotland) Regulations 2004, Non-domestic Technical Handbook 2010).

This Appendix provides a very brief introduction to the provision of lifting platforms and wheelchair platform stairlifts in healthcare buildings. Where they are considered for installation, specialist advice should always be sought. Stairlifts for standing and seated persons should not be considered for installation in healthcare buildings.

### Regulations

Lifting platforms and wheelchair platform stairlifts are machines under the Machinery Directive enacted as the Supply of Machinery (Safety) Regulations 2008, and as such the CE-marking is carried out by the supplier by compliance with a harmonised standard or with an EC-type examination certificate obtained for model equipment from a notified body.

- lifting platforms travelling in enclosed liftways should be installed to prEN 81-41;
- lifting platforms with no or partial enclosures should be installed to BS6440;
- wheelchair platform stairlifts should be installed to the harmonised standard BS EN 81-40;
- all lifting platforms and wheelchair platform stairlifts should be tested after installation and a test certificate provided;
- thorough examinations of all lifting platforms and wheelchair platform stairlifts should be periodically carried out under *Loler*.

### Selection of lifting platforms

Lifting platforms can be used for conveying persons with reduced mobility, wheelchairs, prams and pushchairs.

The selection and location of lifting platforms should follow the recommendations in Building (Scotland) Regulations, Non-domestic Technical Handbook.

Lifting platforms are installed into a structural opening provided in the building, which generally requires no special structural considerations.

Lifting platforms are factory-built, and their characteristics are closely defined (for example their maximum rated speed is 0.15 m/s).

Several platform sizes are available to suit different requirements.

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

- the peak demands that might be made on the equipment;
- the number of passengers using the lifting platform per day.

## Selection of wheelchair platform stairlifts

Wheelchair platform stairlifts are used to transport wheelchair users from one level to another. Their provision in healthcare buildings is likely to be rare and needs to be fully justified over the provision of a conventional lift or a lifting platform.

The selection and location of wheelchair platform stairlifts should follow the recommendations in the Non-domestic Technical Handbook of the Building (Scotland) Regulations 2004.

Wheelchair platform stairlifts are attached to the building structure in a stairwell. Care should be taken to ensure structural integrity of the installation, and specialist advice should be sought.

It is important that the installation does not obstruct the normal and emergency use of the stair.

The rated load should be calculated at not less than 250 kg/m<sup>2</sup> of the clear loading area, with minimum values for a lone user in:

- a type A or B manual wheelchair as 150 kg;
- a type A powered wheelchair as 225 kg; and
- a type B powered wheelchair as 250 kg.

## Specifying the equipment

Specialist advice should be sought at the design stage, where unusual environments are likely to be encountered, for example:

- hosing-down for hygiene or decontamination (infection control);
- the need for quiet operation;
- vandal-prone installations.

Risk assessments should always be carried out before designing, installing and maintaining lifting platforms and wheelchair platform stairlifts. Their installation may also be subject to the Construction (Design and Management) Regulations 2007.

## Location

Care must be taken to ensure that the alighting (landing) areas are not obstructed.

## Electrical supply and electromagnetic compatibility

The supplier should provide details of the full load current, starting current etc, in order to enable the size of the supply to be determined. The electrical supply generally requires no special consideration and can usually be taken from an adjacent 13 A supply outlet.

The electrical installation should conform in all respects to the IEE Wiring Regulations (BS7671).

The electrical installation should be in accordance with BS EN 12015 and BS EN 12016 to ensure electromagnetic compatibility.

## Noise

The location of lifting platforms and wheelchair platform stairlifts should be such as to cause minimum noise disturbance. If there is any doubt about the equipment, a similar installation should be checked. Specialist advice may need to be sought.

## Fire protection

Fire protection systems may be required by the relevant fire authority.

## Installing equipment

Generally, lifting platforms and stairlifts are delivered to site as complete or partially-built units. They do not normally present any difficulties in their installation.

To avoid any disruption, early planning is essential, particularly in the case of installations in existing buildings.

## References

---

### European directives

**Council Directive 89/655/EEC of 30 November 1989 concerning the minimum safety and health requirements for the use of work equipment by workers at work (second individual Directive within the meaning of Article 16 (1) of Directive 89/391/EEC).** Official Journal. L. 393. 30/12/1989. pp. 13–17. <http://eur-lex.europa.eu/LexUriServ/LexUriServ.do?uri=CELEX:31989L0655:EN:HTML>

**Council Directive 95/63/EC of 5 December 1995 amending Directive 89/655/EEC concerning the minimum safety and health requirements for the use of work equipment by workers at work (second individual Directive within the meaning of Article 16 (1) of Directive 89/391/EEC).** Official Journal. L 335. 30/12/1995. pp. 28–36. <http://eur-lex.europa.eu/LexUriServ/LexUriServ.do?uri=CELEX:31995L0063:EN:HTML>

**Directive 2006/42/EC of the European Parliament and of the Council of 17 May 2006 on machinery, and amending Directive 95/16/EC (recast) (Text with EEA relevance).** Official Journal. L 157. 09/06/2006. pp. 24–86. <http://eur-lex.europa.eu/LexUriServ/LexUriServ.do?uri=OJ:L:2006:157:0024:01:EN:HTML>

**European Parliament and Council Directive 95/16/EC of 29 June 1995 on the approximation of the laws of the Member States relating to lifts.** Official Journal. L 213. 07/09/1995. pp. 1–31. <http://eur-lex.europa.eu/LexUriServ/LexUriServ.do?uri=CELEX:31995L0016:EN:HTML>

### Acts and Regulations

NB: Access to information related to the following Acts and Regulations can be gained via [www.legislation.gov.uk](http://www.legislation.gov.uk).

**Building (Scotland) Regulations 2004:** Non-domestic Technical Handbook 2010. The Scottish Government.

**Construction (Design and Management) Regulations 2007.** SI 2007 No. 320. HMSO, 2007.

**Control of Substances Hazardous to Health Regulations (COSHH) 2002.** SI 2002 No 2677. HMSO, 2002.

**Disability Discrimination Act 2005.**

**Electricity Act 1989.** HMSO, 1989.

**Electricity at Work Regulations 1989.** SI 1989 No 635. HMSO, 1989.

**Electromagnetic Compatibility Regulations 2005.** SI 2005 No 281. HMSO, 2005.

**Health and Safety at Work etc Act 1974.** HMSO, 1974.

**Lifting Operations and Lifting Equipment Regulations 1998.** SI 1998 No. 2307. HMSO, 1998.

**Lifts Regulations 1997.** SI 1997 No. 831. HMSO, 1997.

**Management of Health and Safety at Work Regulations 1999.** SI 1999 No. 3242. HMSO, 1999.

**Personal Protective Equipment Regulations 2002.** SI 2002 No. 1144. HMSO, 2002.

**Pressure Equipment Regulations 1999.** SI 1999 No. 2001. HMSO, 1999.

**Provision and Use of Work Equipment Regulations 1998.** SI 1998 No. 2306. HMSO, 1998.

**Supply of Machinery (Safety) Regulations 2008.** SI 2008 No. 1597. HMSO, 2008.

**Workplace (Health, Safety and Welfare) Regulations 1992.** SI 1992 No.3004. HMSO, 1992.

## British European and ISO standards

**BS5266-1: 2005.** Emergency lighting. Code of practice for the emergency lighting of premises. British Standards Institution, 2005.

**BS5655-6: 2002.** Lifts and service lifts. Code of practice for the selection and installation of new lifts. British Standards Institution, 2002.

**BS5655-11: 2005.** Lifts and service lifts. Code of practice for the undertaking of modifications to existing electric lifts. British Standards Institution, 2005.

**BS5655-12: 2005.** Lifts and service lifts. Code of practice for the undertaking of modifications to existing hydraulic lifts. British Standards Institution, 2005.

**BS5656-1: 1997.** Safety rules for the construction and installation of escalators and passenger conveyors. Specification and proformas for test and examination of new installations. British Standards Institution, 1997.

**BS5656-2: 2004.** Escalator and moving walks. Safety rules for the construction and installation of escalators and moving walks. Code of practice for the selection, installation and location of new escalators and moving walks. British Standards Institution, 2004.

**BS5839-1: 2002+A2: 2008.** Fire detection and fire alarm systems for buildings. Code of practice for system design, installation, commissioning and maintenance. British Standards Institution, 2008.

**BS6440: 1999.** Powered lifting platforms for use by disabled persons. Code of practice. British Standards Institution, 1999.



**BS7255: 2001.** Code of practice for safe working on lifts. British Standards Institution, 2001.

**BS7671: 2008.** Requirements for electrical installations. IEE Wiring Regulations. Seventeenth edition. British Standards Institution, 2008.

**BS7801: 2004.** Escalators and moving walks. Code of practice for safe working on escalators and moving walks. British Standards Institution, 2004.

**BS8300: 2009.** Design of buildings and their approaches to meet the needs of disabled people. Code of practice. British Standards Institution, 2009.

**BS8486-1: 2007.** Examination and test of new lifts before putting into service. Specification for means of determining compliance with BS EN 81. Electric lifts. British Standards Institution, 2007.

**BS8486-2: 2007.** Examination and test of new lifts before putting into service. Specification for means of determining compliance with BS EN 81. Hydraulic lifts. British Standards Institution, 2007.

**BS9999: 2008.** Code of practice for fire safety in the design, management and use of buildings. British Standards Institution, 2008.

**BS EN 115-1: 2008.** Safety of escalators and moving walks. Construction and installation. British Standards Institution, 2008.

**BS EN 12015: 2004.** Electromagnetic compatibility. Product family standard for lifts, escalators and moving walks. Emission. British Standards Institution, 2004.

**BS EN 12016: 2004+A1: 2008.** Electromagnetic compatibility. Product family standard for lifts, escalators and moving walks. Immunity. British Standards Institution, 2008.

**BS EN 12183: 1999.** Manually propelled wheelchairs. Requirements and test methods. British Standards Institution, 1999.

**BS EN 12184: 1999.** Electrically powered wheelchairs, scooters and their chargers. Requirements and test methods. British Standards Institution, 1999.

**BS EN 13015: 2001+A1: 2008.** Maintenance for lifts and escalators. Rules for maintenance instructions. British Standards Institution, 2008.

**BS EN 61009-1: 2004.** Residual current operated circuit-breakers with integral overcurrent protection for household and similar uses (RCBOs). General rules. British Standards Institution, 2004.

**BS EN 62305: 2006.** Protection against lightning. British Standards Institution, 2006.

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



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

**BS EN 81-3: 2000+A1: 2008.** Safety rules for the construction and installation of lifts. Electric and hydraulic service lifts. British Standards Institution, 2008.

**BS EN 81-28: 2003.** Safety rules for the construction and installation of lifts. Remote alarm on passenger and goods passenger lifts. British Standards Institution, 2003.

**BS EN 81-40: 2008.** Safety rules for the construction and installation of lifts. Special lifts for the transport of persons and goods. Stairlifts and inclined lifting platforms intended for persons with impaired mobility. British Standards Institution, 2008.

**BS EN 81-58: 2003.** Safety rules for the construction and installation of lifts. Examination and tests. Landing doors fire resistance test. British Standards Institution, 2003.

**BS EN 81-70: 2003.** Safety rules for the construction and installation of lifts. Particular applications for passenger and goods passenger lifts. Accessibility to lifts for persons including persons with disability. British Standards Institution, 2003.

**BS EN 81-71: 2005.** Safety rules for the construction and installation of lifts. Particular applications to passenger lifts and goods passenger lifts. Vandal resistant lifts. British Standards Institution, 2005.

**BS EN 81-72: 2003.** Safety rules for the construction and installation of lifts. Particular applications for passenger and goods passenger lifts. Fire-fighters lift. British Standards Institution, 2003.

**BS EN 81-73: 2005.** Safety rules for the construction and installation of lifts. Particular applications for passenger and goods passenger lifts. Behaviour of lifts in the event of fire. British Standards Institution, 2005.

**BS EN 81-80: 2003.** Safety rules for the construction and installation of lifts. Existing lifts. Rules for the improvement of safety of existing passenger and goods passenger lifts. British Standards Institution, 2003.

**BS EN ISO 9000-1: 1994.** Quality management and quality assurance standards. Guidelines for selection and use. British Standards Institution, 1994.

**BS ISO 4190-2: 2001.** Lift (US: Elevator) installation. Class IV lifts. British Standards Institution, 2001.

**BS ISO 4190-1: 1999.** Lift (US: Elevator) installation. Class I, II, III and VI lifts. British Standards Institution, 1999.

**BS ISO 4190-5: 2006.** Lift (elevator) installation. Control devices, signals and additional fittings. British Standards Institution, 2006.

**DD 265: 2008.** Protocol for communications between a lift alarm system and an alarm receiving station (rescue centre). Specification. British Standards Institution, 2008.

**ISO/DIS 25745-1: 2008.** Energy performance of lifts and escalators. Energy measurement and conformance. International Organization for Standardization, 2008. British Standards Institution, 2008.

## Draft standards

**prEN 81-31.** Safety rules for the construction and installation of lifts. Lifts for the transport of goods only. Accessible goods only lifts.

**prEN 81-41.** Safety rules for the construction and installation of lifts. Special lifts for the transport of persons and goods. Vertical lifting platforms intended for use by persons with impaired mobility.

**prCEN/TS 81-76.** Safety rules for the construction and installation of lifts. Particular applications for passenger and goods passenger lifts. Use of lifts for the evacuation of disabled persons from building in the event of emergency.

## Department of Health codes of practice/guidance

**(The) Health and Social Care Act 2008: Code of Practice for health and adult social care on the prevention and control of infections and related guidance.** 2009.

[www.dh.gov.uk/en/Publicationsandstatistics/Publications/PublicationsPolicyAndGuidance/DH\\_110288](http://www.dh.gov.uk/en/Publicationsandstatistics/Publications/PublicationsPolicyAndGuidance/DH_110288)

**Health Building Note 00-04: Circulation and communication spaces.** The Stationery Office, 2007.

## Health Facilities Scotland Publications

**Scottish Health Technical Memorandum 00: Policies & Principles,** 2010

**Scottish Health Technical Memorandum 02-01: Medical gas pipeline systems,** 2012

**Scottish Health Technical Memorandum 81-87: Firecode series.**

**Scottish Health Technical Memorandum 06-01: Electrical services supply & distribution,** 2011

**Scottish Health Technical Memorandum 06-02: Electrical safety guidance for low voltage systems,** 2013

**Scottish Health Technical Memorandum 06-03: Electrical safety guidance for high voltage systems,** 2011

**Scottish Health Technical Memorandum 07-02: Encode,** 2006

## Scottish Health Technical Memorandum 08-01: Acoustics, 2011

### Health and Safety Executive codes of practice/guidance

**INDG339: Thorough examination and testing of lifts: simple guidance for lift owners.** HSE Books, 2008.

**Safe use of lifting equipment: Lifting Operations and Lifting Equipment Regulations 1998: Approved Code of Practice and guidance L113.** HSE Books, 1998.

### Other publications

Building Research Establishment (BRE). **BREEAM Healthcare Assessor Manual, 2008.** BRE, Garston, 2008.

Chartered Institution of Building Services Engineers (CIBSE). **Guide D: Transportation systems in buildings.** CIBSE, 2005.

Chartered Institution of Building Services Engineers (CIBSE). **Lighting guide LG2: Hospitals and health care buildings.** CIBSE, 2008.