THE UNIVERSITY of EDINBURGH
Estates Department

Estates Design Guideline No. 7

Lift Engineering Installation Design

Important Comment on Estates Design Guidelines, Assets & Standards

These Design Guidelines, Assets and Standards and the associated suite of documents have been produced in order to furnish external design consultants and contractors with guidance on required University standards for inclusion within their proposed project design.

These guidelines are to be used as supplementary information during project design stage, and as such, detail the minimum standards expected from the University Estates Department.

Please note, these guidelines do not absolve the project design team including, sub-consultants and sub-contractors of their legal and contractual obligations under, design liability, statutory regulations and health and safety legislation.

EDG No. 7 - Lift Engineering Installation - Approval Procedure	
Estates Design Guidelines (Assets & Standards) No. 7 Lift Engineering Installation Lead: Lift Engineers	Name Signed Off Date
Estates Design Guidelines (Assets & Standards) No. 7 Lift Engineering Installation – equality check Lead: Building Services Group Manager	Name Signed Off Date
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1.0 Introduction

The UoE Design Guidelines (as a whole), have been developed for employees of the UoE, Design Teams, Architects, Engineers, Project Managers, external consultants and contractors. This documentation has been developed to enable Design Teams and Contractors to have a broad understanding of the principles that the University of Edinburgh will require to be adopted for any future developments.

The guide is primarily designed to be used in conjunction with Royal Institute of British Architects (RIBA) stages. The actual extent and scope of the design guide to be incorporated for any future development will be based upon the specific project requirements.

The UoE Design Guidelines aim to discuss strategic matters and does not provide an exhaustive treatment of statutory or best practice design and compliance requirements; its primary purpose is to establish a starting point for design briefs, support the consultation process and outline existing assets and standards. It is the responsibility of Design Team readers/duty holders to ensure subsequent designs are complete, compliant and able to meet the final approved brief when measured in use.

1.1 Important Notice – Essential Prior Reading

It is essential for readers of this document to first refer to Design Guideline No.1 entitled *"Estates Design Guidelines (Assets & Standards) Introduction and Application"*, which serves to provide the principles and overview with vital information and context that will apply to all projects.

1.2 Purpose of the University of Edinburgh Estates Design Guidelines (Assets and Standards) – UoE Design Guidelines

The purpose of the Estates Guidelines is to act as a briefing document to give designers an overview of the minimum design requirements, constraints and challenges presented by the University of Edinburgh's particular needs. It applies to all new-build, refurbishment, minor works and change of use projects, including property leased by the University, controlling quality in the production of designs, specifications and the subsequent performance of buildings, developed to a consistently high standard and ensuring continuity throughout the University Estate.

The University of Edinburgh encourages innovation; however, all project Design Teams should ensure that their proposed projects have end user considerations and ease of maintenance at its core.

The use of the University of Edinburgh Estates Guidelines, Assets and Standards will not take the place of, or remove, any of the professional responsibility from Design Teams and Contractors to fully comply with the requirements within this document. Given the complex, diverse and growing estate, not all eventualities can be fully defined within this document.

Should any projects deviate from these guidelines, a technical submittal outlining the deviation, reason why and impact to the University maintenance strategy should be prepared and forwarded to the nominated University project representative for liaison with the Building Services Group (BSG).

A review of this deviation shall be carried out by the BSG; a final decision on the deviation shall be communicated to the appropriate design/construction team.

1.3 Interpretation of UoE Estates Design Guidelines, Assets and Standards

The Estates Design Guidelines, Assets and Standards are required to be issued with all project contractual documentation in order to inform project design and construction teams of expected standards to ensure quality continuity across its Estate.

Glossary of Terms:

1.3.1 Enforced Requirements

The use of the word(s) ‘shall’, ‘are required’, ‘is required’ ‘must’ or ‘will’ denotes a requirement that is non- negotiable and shall be used as the basis for designs, technical submissions and/or activities. If such a statement conflicts with a statutory obligation then a technical submittal shall be issued to the University project representative for liaison with the BSG for their final decision regarding compliance with the documentation.

1.3.2 Requirements Needing Confirmation

The use of the word ‘may’ denotes a negotiable requirement or indication of a solution, where innovation and further calculation, design and discussion may be required to arrive at an optimised solution.

1.3.3 Quality

The Design Guide aims to arrive at the University of Edinburgh’s highest design aspirations and standards. It may be that, at the University of Edinburgh’s sole discretion, solutions are value managed and then value engineered during subsequent design iterations. Design Teams and Contractors are encouraged to consider where value management and subsequent value engineering may result in an improved financial performance should funding constraints occur. All mechanical and electrical value management and value engineering exercises carried out shall be forwarded to the BSG for review.

1.3.4 Assets and standards

The Design Guidelines endeavours to set out Assets and Standards that will maximise the benefits realisation for the UoE to achieve its strategic objectives and maximise value for money. This will involve coordinated and optimised planning in conjunction with Procurement, robust asset selection with particular reference to existing legacy assets and standards on the University Estate, for reasons of utilisation and continuity of maintenance, replacement of parts, renewal and ultimate disposal

1.3.5 Currency of Third Party Documents

Where superseded standards and regulatory documents are referred to in the text, the reader shall apply current revisions and amendments to their project. Should there be any ambiguity, the BSG should be contacted for clarity.

1.3.6 Proof

Where the word ‘proof’ is used, e.g. ‘proof is required’, a written report or installation certificate must be produced for approval depending on context.

1.4 Review Design Data Process (RDD)

All proposed designs shall be submitted to the Project Manager and respect Estates Teams and Building Services Group for review and comments, the response will be categorised as follows:

A. Design Team to acknowledge comments and continue to develop the design to the next stage.

B. Design Team to acknowledge comments and update the design in accordance with comments and resubmit for consideration before proceeding to the next stage.

C. Design Team to acknowledge comments and completely review and update the design in accordance to the agreed design principles and resubmit for consideration before proceeding to the next stage.

In addition to the above, the UoE may request specific technical submission to support the RDD and may include the request setting out with proof, e.g. calculations, drawings, etc.

The purpose of the RDD is to ensure designs meet the strategic requirements of the UoE and do not compromise the future operations and maintenance provision. The obligations owed by external architects, consultants and contractors to UoE and their liabilities to UoE is not in any way diminished or otherwise reduced by the RDD.

1.5 The Obligations Owed

By external Design Teams, consultants and contractors to University of Edinburgh and their liabilities to University of Edinburgh is not in any way diminished or otherwise reduced by the approval process. University of Edinburgh is not taking over the roles and duties of the external Design Teams, consultants and contractors who will remain legally responsible for the design and/or works carried out by them or on behalf of their staff, agents, sub- consultants and/or sub-contractors.

1.6 Version Control and Updates

The Estates Design Guidelines, Assets and Standards will be updated annually. The anticipated date of issue being January each calendar year. This is subject to change.

The version number will, using 2018 as an example, move from 2018 V1.0 at the end of January to 2019 V1.0 for the following year. The picture or colour of front cover of each new version will be changed to simplify referencing.

Any new or amended content is highlighted in yellow so readers can easily identify changes from previous versions. If there are no further revisions, a guidance note will accompany the issue.

1.7 Purpose of UoE Design Guideline No. 7

The purpose of this document is to set out the guidelines and standards that apply to University of Edinburgh (hereby referred to as UoE) Estate and its design requirement for Lift Engineering Installations as set out by the UoE Lift Engineering Team and associated Consultants. This document will apply to newly constructed buildings and existing buildings scheduled to be refurbished. In some cases, this standard exceeds the Building Regulation requirements, as it represents good practice in the Higher Education sector.

The Building (Scotland) Regulations set out to ensure that new buildings and works achieve the objectives of the Building (Scotland) Act 2003 in terms of health, safety, welfare, convenience conservation of fuel, power, and sustainable development, and the purpose of this guide will be to provide a standard policy specifying the standard that is required by the UoE.

This UoE Design Guideline No. 7 is for designers, engineers, specifiers, installers and commissioning and maintenance engineers of Lift Engineering Installations for UoE Estates from the Developed Design Stage (RIBA Stage 3) to when the building is in use (RIBA Stage 7).

- To align the requirements of the Technical Standards (Scotland) Regulations / Building Regulations, CIBSE Guide D: Transportation Systems in Buildings 2015. There is potential conflict between these as the Technical Handbook /Building Regulations are generic and often prescriptive whilst the UoE Lift Engineering Team and associated Consultants encourages creative solutions relative to actual use and management

- To provide an indication of non-prescriptive preferred solutions and appropriate standards. The content is not a statement of requirements or intended to replace existing British or European technical standards or national guidance; reference to these will still be necessary.

If due to the nature of the project, certain aspects of Lift Engineering Installations are not covered in these guidelines and standards, the relevant codes of practices, British Standards and building regulations are to be applied and followed. For any general and specific queries, advice is to be obtained from the UoE Lift Engineering Team and associated Consultants. In the event those documents referred to within this document, which have been superseded, then most recent versions are to be referred to.

Any other doubts, concerns or points of clarification on Lift Engineering Installations, please contact the UoE Lift Engineering Team and associated Consultants.

This document applies to all buildings managed or owned by the UoE. Any tenanted buildings must not have building works, adaptions or change any building or part of a building which will affect the Lift Engineering Installations or any other building without first receiving permission from UoE Lift Engineering Team and associated Consultants and the Landlord of the property or nominated agent and written in the respective lease.

This document indicates the University's generic Lift Engineering Installations Client requirements. Consultants must also refer to specific project requirements identified by the University's Project Manager. Consultants and contractors must obtain approval in writing for any variation from these requirements.

During early project RIBA stages and at technical submittal stage, the lift proposal shall be sent to UoE Development Engineer for liaison with UoE Lift Operations Team and incumbent Lift Consultant.

Please note, Main Contractor and associated sub-contractors are not permitted to procure the lift equipment without full consent of UoE Estates Team.

2.0 Legislation and best practice standards for reference

The University will comply with all relevant legislation and regulations relating to the design and structure of the building. Academic, administrative buildings and all residential property are subject to the requirements of the Technical Standards (Scotland) Regulations / Building Regulations, CIBSE Guide D: Transportation Systems in Buildings 2015

These standards allow detailed professional knowledge and judgement to be applied in order to develop a final design solution, which will satisfy projects that are more complicated.

3.0 Design Consultation and Notification Process for Projects

The University Lift Engineering Team shall be consulted on any proposed works to both existing and new lift installations. The Design/Construction Team are required to forward all lift proposals via UoE PM/Development Engineer for liaison with UoE Lift Team and incumbent Lift Consultant.

Any proposed works to an existing building that may/will affect the operational capability of the lift installation, shall be reviewed by UoE Lift Team prior to commencement of any works.

The Design Team shall engage with UoE Estates, via workshops, at an early RIBA stage within the project to discuss the proposed lift operation and maintenance strategy to ensure all requirements and expectations are met.

Early and comprehensive consultation with the UoE Lift Engineering Team and associated Estate stakeholders is key to achieving a cost effective lift installation and operational standards compliant with relevant legislation.

The Design/Construction Team shall engage with the UoE Lift Engineering Team throughout the project via UoE PM/Development Engineer Team.

Procurement of lift equipment without prior agreement of UoE Estates is not permitted. All technical submittals shall be forwarded for review by UoE Estates Operations and incumbent Lift Consultant.

4.0 Lift Engineering Installations

- Any design must, as a matter of statute, be compliant with the Health and Safety at Work etc. Act 1974, ANY relevant secondary legislation and associated Approved Codes of Practice (ACOP's)
- Examples of secondary legislation include the Provision and Use of Work Equipment Regulations 1998 (PUWER) the Workplace (Health, Safety and Welfare) Regulations 1992 the Electrical Safety at Work Regulations 1989 the Control of Major Accident Hazards Regulations 1999 the Confined Spaces Regulations 1997 and the Gas Safety (Installation and Use) Regulations 1998
- Your attention is drawn in particular to the legal duties placed on designers by the Construction (Design and Management) Regulations 2015
- Suitable and sufficient safe access for maintenance and repair must always be provided
- The following CIRIA guides should be used to inform your decisions, Construction work sector guidance for designers (C662) Workplace "in-use" guidance for designers (C663) and Construction work sector guidance for designers (C662D)

The following information is primarily intended to provide guidance to those responsible for the design of lift engineering services within the Estate of the University of Edinburgh. It is not intended to be exhaustive or definitive, and it will be necessary for users of the guidance to exercise their own professional judgement when deciding whether to abide by or depart from it. For this reason also, any departure or exception from the guidance contained in this document should not necessarily be regarded as a departure from best practice and should always have the written approval of the Building Services Group.

5.0 Design Brief

Designers must exercise care in ensuring that all operational requirements of the proposed building are met by careful detailed selection of their vertical transportation scheme. Where the University considers that it has relevant experience for specific installations, these will be detailed elsewhere in the site-specific briefing document.

Designers should:

- Take into consideration the requirements of the specific building design brief.
- Review the traffic patterns in similar University Buildings
- Under UoE ESME - undertake a lift traffic analysis study, including cyclic peak periods and lunch peaks, stating all assumptions made in relation to mass student movement
- Ensure the traffic analysis philosophy extends to flow of persons between buildings and shared facilities over the whole period etc. not solely on a population at a specific snap shot in time
- Ensure mobility impaired access is available to all major areas of the building
- Consider disabled emergency evacuation from the building using the lifts, based on building fire/evacuation strategy and risk profiles
- Review the need for Fire Fighting Lifts where appropriate
- Solicit the specific requirements of proposed University Departments for movement of materials and equipment
- Consider the impact of future changes of use of the building transportation system
- Consider the different applications in different University Buildings, e.g. supervised Schools v unsupervised halls of residences, and specify equipment appropriate to the application
- Include items listed in the Lift Acceptance section 24.

6.0 Design Criteria

The following design criteria are considered appropriate for the majority of new projects. The engineering services shall be designed in accordance with the following:

- The requirements of the Project Brief including Section 24
- The needs of the occupiers/users
- Flexibility in use
- Compliance with an agreed set of technical criteria
- Systems reliability, maintainability and cost in use
- Compliance with applicable Current Codes, Standards and Regulations
- Full Product Support
- Open Protocol Equipment

7.0 Application of Standards

All lifts shall comply with the current issue of EN 81-20, EN 81-50 and EN 81-70 current editions.

All lifts shall be interfaced with the building fire alarm system to EN 81-73 current edition, including an alternative fire evacuation floor where an alternative escape route exists.

Where Firefighting Lifts are required they shall comply with EN 81-72 current edition.

Where Evacuation Lifts are required they shall comply with BS 9999 Appendix G current edition.

Lifts provided in Halls of Residences shall comply with EN 81-71 current edition Category 1 Vandal Resistant requirements, including lighting, lift calling stations and buttons and other fittings.

BS EN 81-70:2018 Safety rules for the construction and installation of lifts - Particular applications for passenger and goods passenger lifts Part 70: Accessibility to lifts for persons including persons with disability.

BS EN 81-71 Safety rules for the construction and installation of lifts - Particular applications to passenger lifts and goods passenger lifts Part 71: Vandal resistant lifts.

8.0 ESME

Whilst the UoE no longer operates BREEAM accreditation, the following credits shall be achieved under the UoE Edinburgh Sustainability Model Evaluator (ESME) for transportation systems in proposed new, refurbished and building lift replacement projects;

The First ESME Credit shall be achieved by:

a) The Design Team shall undertake an analysis of the transportation demand and usage patterns for the building to determine the optimum number and size of lifts (including counter-balancing ratio), and if applicable escalators and/or moving walks. This shall be achieved using a Computer Simulation Programme to review the people handling capabilities of various size, speed, numbers and control algorithms to determine a best value solution which achieves the traffic handling requirements of the proposed building.

b) The energy consumption based upon the traffic analysis shall be estimated by computer simulation for one of the following:

   i. At least two types of system (for each transportation type required) or
   ii. An arrangement of systems (e.g. for lifts, traction geared, traction gearless, MRL) or
   iii. A system strategy which is 'fit for purpose' (scheduling)

   The comparative analysis shall be undertaken for a period of intensive two way traffic over a period of not less than 4 hours, including a lunch period, in order to simulate the energy consumption of the period.

c) The lift/escalator/moving walk system/strategy with the lowest energy consumption is specified.

The Second ESME Credit shall be achieved by:

a) Ensuring that the criterion of the First ESME Point has been achieved

b) For lifts, providing evidence that of the following energy-efficient features, the three that offer the greatest potential energy savings are specified:

   i. The lifts operate in a stand-by condition during off-peak periods. For example the power side of the lift controller and other operating equipment such as lift car lighting, user displays and ventilation fans switch off when the lift has been idle for a prescribed length of time.
   ii. The lift car uses energy-efficient lighting and display lighting i.e. an average lamp efficacy, across all fittings in the car, of > 55 lamp lumens/ circuit watt and lighting switches off after the lift has been idle for a prescribed length of time.
   iii. The lift uses a drive controller capable of variable-speed, variable-voltage, and variable-frequency (VVVF) control of the drive motor.

iv. The lift has a regenerative drive unit so that any energy generated by a traction lift (due to running up loaded to less than the counterbalancing ratio or running down loaded to more than the counter balancing ratio) or by a hydraulic lift (due to running down) is returned back to the electricity utility supplier or used elsewhere in the building.

The Design Team shall present a Schedule of Evidence to the UoE ESME Consultant which shall comprise of:

a) A professional report including a traffic analysis study of transportation solutions for the building including output data from the simulation programme.

b) Details of energy consumption simulations for two selected lift arrangements with a summary statement clearly stating the reasons for the selected system and the energy saving benefit in percentage terms to the alternative assessed arrangement.

c) Relevant sections of the specification demonstrating the selected energy efficient features and evidence of the features in the selected lift contractor's tender documentation.

If it is deemed impractical to pursue an ESME accreditation then the design team shall ensure that all relevant good practice design guides and procedures are followed as far as is reasonably practicable to achieve an energy efficient and sustainable development.

9.0 Environmental Impact

The designer is encouraged to address all the issues relevant to energy efficiency in buildings and promoting sustainability.

Whether designing new buildings or refurbishing existing buildings, designers should adopt an approach which recognises the need to:

- Reduce the demand for energy and materials
- Consider the benefits of regenerative energy sources
- Consider the lift cycle assessment impact of the proposed solutions
- Consider waste management and recycling

In order to identify opportunities to improve contract performance and to minimise the sustainability impact of the University's activities designers should ensure that their design can support these objectives, and obtain a life cycle assessment of the sustainability risks/impacts of products or services as defined by ISO14040 and ISO14044 and capabilities to address these consequences throughout the supply chain.

Assess the energy efficiency classification of lifts offered in response to specifications and score accordingly to a bench mark using VDI 4707 which measures and classifies lifts according to their energy performance. It defines an Energy label and provides a figure for a "yearly nominal energy demand."

The lift works shall provide a reliable, high quality installation, engineered for an economical long term life cycle for a minimum of 20 years, to comply with the requirements of this specification and the following:

- Statutory UK & EC Regulations, Directives and Instruments
- Building Standards (Scotland) Regulations
- Health and Safety Executive Guidance Publications
- HSE Memorandum of Guidance on the Electricity at Work Regulations
- British Standards and Codes of Practice
- (B.S. 7671) 18th Edition of the I.E.E. Wiring Regulations
- The Construction (Design & Management) Regulations 2015
- EN 81-20: current edition and EN 81-50: current edition
- EN 81-70:2018 in relation to Lift Accessibility
- EN 81-71:2018 in relation to Vandal Resistance
- EN 81-72: current edition and 73: current edition in relation to Fire
- CEN TS 81-76:2011 Safety Rules for the construction and installation of Lifts
- EMC Regulations
- The Lift Regulations 1997 as amended by the UK Supply of Machinery (Safety) Regulations 2008.
- Lifts Directive 2014/33/EU

10.0 Concept

For refurbishment or replacement of existing traction lifts the designer shall review the accessibility of personnel and materials to, and from the existing machine room as required under CDM Regulations. Where the machine room is suitably accessible for maintenance personnel, e.g. by stairs rather than vertical ladders or without the need to cross and external roof space, the University preferred solution is to retain machine above traction lifts, however, this should be discussed with the UoE BSG prior to any works taking place.

For existing buildings which do not have safely accessible machine rooms a Machine Room less [MRL] Traction Lift should be considered.

For all 'new build' installations the University **preferred** solution is a Machine Above Traction Lift however a 'cost benefit analysis' shall be produced on each individual case to demonstrate the difference in cost of the structure and for the lift for 'Machine Above Traction Lifts' and 'MRL Traction Lifts' taking into consideration a Life Cycle Assessment application also. The University will be the final arbitrator on the lift solution.

Liaison with the UoE BSG at early design stage is required to discuss and agree lift type to be utilised. Following on from early engagement, lift design progress and contractor technical submittals shall be forwarded for review prior to acceptance and installation of lift equipment.

Hydraulic lifts shall **not** be installed in new buildings as they will not meet the requirements of ESME or the University Energy Efficiency and Environmental Policies.

Existing hydraulic lifts in need of refurbishment shall be assessed in cost and efficiency against replacement with significantly more efficient MRL Traction Lifts.

Where the design team establish that lift service is to operate as an Evacuation Lift the relevant sections of these Guidelines identify applicable requirements.

11.0 Asset Numbers

Unique lift identification/asset numbers of the form “XXXX LIFT YY” where XXXX is the building number and YY is a sequential number for each lift. They shall be provided in the following locations on each lift:

a) Each landing entrance header
b) On the car top and pit control station
c) Adjacent to each pit stop switch
d) With the lift car at the top of the Car Operating Panel
e) On each lift control panel
f) On the main supply isolator
g) On machine room installations on each machine and each over speed governor.

Identification numbers on landings, on the car operating panel and MRL landing emergency and intervention/maintenance control panels shall be engraved on matching material to the approval of the engineer.

0001 LIFT 0001

12.0 Controllers, Control Equipment and Wiring

The electrical equipment of the lift shall comply with the requirements of EN 60204-1, BS 7671 or current regulatory standards and requirements as referenced in the clauses of this standard.

Wherever practicable the controller shall be located within a separate lift plant room and shall be floor or wall mounted with a lockable cabinet incorporating IP2X protection and forced air anti dust filtration system. Where a separate lift plant room cannot be provided the control cabinet shall be built into the top floor landing entrance/wall and shall otherwise comply with these Guidelines.

All control gear shall be mounted so as to, facilitate ease of operation and maintenance from the front.

Heat emitting components may be located in a protected enclosure external to the lift control panel and where necessary be provided with natural or mechanical ventilation to ensure no unacceptable heat build-up within the panel.

All enclosures containing electrical equipment with a potential in excess of 50V shall be marked with the graphical symbol IEC 60417-5036:

Control circuits for landing controls and indicators and the safety chain having higher voltage than 50V AC and circuits on the lift car having higher voltage than 50V AC shall be supplied via a residual current protective device (RCD) with a rated residual operating current not exceeding 30mA.

It is a fundamental requirement that all control systems shall utilise “open protocol” technology and programming.

In this specification, an “open protocol” is a protocol that the control panel manufacturer shall make available to the UoE and third parties the technical details of their protocol and provide the rights to use associated with it, allowing third parties to manufacture or programme compatible equipment.

Where the ability to interrogate and/or modify any of the control parameters requires the use of any hand held or demountable Man Machine Interface (MMI) any such components not permanently fixed to the controller shall form part of the lift installation with title to same passing to the University upon completion of the works.

Any interface tool shall not allow changes to programmable electronic systems in safety related applications (PESSRAL) which shall be protected by, e.g. using EPROM, access code, etc.

Internal components such as contactors, relays, solenoids, timers rectifiers and other discrete equipment shall be identified by permanent labels, which shall bear the same designation as the schematic wiring diagrams and record information and a chart shall be permanently affixed to the inside of the controller's door to provide a key of abbreviations used. Sample labels are to be offered to the UoE for approval.

The controller shall be provided with an incoming mains filter to protect against spikes and harmonic disturbance of the supply, with suitable fuse and MCB protection to ensure that all circuits affecting all electrical equipment are suitably protected against short circuit, overload and/or reverse current.

The input/output structure of the controller shall be provided on separate input/output printed circuit boards. The status of each input and output shall be indicated by dedicated LEDs or via LCD diagnostic display.

The input/output structure of the controller shall be flexible with the option to increase the capability by the introduction of further input/output boards at a later stage or, alternatively, via distributed intelligence network.

All control devices, and electrical components shall be clearly identified with the same reference designation as shown in the electrical diagrams.

12.1 Fault Diagnostics

The controller shall have an Open Protocol Man Machine Interface (MMI) mounted within the control panel cabinet for fault diagnostics and event display incorporating the following Features and Modes of Operation:

- 200-event fault logging facility-indicating event, lift position at time of event, status, time and date. Once 200 events have been recorded, each new event shall cause the oldest event to be deleted. There should be no facility to manually delete events
- Car and landing call input
- Display of car and landing calls latched
- Lift position, direction and status
- Time and date adjustment
- Site identification code input
- Battery backup memory for the last 200 events and with a minimum 12 hours autonomy. Memory should not be disrupted by any power loss or disturbances.

To facilitate remote access in the future, the controller shall incorporate provisions to readily accept an additional of a network connection, to be agreed with the UoE.

All aspects of the installation shall comply with Electromagnetic Compatibility per BS EN 12015: 2014.

The controller shall:

- Be quiet in operation to the UoE requirements
- Be installed to avoid transmission of vibration to the building structure

- Provide the specified method of control with smooth acceleration, running and deceleration characteristics in both directions of travel
- Provide a stopping accuracy of +/- 5mm under all conditions of load and in both directions of travel
- Relevel under change of load conditions to within +/- 5mm under all conditions at any floor
- Incorporate a non-resetting counter recording motor hours run fitted within the control panel
- Incorporate an audio and visible indication on/in the lift control panel during hand winding to indicate when the car is at a landing level to allow trapped passengers to be released from the car
- Incorporate an ultimate limit reset within the lift control panel
- Cause the lift car lighting and any mechanical ventilation to turn off after a variable interval of 5-30 minutes when no car or landing calls have been made with both being turned back on immediately a call is made. In addition, please note that the car lighting and ventilation is to be switched by a PIR within the lift car
- Where the lift is intended to serve as an evacuation lift it shall, in the event of failure of the primary power supply, automatically reset and find its position within 1 metre once the secondary power supply has been energised regardless of whether the recall switch has been operated. Where the recall switch has not been operated, the lift shall continue to operate normally until that switch is operated.

The following other control features shall be included as a standard within the control system:

- Thermistor protection relay
- Double journey timer
- Car and landing call acceptance
- Load weighing by pass of calls when 70% loaded
- Car overloaded to 110% with a min of 75kg
- Provision for digital position indicators
- Provision for direction indicators
- Provision for arrival gong
- Inspections controls
- On the car roof
- In the pit
- In the control panel

12.2 Energy Efficiency

The control panel shall incorporate energy efficiency control features to reduce power consumption when the lift is not in use or there is little demand.

The energy saving features shall include:

- Fans to run on timer to switch off after a variable time limit of 1-10 mins after the last car call and switched via a PIR within the lift car
- Car lighting to extinguish within a variable time of 1-10 mins after the last car call and re-initiate lighting when lift is called and switched via a PIR within the lift car
- Indicators to reduce illumination after a pre-defined period of inactivity of the lift
- Indicators to extinguish after a prolonged period of inactivity of the lift and resume on first landing call
- False call (anti-nuisance) cancellation where there are car calls to a number of levels however there is no movement through the car door light ray after the second call has been answered
- Dynamic load weighing bypass to bypass landing calls when the car is loaded to 80% of its rates load and thereby prevent unnecessary stops
- Omit homing runs.

The control system shall support lift door operation when not under key control as described hereunder:

- On arrival at a landing in response to a landing call, the car and landing doors shall open automatically and remain open until a car button is operated. If the lift has no other calls registered, priority shall be given to car calls for an adjustable period of between 0-30 seconds after the doors have reached the fully open position. If during this period no car calls are registered, the doors shall start to close automatically. Adjustment of this facility shall not require the need for external tools or hand held device
- Project Architect/Electrical Consultant and Main Contractor shall ensure that the levels indicated on the car buttons (in both numbers and braille) and announced in the car, match that of the floor designations agreed with the UoE PM during early design consultations. For example, building with 3 storeys, will be shown and announced as level zero, 01, 02 or 01, 02, 03, or Ground Floor, First Floor and Second Floor
- On arrival at a landing in response to a car call, the car and landing doors shall open automatically and remain open for an adjustable period of between 0-30 seconds after the doors have reached the fully open position when they will start to close automatically. Adjustment of this facility shall not require the need for external tools or hand held device
- Operation of the door open, or the corresponding floor selection, button shall cause a closing door to re-open automatically or prevent an open door closing so long as pressure is maintained on the button
- Operation of a floor selection button (other than that for the floor the lift is at) shall instigate immediate door closure irrespective of unelapsed time remaining on normal closure or from prior use of the door open button so long as pressure is not still maintained on such button

- Operation of the door protection device shall override door closure
- With the doors fully closed and the lift car parked within the door zone, operation of the door open button or the corresponding landing level button shall instigate automatic door opening. Door closure pressures to meet with UoE requirements and any regulatory requirements.

The control system shall be configured such that under attendant's key control (captive key) the lift shall be removed from normal service and lift door operation shall be as described hereunder:

- In the event of any other special function, Fire Evacuation or Hazardous Material mode, this function, on arrival at a landing in response to a car call, the car and landing doors shall open automatically and remain open until the key switch on the car operating panel is de-activated after which time the doors shall remain open for an adjustable period of between 5 and 12 seconds when they shall start to close automatically
- Irrespective of the key switch status, operation of the door open, or the corresponding landing level button shall cause a closing door to re-open automatically or prevent an open door closing so long as pressure is maintained on the button
- Operation of the door protection device shall override normal timed door closure.

Six copies of the attendant's key shall be handed over on completion of the works.

12.3 Electrical Safety Mat

An approved electrical safety mat shall be provided adjacent to each piece of control equipment. The mat shall be compliant to B.S. BS EN 61111:2009 to a minimum of class 1 and marked as such. In addition all necessary landing barriers as part of the installation

Emergency and Test Operation Panels (MRL) - the necessary devices for emergency and test operations shall be provided on a panel outside of the well suitable for carrying out all emergency operations and dynamic tests of the lift. The panel shall have a hinged door with a key-operated integrated tamper/vandal proof lock, capable of being reclosed and relocked without a key. The panel shall be finished as per the requirements of the schedule of finishes.

The devices on the panel shall incorporate a permanently installed electric light with an intensity of at least 200 lux measured at the device which shall switch with the opening of the panel door to supplement the available lobby lighting.

The Emergency and Test Operations Panel shall incorporate a means of emergency operation of the lift. This shall include:

- Either an electrical or mechanical means of releasing the brake in a controlled manner
- An electrical means of moving the car in the upwards direction with the rated load
- An electrical means of moving the car in the down direction with no load

(The movement of the car in inspection operation shall solely depend on constant pressure on a direction and the "RUN" push-button)

- An intercom with Duplex Speech to the lift car
- Controls for having the dynamic tests undertaken
- A display showing:

    i. The position of the lift car in relation to the designated floor numbers
    ii. The direction of movement of the lift car
    iii. Whether the car is in the unlocking zone of the lift
    iv. The speed of the lift
    v. The status of the lift safety circuit
    vi. The car load
    vii. Operations of the car doors
    viii. The fault status of the lift

- A means to disable the door operation
- A means to disable accepting landing calls
- A door locking a bypass device which shall be mechanically protected against operation identifiable by the word "BYPASS" written on them.

12.4 Drive System

The lift drive shall be contained within the controller cabinet, or in the case of MRL lifts a separate cabinet within the well. The drive shall be fully compatible with the selected control system and shall be configured for use in closed loop operating mode. The following functions shall be incorporated as standard within the lift drive:

- Adjustment of the rate of acceleration
- Adjustment of the rate of change of acceleration
- Brake controller
- Velocity thresholds interfaced to the control system
- Regeneration

12.5 Control Wiring

Other than the trailing cables, all cables shall be enclosed in galvanised steel conduit or trunking, halogen free trunking will require approval from the Building Services Group Engineer. Conduit entry and exit points shall be protected with male and female brass glands as appropriate. Trunking and conduit shall be run on the plant room walls only to eliminate their constituting a tripping hazard. Trunking shall be provided with external copper earth link points at each joint and shall incorporate cable strainers at no greater than 3m intervals in vertical runs.

Where the use of flexible conduit is unavoidable it shall be metallic and shall be terminated in suitable couplings which shall positively grip the flexible conduit complete with all necessary fixings. An additional earth continuity conductor shall be run outside such flexible conduit between lengths.
An additional earth route shall be provided for all components and equipment including guards, ladders and landing door frames.

The installer shall utilise multi-strand 600/1000V grade control wiring having low smoke and fume insulation. All terminations of cables shall be at designated points. Where cables are interfaced, these points shall be marked and identified with DIN rail mounted screw terminals.

Volt free contacts from fire alarm system shall be provided adjacent to lift controller position. Inclusion shall be made for liaison with the University's Fire Alarm Contractor to ensure compatibility between the control system and a fire alarm signal such that in the event of a fire alarm situation the lift shall home to a designated floor level where it shall park until the fire alarm to BS 9999:2017 has been cleared.

Inclusion shall be made for liaison with and attendance on the University's Fire Alarm Contractor to accommodate their installation of any necessary automatic fire detection components and/or cables at the well top or within the lift plant room.

13.0 Lifting Machine

The hoist unit shall be located within a separate lift plant room preferably above the lift well. Where a separate lift plant room cannot be provided the hoist unit shall be located within the lift well and shall otherwise comply with these Guidelines.

Gearless machines shall be used for all new passenger lift applications having a speed of 0.6 m/s or greater.

Geared machines may be used for: lower speed lifts; large capacity lifts; or infrequently used goods lift where there is no significant energy efficiency saving and ESME is not a consideration.

The AC gearless lifting machine shall incorporate:

- A 3-phase synchronous permanent magnet motor
- Traction sheave
- Disc brake with 100% redundancy
- An encoder matched to the Vector Drive and control arrangement.

The lifting machine shall be designed with high efficiency and incorporate an internal fan. Where additional cooling is necessary, incorporate a low-noise cooling fan which shall be separately driven.

The motor shall be matched to the vector drive and shall be suitable for the specific duty demands placed on the system.

Rope retainers shall be provided at the main sheave and at all pulley wheels.

13.1 Guarding

Protection shall be provided for accessible rotating parts of machinery other than, where fitted, the hand winding wheel. Guarding shall include the sheave of all lifts within a machine room. All guarding and rotating parts should be finished in a bright yellow colour respectively to BS EN 81-20/50 and BS EN 7255 2012 A6.

The guarding shall consist of close fitting, site-measured guards, manufactured out of welded steel mesh complying with BS EN 13857. The mesh shall be painted off site to a safety yellow colour.

Where the guards have to be removed during regular maintenance and inspection, the fixings shall be via hinged or removable panels accessible without the use of tools, e.g. captive thumbscrews that shall remain attached to the guard or to the equipment when the guard is removed.

Fitting of any guard shall protect each individual component and not whole areas such as winding units and diverters. Additional bracing and support points shall be used to minimise deflection.

Where ropes enter the well, rope-reducing plates shall be fitted at each individual point of ingress with a minimum of a 50mm upstand. These shall be painted orange reflective to BS4800 to identify.

The over speed governor shall be provided with upstands as well as guarding.

MRL lifts shall be provided with guarding in accordance with EN 81-20: current edition.

13.2 Brake

The brake shall be mechanically applied and electrically held off and be capable of stopping the machine when the car is travelling downward at the rated speed and with the rated load plus 25%. Brake linings shall be incombustible and shall contain no asbestos.

Pulleys shall have machined grooves, be smoothly finished and have rounded edges.

Automatic Battery UPS Recovery System – an emergency release system to facilitate brake release and powered movement by battery backup under power loss conditions shall be incorporated into the control system for the gearless hoisting machine.

In the event of a power loss the battery UPS drive shall automatically instigate the recovery which allows a fully laden lift to drive to the nearest floor level and open its doors. The speech synthesis unit will make an announcement that the lift is returning to floor level on emergency power and to exit upon arrival.

The battery UPS recovery drive feature may be supplied from regenerative power of the drive system. The battery recovery drive shall be supplied with a signal cable from the source supply to be able to identify the power supply status and not engage the UPS battery drive on deliberate isolation of the lift supply.

Full details of the recovery drive system shall be provided with the tender.

14.0 Hydraulic Drive

Hydraulic drives shall not be installed on new projects due to energy efficiency and environmental considerations.

On building refurbishment schemes where the designer identifies that replacing a hydraulic arrangement is the optimum solution, the hydraulic pump unit shall be selected to provide the required contract speed and shall incorporate an electronic valve block, pressure gauge, hand pump and device/s to detect both high and low pressure. The pump unit shall be located within 6m from the hydraulic ram. The system shall include a means of detecting un-intended car movement, an anti-creep device and an oil filter accessible for inspection and cleaning.

The designer shall establish whether oil cooling equipment is necessary to facilitate the required number of motor starts per hour without overheating the motor or adversely affecting hydraulic oil viscosity. Oil cooling equipment shall be located so as to preclude the dissipated heat causing excessive plant room temperatures.

Inclusion shall be made for the provision of a suitable bund around the pump unit the internal surfaces of which shall be treated to prevent penetration by oil spillage. The external and top elements of the bund wall shall be highlighted by the addition of painted alternating yellow and black hazard stripes which shall be at an angle of approximately 45o in compliance with the Health and Safety (Safety Signs and Signals) Regulations 1996.

The hydraulic connection between the pump unit and the ram shall be undertaken by hydraulic hose which shall be installed so as to avoid twisting, sharp bends and chaffing and shall be effectively isolated from the building structure to minimise the transmission of vibration. Where the hose may cross the pit floor, it shall be routed so as to minimise tripping hazard to service personnel and supported clear of the floor by suitable pipe supports.

Single-acting or twin cylinder arrangements shall provide a 2:1 ratio of car travel to piston stroke by means of a rope or chain arrangement with suitable pulley/s. Where an indirect acting arrangement is adopted inclusion shall be made for appropriate safety gear.

Inclusion shall be made for the incorporation of a compatible rupture valve/s and for the provision of appropriate collection vessel/s fitted to the bottom of the ram cylinder to collect oil as naturally dissipated from the ram.

15.0 Safety Gear, Stopping Devices and Temporary Waiting Spaces

15.1 Safety Gear

Safety gear shall be mounted on the lift car sling to prevent uncontrolled descent of the lift car, and additionally for traction lifts uncontrolled bi-directional movement.

Every effort shall be made to avoid the possibility of accessible space below lift pit. Where this cannot be achieved, if accessible spaces do exist below the base of the pit, it shall be designed for an imposed load of at least 5000 N/m² and the counterweight or the balancing weight shall be equipped with safety gear.

Instantaneous or progressive safety gear as appropriate to the speed and rated load of the lift shall be selected to work in conjunction with suitable over speed governor/s.

15.2 Stopping Devices

Where maintenance work is to be carried out from the car roof a mechanical device shall be provided to prevent movement of the lift car. This shall be electrically interlocked as 5.11.2 of EN 81-20: current edition .

When this mechanical device is in its active position and cannot be disengaged due to forces exerted on it; it shall be possible to leave the well via the landing door by a clear opening of at least 0, 50 m x 0, 70 m above the car door header/door operator.

Where machinery is to be maintained or inspected from the pit and if any kind of uncontrolled or unexpected car movement resulting from maintenance/inspection can be dangerous to persons, a permanently installed device shall be provided to mechanically stop the car with any load up to rated load and from any speed up to rated speed to create a free distance of at least 2m between the floor of the working area and the lowest parts of the car.

The necessary devices for emergency operation and for dynamic tests shall be arranged so that they can be carried out from outside of the well in accordance with 5.2.6.6.

15.3 Headroom and Pit Clearances

The designer shall ensure adequate pit and headroom provision is made within the building design to achieve the required clearances as stated in EN 81-20: current edition.

15.4 Car Top Balustrade

The car roof shall be provided with a balustrade whose height shall be in accordance with the requirements of BS EN 81 20: current edition only in relation to the perimeter gap around the car top. It shall include a mid-rail and toe board. The rail shall be located within 150mm of the outside edge of the lift car top.

It is permissible to mount equipment outside of the area of the car top balustrade. The rails and toe board shall be painted bright yellow. A sign shall be provided on the car top to advise on the allowable numbers of persons on the car top and the posture of the safe refuge space that is provided accordingly.

This shall be clearly displayed at the access point to the car top on the balustrade, readable from the landing, and also to the rear of the car.

The area of the car top that the safe refuge is available shall be clearly defined by a green boarded refuge area which will define the refuge space per person.

On all University lifts of 8 persons and above, a minimum of two refuge spaces shall be provided which shall accommodate the lift engineer attending another trade, e.g. a fire alarm engineer.

15.5 Pit Refuge Space

With the car on its compressed buffers a safe refuge space as per Table 4 of EN 81-20: current edition shall be provided.

Where the detailed maintenance information identifies that a 2 person tasks are involved with lift maintenance then refuge spaces for 2 persons shall be provided.

A pit refuge space shall be clearly defined within the lift pit by a green bordered sign together with a notice at the entry to the pit consisting of at least a warning triangle sign advising on the posture of the safe refuge and the need to use any mechanical props to achieve the refuge space.


1 m
SAFE REFUGE FOR
MAXIMUM OF
2 PERSONS
USE PROP
DEVICES
PROVIDED

16.0 Belts, Ropes, Suspension & Governor

The selection of the size, construction and lay of SDR ropes shall be the responsibility of the manufacturer to suit the characteristics of the lift installation to achieve compliance with EN 81-50: current edition.

Plastic encapsulated/sheathed steel wire ropes shall not be used on University projects.

The suspension using polyurethane or equivalent coated steel wire cores belts is permissible providing that belts shall be terminated in a manner which allows adjustment of the belts due to stretch.

Belts shall have a minimum estimated life span of a minimum of 10 years for the rated duty cycle of the specified lift, measured at a rate of 300,000 journeys per year.

It shall be possible to establish the condition of the steel cores of the belt with either permanently attached monitoring equipment or portable test equipment. Where permanently attached monitoring equipment is not provided the portable equipment shall be provided as part of the contract with open protocol for third party use.

Permanently attached monitoring equipment shall provide a visual indication of the status of the belt cores and have status inputs to the control panel or E&I panel on MRL.

17.0 Lift Plant Room Sundries

An information board shall be erected in the plant room. The board shall incorporate the following information and equipment:

- Manufacturer's instructions
- Service log card
- Details of suspension and governor ropes
- A door release key
- Labelled keys for any attendant controls
- Labelled key for emergency lighting test switch
- Labelled key and a padlock to fit the main isolating switch
- A set of signs as BS EN 7010 as BS 7255:2012 Fig C1 to apply to each landing entrance when a lift is taken out of service and during an emergency release procedure.

A landing entrance barrier shall be provided in the building at a location to be agreed with the University. The barrier shall incorporate a permanent legend identifying it as being the property of the University and shall be capable of being securely fixed to landing architraves.

Appropriate and site-specific emergency hand lowering procedures shall be displayed adjacent to the lifting machine or pump unit to BS 7255:2012.

Treatment for Electric Shock and Electricity at Work posters shall be displayed in a prominent location in the plant room.

Permanent labels shall be added, as Manufacturers Guidelines and secured to each item of switchgear or outlet to identify their function. Sample labels are to be offered to the UoE for approval.

A clear polycarbonate rear screen printed sign in accordance with BS EN 7010 and as BS 7255:2012 Fig C2 shall be fixed to the outside of the plant room door using brass screws and brass screw cups.

18.0 Lift Car and Equipment

A steel sling shall be installed which shall be of robust construction to withstand normal operation, buffering or operation of safety gear without any damage or deformation and which shall incorporate:

- Safety gear complete with actuating mechanism and rope hitch
- Welded or bolted steel channel construction
- Centrally located buffer plate
- Crosshead construction with self-locking bolts
- Rope-hitch plate
- Guide shoes with lubricating system
- Car anti-vibration mountings
- Primed anti rust finish and painted two coats of matt black paint.

A car cabin shall be installed to interface with the sling assembly and the interior shall be installed with walls vertical and floor and ceiling level. A toe guard shall be fitted to the car sill. The lift car shall be statically balanced such that the car hangs centrally within the existing guide rails without the use of guide shoes.

The whole assembly shall be constructed and shall incorporate sufficient isolation material such that in-car noise and vibration meets or improves on the minimum criteria given in Section 12.12 of the Chartered Institution of Building Services Engineers Guide D: 2015. Particular care shall be exercised in the installation of anti-vibration mountings and isolation between the car frame and the car enclosure and BS Guidelines. Additional sound insulation in the form of fire-retardant anti-drumming compound shall be applied externally to the car enclosure.

Internal car finishes shall be selected in conjunction with the University and/or the Design Team to suit the environment. Cabin lighting should be designed to provide at least 100 lux at the car floor level and to facilitate re-lamping from within the lift car and incorporate 3 hour non-maintained emergency lighting to provide at least 5 lux at the car floor level for 1 hour. Emergency light/s shall not be mounted within the car operating panel. EN 81-20 and EN 81-50 current editions.

The lift car design shall incorporate mechanical ventilation or natural ventilation slots in the side walls which shall provide an effective area of at least 1% of the car floor area. Ventilation openings shall be fitted with baffles to preclude the insertion of objects.

The lift car design shall incorporate discreet hooks to allow protection of the car finishes by the installation of heavy duty drapes which shall include transparent section to facilitate use of the COP with the drapes in position. One full set of drapes shall be provided to the University for each lift car.

Shaft lighting should provide a minimum of 50 lux a metre above the car roof vertically, 1 metre above the pit floor everywhere a person can stand, work or move between work areas, and 20 lux elsewhere excluding any shadows.

Emergency lighting on the car roof must now be sustained at 5 lux for one hour. The car roof itself should also have an anti-slip working surface.

The machine room should have a lighting of a minimum 200 lux.

18.1 Car Operating Panel (COP)

A COP shall be installed in the lift car which shall include a satin stainless steel face plate and incorporate features in line with EN 81-70 and include the following equipment:

- The installers name
- Lift manufacturers serial number
- Year of installation
- CE mark
- Notified body number
- Induction loop symbol
- Elevator load in kg and persons
- LCD position indicator
- Tactile LED illuminated floor selection buttons
- Alarm button interfaced to emergency communication system
- Door open button
- Door close button
- Attendant's key control switch.

Inclusion shall be made for audible feedback of all push buttons operation per BSEN 81-70:2018. This shall be facilitated by the control system network with a dedicated CAN node for connection of the COP.

The installer's name and contact details shall be incorporated on a removable plate mounted on the COP.

18.2 Guide Shoes

Shall be installed to interface with the sling assembly and shall be provided with integral lubrication devices. Guide shoes shall be provided in primed anti-rust finish and shall be self-adjusting with renewable liners and adjustable stops.

18.3 Load Weighing Device

The lift car shall be fitted with an electronic load weighing device complete with sensors to interface with the control system to prevent an overloaded car from leaving a landing and to bypass landing calls when loaded to an adjustable percentage of rated loads.

The device/s shall be capable of having all adjustments undertaken from the car top area. A certificate of completion and compliance shall be incorporated in the O&M manual.

18.4 Car Top Controls

A car top control station shall be installed on the lift car to interface with the control system and shall be complete with integral or adjacent metal clad 13A RCBO protected socket outlet; self-contained maintained emergency and mains luminaire to BS 7255 2012.

The unit shall comply with EN 81-20 Fig 22, requirements incorporating colour coded directional; run; door open and door close buttons. The car top control station shall incorporate an emergency stop button switch positioned within 1m from the landing threshold.

An additional well terminal switch shall be installed and interfaced with the car top control station such that when under inspection control the ascending lift will stop with its roof not less than 1.8m from the nearest obstruction. In addition, a notice shall be fitted bearing the legend WARNING – DO NOT MOVE UP TEST SAFETY LIMIT.

18.5 Car Door Operator

A door operator of VVVF design shall be installed at the lift car to interface with door equipment. The operator shall facilitate individual adjustment of parameters independent of external hand held or semi-permanent programming devices, types, usage and applications.

In the event of detector or door open button failure, an internal closing force detection system shall be permanently incorporated to afford passenger protection.

The door operator shall include facility for selecting from three opening and two closing speeds and each speed shall have separate torque adjustment to enable adjustment to suit site conditions.

Skate assemblies shall be included to operate correctly the landing mechanical locks and shaft facias.

Reduced speed door nudging shall be incorporated which shall include the sounding of a warning buzzer in operation and which shall be capable of being selected and deselected by the University’s maintenance engineers.

18.6 Car Doors

Power operated car doors shall be fitted to the lift car to provide a clear opening of not less than 800 mm width and 2000 mm height. Car door panels shall be finished with linen pattern stainless steel and shall incorporate full height electronic safety edges the power for which shall be from a dedicated supply from the elevator controller and not from the car top light supply.

The doors shall include car door locking with a full height car door lock release chord provided to the rear of the door to facilitate emergency manual opening of the car doors.

Visible components, i.e. pictograms, shall be integrated into the COP and shall not be mounted on a separate plate. Inclusion shall be made for all necessary power supplies, interconnections, trailing cables, anchorages, power supplies and marshalling boxes.

18.7 Speech Synthesiser

A speech synthesiser shall be installed to interface with the controller complete with all necessary connections to a discrete speaker in the lift car. The system shall incorporate a compatible hearing aid ceiling mounted induction loop system.

Inclusion shall be made for the incorporation of messages announcing arrival at each floor, together with:

- Doors opening
- Doors closing
- Going up
- Going down
- Lift overloaded, last passenger please leave the car
- Lift returning to ground under fire alarm control, exit on arrival
- Lift returning to ground under evacuation controls, exit on arrival.

Each message shall be initiated automatically by the controller for announcement over the car speaker in sequence with other messages or individually as appropriate to the car's programmed operation. The system shall incorporate a means to turn off messages and also to adjust the volume of messages on site without the need for special tools or new components.

18.8 Induction Loop

The lift car shall be provided with an induction loop system which conforms to BS7594: 2011 and BS EN60118-4: 2015.

The outputs of the speech synthesis unit and the emergency auto-dialler shall be fed into an amplifier via transformer isolated inputs which shall provide a corresponding electric current in the loop proportional to the source input signal. The electric current in the induction loop will produce a magnetic field which can be detected by hearing aid users with their hearing aids set on the 'T' setting.

There shall be sufficient field in the induction loop circuit to generate an adequate magnetic field at a height of not more than 1200 mm above floor level of the lift car, corresponding to the height of a wheelchair user's hearing aid.

The frequency response shall be to cover the range 80Hz to 5 kHz ± 1.5dB relative to 1 kHz at low level, measured as loop current with no metal loss correction.

The induction loop cable shall be run around the perimeter of the ceiling in a concealed location with non-metallic containment providing 300mm separation from electrical switching equipment on the car, e.g. door operator which may provide interference to the magnetic field.

The system shall include a "metal loss correction" adjustment where the loop can only be installed above the car roof to compensate for the reduction in field penetration.

The induction loop field strength shall be tested as part of the commissioning procedures of the lift and demonstrated to the engineer using a calibrated magnetic field strength meter and loop listening device.

18.9 Lift Alarm System

Operation of the push button on the COP by persons trapped in a lift car shall cause a 100 dB sounder to operate. A sounder shall be installed within the lift well at the main entrance floor at the header level. The designer shall specify the sounder so as to avoid any possible confusion with other sounders for other purposes within the building.

The system shall incorporate a mains failure battery of 3 hours duration with trickle charger.

The system shall be configured such that pressing the alarm button continuously for three seconds shall initiate the emergency communication system's auto-dialler.

18.10 Emergency Communication System

Equipment shall be manufactured by Windcrest auto-diallers or equal and approved by the Building Services Group and must be connected to Security Control. The auto-dial hands-free two-way communication system shall be mounted on the lift car incorporating communication to and from the lift car, the car top, the lift pit , but not the underside of the car and University Security. Inclusion shall be made for co-operating with the University's telephone service provider to ensure the compatible interface of telephone equipment and connections.

Inclusion shall be made for remote monitoring. The system shall incorporate battery back-up to facilitate full functionality in the event of mains failure for a period of up to two hours. The system shall incorporate a compatible hearing aid induction loop system.

18.11 Car Apron

A car apron shall be provided complying with EN 81-20 5.4.5.1. The apron shall be manufactured from 16 gauge sheet steel shall be fitted to the car sill across the full width of the clear landing entrance and be of at least 750mm in vertical height . The apron and any supports shall be primed and finished with two coats of matt black paint.

18.12 Trailing Flexes

Low Smoke Zero Halogen [LSZH) travelling cables shall only be used. Travelling cables shall contain wires which shall be grouped their specific functions and shall have a cross sectional area of not less than 0.75 mm2 and shall be installed in flat form. A minimum of 10% spare cores shall be provided. All spare flexes shall be terminated at a designated earth point within the termination housing. Screened twisted pair cores shall be provided where necessary for all communication and CCTV connections.

18.13 Halfway Box

Where the termination of connections to the lift car requires being via a halfway box, the box shall be metal clad in design with a hinged lid for access and a termination legend shall be affixed to the underside of the lid to identify all terminations. High and low voltage shall be separated as to preclude damage by short circuit. Reduction of conductor size will not be permitted.

19.0 Lift Well and Pit Shaft Signal Device

A shaft position system shall be provided. A high resolution encoder shall calculate the cabin position via suitable mounting on the overspeed governor. This device shall be connected to the control system via the CAN network.

19.1 Guide Rails and Brackets

Drawn steel T-section car and counterweight guide rails with machined running blades shall be installed. The size, profile and fixing method shall be selected to suit the total load, the selected arrangement of equipment within the well and the backgrounds available for fixing. All guide rails shall be aligned to the following tolerances:

- Distance between guides –0mm + 1mm
- Accuracy of angular alignment +/-0.5mm
- Accuracy of vertical alignment over any 5 metre vertical length +/-1mm

A purpose designed oil collection device shall be fitted to collect used lubricant at the bottom of each guide rail where lubricant is used.

19.2 Counterweight

A robustly constructed channel frame type of counterweight shall be installed in filled with multiple section filler weights; either cast iron or flame cut mild steel complete with counterweight safety gears.

The counterweight shall be balanced by the suspended weight of the lift car and its attachment with 45% - 50% of the contract load placed in the lift car as determined by traction and economical running of the car.

Provision shall be made for securely clamping the filler weight in position so that under no circumstances, including operation of the car or counterweight buffers, can they become dislodged. Counterweight buffers shall not be attached to the counterweight.

Where extensions are attached to the bottom of the counterweight to allow for adjustment of the run by after normal stretching of the hoisting ropes has taken place, these shall be fabricated from rolled steel section. The whole assembly shall be site painted with safety yellow proprietary machine paint.

Guide shoes to match the guide rails shall be fitted and the counterweight shall be statically balanced such that the counterweight hangs centrally within the existing guide rails without the use of shoes. It is acknowledged that the shoe type may be determined by the project.

19.3 Counterweight Screen

A counterweight screen shall be provided complying with the provisions of EN 81-20 5.2.5.5.1. A sign shall be placed on or near the counterweight screen stating the maximum allowed clearances between the counterweight and the counterweight buffer when the car is at its upmost landing level in order to maintain the car headroom dimensions. The counterweight screen shall be painted safety orange. A hinged access panel secured with wing nuts shall be provided to afford access to buffer units.

19.4 Limit Switches

Lift well limit switches to EN 81-20 5.12.2; shall be installed in the proximity of terminal floors and selected to interface with the control system and the lift well signal device. The final position of limit switches shall be determined by liaison with the control system supplier.

The fixing of limit switches may be on individual brackets or frames. At the point of contact to the guide rails and after final test all brackets shall be through bolted with a minimum of a M8 machine screw, complete with locking washer or nut. Dedicated galvanised trunking shall be routed as close as practically possible to the limit switches as to minimise the use of flexible conduit a dedicated earth connection shall be routed to each limit switch.

The maintenance test limit switch position shall allow egress from the car top with a vertical distance of 1000mm

19.5 Pit Mounted Buffers

Energy accumulation or energy dissipation type buffers as appropriate to the speed and rated load of the lift shall be selected shall be installed in the pit below the car and the counterweight to arrest either should one or other over travel into the pit. Buffers shall not be attached to the car or the counterweight. Buffers shall be mounted on robust steel plinths to achieve the required clearances of BS EN 81-20 5.2.5.8 and shall be securely fixed to the base of the pit. A data plate shall be affixed to all energy dissipation buffers providing the information stated in EN 81-20 5.8.1.8 in the English Language.

19.6 Stopping Devices

A stopping device shall be provided for stopping, and maintaining the lift out of service, including the power operated doors:

a) In the lift pit, installed directly adjacent to the pit access ladder at waist height
b) Where the pit depth necessitates, a second pit stop switch shall be installed within easy reach of the pit floor
c) In the pulley room, pit pendent as EN81-20
d) On the car roof
e) At the inspection control devices
f) At the lift machine, unless there is a main switch or another stopping device nearby that is directly accessible within 1m
g) At the test panel(s), unless there is a main switch or another stopping device nearby that is directly accessible within 1m.

19.7 Lift Well Lighting - LED

Lift well lighting shall be provided by surface mounted LED luminaires having impact resistant diffusers which shall be to IP 65. Luminaires shall be positioned such that there shall be a minimum of one luminaire per landing level to provide sufficient illumination to allow detailed inspection of the whole landing entrance unit. Luminaires shall additionally be positioned above and below the top floor level and at the pit area.

The switching arrangement of the lift well lighting shall provide two way and intermediate switching with switches installed in the plant room, in the pit adjacent to the emergency stop button and at the lift car top control station.

19.8 Emergency Lighting – LED

Shall be provided in the pit and lift well at intervals of not less than every other floor by, self-contained, non-maintained LED luminaires with 3 hour emergency mode duration. An emergency lighting test switch shall be erected adjacent to the pit light switch which shall incorporate a key switch.

19.9 Pit Access Ladder

A pit ladder shall be provided in accordance with Appendix F of EN 81-20. A ladder shall be installed in the pit, within safe reach from the landing and extending from the pit floor to 1.1m above the bottom floor sill level. To enable mounting direct to the lift well wall the rungs of the ladder shall provide full application of the foot and a textured finish will be provided to offer a grip finish for each rung. For new installations pit to be suitable tanked against water ingress.

If due to insufficient running clearances a fixed ladder cannot be installed, then the ladder shall be removable. The ladder shall have permanently mounted fixings at the bottom and top of the position and shall have an electrical interlock so as to prevent any movement of the car on normal or test when the ladder is in position. The contact shall be by either a position switch or a safety switch. The lift shall come complete with a suitable landing door safety barrier.

Where folding ladders are used these shall be two piece ladders only and shall open in such a manner as the ladder cannot fold when the load is applied if the mechanical locking lugs have not correctly engaged.

19.10 Lift Well Fascia's

Sheet steel fascia plates, primed and painted, shall be fitted between each floor from the top track and the sill of the floor above and between the sill of the lowest level served and returning at an angle to the pit wall at the lowest limit of car travel. Fascia plates shall be manufactured from 16 gauge sheet steel to full architrave width and shall flex no more than 5mm at any point with the force of 75 kg applied.

All frames and supports shall be manufactured from rolled channel. All fascia's, frames and supports shall be provided and be finished with two coats of matt black paint or bare galvanised steel.

20.0 Landings, Door and Devices

20.1 Landing Door Equipment

Landing door equipment shall be installed to interface with the door operator drive and shall be supplied with a clear opening of not less than 800 mm width (preferably 900mm minimum) and 2000 mm minimum height (preferably 2100mm minimum.)

Exposed door and architrave finishes shall be linen pattern stainless steel. Entrances shall include the following components:

- Hanger mechanism
- Door mechanical and electrical interlocks
- Door panels
- Bias weights to close the doors
- Landing sills and door shoes
- Emergency lock release device (unlocking triangle)
- Wrap round architraves and header

Landing entrances shall possess CE certification in accordance with EN 81-50: 2014 and shall also have fire test certification to EN 81-58:2018 for a 2 hour period.

Inclusion shall be made for the permanent marking of each floor level on the inner face of each landing door set. This may be by stencilled numerals or adhesive numbers.

20.2 Landing Call Stations

Each landing call station shall comprise of flush mounted stainless steel face plate, compact tactile LED illuminating call button/s, network PCB (node) and sounder. Landing call buttons shall not be heat activated touch sensitive type and shall not operate as a result of conditions resulting from the effects of fire.

Landing call stations shall include illuminating halo up and down buttons at intermediate floors and have a single directional button at each terminal floor. Inclusion shall be made for audible feedback of push button operation per BSEN 81-70:2018. This shall be facilitated by the control system network with dedicated CAN nodes for connection per call station.

20.3 Position Indicators

LCD position and direction of travel indicators shall be installed above or adjacent to each landing entrance. The mounting height and style of indicators shall be compliant to BSEN 81-70:2018 and shall be complete with stainless steel back plate. The height of the floor numerals shall be at least 60mm and the height of the direction arrows 80mm.

Inclusion shall be made for the incorporation of a quiet tone audible signal which shall emit before the car arrives at the landing. To assist the sight impaired, the signal shall sound once for upwards travel and twice for downwards travel.

21.0 Painting/Colours

21.1 Equipment

All equipment shall be suitably prepared, primed, undercoated and then painted with an approved colour before shipment to site. All shaft steelwork within the shaft shall be primed, and then painted two coats of machine paint after erection. Any existing steelwork retained within the shaft, pit or motor room shall be wire-brushed, cleaned, treated, primed, undercoated and then painted with an approved shade of machine colour. Any damage to the painted surfaces before completion shall be made good. Any new steelwork that will not be accessible after erection shall be painted with red oxide paint (or paint of similar protective quality) before installation.

21.2 Lift Machine Room

The lift machine room shall be painted with two coats of white vinyl silk emulsion to prevent dust generation as BS 5655 Part 6.

21.3 Lift Shaft Painting

The pit area shall be cleared of all debris and dust. Cracks and other defects shall be stopped. Stopping shall be allowed to dry out and shall be rubbed down prior to painting. The pit floor and shaft walls up to a height of 600mm shall be cleaned and painted using Amtred Ltd, Drycote or equal and approved in full accordance with the manufacturer's instructions.

The application of paint shall not cover any conduits or trunking or degrade in any other identification of services or tripping hazards. The well shall be painted with two coats of matt white emulsion paint to seal the lift well against dust generation and to assist the well illumination.

21.4 Colours

The following colours shall be used uses to highlight specific equipment or hazards:

- Red – shall be used to highlight fire alarm equipment, stop switches
- Orange – shall be used for guarding. This shall include machine guards, governor guards, well divider screens, counterweight screens, etc. RAL 2004 orange
- Yellow – shall denote caution and be used for machine plinth guard rails, car top balustrades, rotating parts of machinery, etc. RAL 2016
- Yellow/Black Stripes – shall also denote hazards and be used to highlight tripping hazards in machine rooms, tripping hazards in lift pits, head hazards in machine rooms, etc.

22.0 Evacuation Lift

The current guidance on evacuation lifts is outlined in BS9999:2017, section G.2 Evacuation Lifts and in addition CEN/TS 81-76:2011 - Safety Rules for the Construction and Installation of Lifts.

Where a lift is part of the evacuation sequence for people requiring assistance, it should be an evacuation lift. Where an evacuation lift is used, it is expected that the evacuation will be assisted by a competent and authorised person(s). An evacuation lift, where provided, should always be available for evacuation purposes.

Wherever practicable it needs to be a lift used routinely as a passenger lift and not one used solely for evacuation or occasionally as a lift for transporting goods. It should be designed and installed in accordance with the relevant provisions in BS EN 81-20:2014 and BS EN 81-70:2018.

An evacuation lift should be situated within a protected enclosure consisting of the lift well itself and a protected lobby at each storey served by the lift, and should be provided with a protected route from the evacuation lift lobby at the final exit level to a final exit. It should be associated with a refuge.

The project design team shall assess the need for an evacuation lift/s to be implemented into the project design based on the overall fire/evacuation strategy and risk profile of the building. Proposed evacuation lifts that **do not** meet the overall requirements of BS9999:2017, and in particular sections 45.9, G.1, G.2 and G.2.2, will not be considered as acceptable to UoE Estates. It is essential that the design team hold combined consultations with the UoE PM/BSG/FSU/H&S to discuss the provision of evacuation lifts.

The evacuation lift/s should be clearly identified with conspicuous signage provided at all floor levels and mounted where possible directly above the lift doors. An example of this signage is provided below.

EVACUATION LIFT No.1

22.1 Evacuation Recall Switch

An evacuation recall switch shall be mounted at high level beside the landing doors on the opposite side of the entrances to the landing pushes and indicators. The recall switch shall comprise of a flush mounted stainless steel face plate incorporating a Euro triangular shaped key switch including the permanently engraved legend EVACUATION LIFT. Operation of this switch shall instigate the evacuation mode as described under the Control and Operation of Evacuation Lifts below.

22.2 Power Supplies

The primary electrical supply should be obtained from a sub-main circuit dedicated to the evacuation lift and independent of any other main or sub-main circuit. Other lifts in the same well may be fed from the same supply, provided that the capacity is adequate for the purpose and that arrangements are such that a fault occurring in any other lift in that well or their power supplies do not affect, in any way, the operation of the evacuation lift.

An alternative independent power supply should be provided from one of the following:

a) A secondary power supply, such as an automatic start stand-by generator or supply from a separate utility meeting the recommendations in BS 8519. Where a secondary supply is specified for other life safety systems then it should be of adequate capacity and used to supply the evacuation lift.

b) A separately fused circuit fed directly from the main incoming electrical supply to the building, located in a fire protected enclosure. The adoption of such an alternative supply route should be only after risk assessment taking factors into account such as the travel of the lift, the implications of a failure of the primary supply, the alternative evacuation planning, etc. Evacuation lifts using such an alternative supply route through the building should have an automatic rescue device which, in the event of a power failure, allows them to move automatically to an adjacent storey and open their doors to allow their passengers to escape.

Please note: should the project in question be deemed as requiring an evacuation standard lift, and the proposal is to utilise option B noted above, a full risk assessment based primarily on the risk to life, is to be provided. A risk assessment based on failure of the electrical supply is also required. This is not a UoE preference, this is in compliance with BS9999:2017 and should be treated as such. Risk assessments shall be forwarded to relevant UoE PM for liaison with UoE BSG/FSU/H&S teams prior to consultation.

The cables transmitting the secondary supply or alternative circuit should be separated from those of the primary supply and routed through areas of low fire risk throughout their length, or should be physically protected so that a breakdown, or any cause of a breakdown, on one supply cannot lead to simultaneous failure of the other supply.

Any power switches or isolators should be clearly identified and labels should be provided at the main switchboard and at the incoming power supplies indicating the presence, purpose and location of the two circuits. The arrangements for cable specification, routing and installation, automatic change-over devices between primary and secondary circuits and the fire protection of any enclosures should be in accordance with BS 8519.

Battery inverters should not be used as secondary power supplies for fire safety purposes.

Any electrical substation, distribution board, generator, hydraulic pump or other apparatus should be protected from the action of fire in the building for a period not less than that specified for the enclosing structure of the evacuation lift installation and in accordance with the general principles of structural fire protection for a lift machine room or machinery space.

22.3 Control and Operation of Evacuation Lifts

On the operation of the “evacuation lift” switch, or on a signal from a fire detection system, the evacuation lift should isolate all car and landing call controls and return to the final exit storey and park with its doors open.

Once at the final exit and storey and once the “evacuation lift” switch has been operated, the car controls should be enabled; the evacuation lift should then operate only in response to the lift car control panel and the communication system provided should be in operation.

For existing evacuation lifts with a “peekaboo” facility the following operation of the lift car control panel – under staff control, will apply:

- On arrival at a designated floor the doors can only be opened by constant pressure on the “door open” button
- Peekaboo system of the car door open push button function, during the above mode
- Constant pressure on car call button or door close button closes the door.

Please note that more recent evacuation lifts installations, do not have a “peekaboo” facility, on the basis that the lift car will access a dedicated 60min fire protected lobby enclosure. Please reference BS standards.

Lift override keys (4) shall be provided. One key will made readily available for use by staff and stored within a break glass box, positioned immediately adjacent to the fire alarm and emergency voice communication panels at fire service access level.

To ensure a standard and consistent application, the override mechanism and associated key should be provided to an agreed specification with the Building Services Group.

Except in two-storey buildings, some form of Emergency Voice Communication System (EVC), should be provided to enable the rapid and unambiguous identification of those locations (e.g. temporary waiting spaces) where people requiring assistance with evacuation may be waiting and the relaying of this information to the person/s managing the evacuation. EVC’s will be provided in the following areas and communicate directly with an EVC systems control panel:

- Within the lift car – flush fitting
- Within lift lobby area
- Temporary Waiting Area within escape stair enclosures.

22.4 Evacuation Intercom

Equipment shall be manufactured by Baldwin Boxall or equal and approved an evacuation intercom system shall be integrated within the lift car. Inclusion shall be made for all liaisons with the University’s specialist intercom contractor to ensure compatibility with existing systems installed at other lifts throughout the campus.

An EVC system control panel shall be provided adjacent to the main fire alarm panel at the fire service access level and speaker boxes installed adjacent to all other landing

doors and in the lift plant room above the lift or adjacent to the emergency and intervention panel of MRL lifts, all as agreed with the Fire Safety Unit.

The EVC system shall enable communication between any of the outstations and the system control panel at the fire service access level. All fascia plates shall be to a green finish.

Each speaker box shall incorporate a CALL button, microphone, speaker and the EVC system control panel shall incorporate also flashing buttons for each speaker box to enable the evacuation manager to enable two way communications with any speaker box and to terminate such calls on completion of that call. The EVC system control panel shall include visual and audible indication of incoming calls from speaker boxes.

23.0 Lift Acceptance

The incumbent lift consultant or other UoE appointed persons for either central /peripheral area lifts will carry out a lift acceptance survey on behalf of the University, in readiness for lift acceptance, the installing lift contractor will be required to provide the following:

- The contractor shall provide a programme of testing and commissioning, covering all aspects of the lift installation
- Main Contractor shall provide completed incumbent UoE Lift Consultant handover spreadsheet document in addition to completed T59B and T59C document
- The main contractor must provide to the University at handover a certificate of the completion/conformity prior to lift being put into service and emergency contact details
- The contractor shall provide an event log
- The contractor shall provide three copies of the lift manual, the manual should contain wiring diagrams and all relevant copies of test certificates and in addition electronic copies on CD or file transfer
- The contractor should supply full access diagnostic tool
- The contractor shall provide six full sets of lift operational keys
- The emergency door release keys must be handed over only to, Estates Operations Department at lift handover demonstration
- The lift contractor shall supply 600V rubber insulated mats as required adjacent to all switch gear
- The lift contractor will supply lift door landing barrier and pit access ladders where necessary
- Project to include full warranty and first years PPM requirements. 12 visits per annum.
- Documentation:
    i. EC Declaration of Conformity – signed and dated by the person placing the lift into service
    ii. Test Certificate in accordance with BS 8486-3-2017 – Examination and Tests – Passenger and Goods Passenger Lifts Conforming to BS EN 81-20
    iii. Manufacturer's O&M Manual
    iv. "As built" drawings

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