FACILITIES AND PROPERTY MANAGEMENT DIVISION

SPECIFICATION FOR THE INSTALLATION OF NEW LIFTS AND MAJOR MODERNISATION
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SECTION 1

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1 INTRODUCTION

1.1 General

This specification sets out the minimum requirements for full modernisation and new lift installations at Imperial College London. The preferred new lift installation package shall be manufactured and supplied by International Lift Equipment Ltd or ‘equal and approved’, by consisting of generic equipment which can be maintained by any competent lift company.

The intention of this specification is to set out the standards the College require for lift installations. All lifts shall be robust, reliable and shall meet the department users’ requirements and expectations.

The preferred lifts shall be electric traction type. However, subject to approval consideration may be given to the installation of machine room less (MRL) type lifts where appropriate.

2.2 New Lift Installation

Any new lift installation must comply with all current regulations, including Building Regulations. The appointed Design Consultant will be responsible for traffic analysis to provide the most suitable lift solution, including items such as size of lift car, contract load, type of load and its associated safety features, speed, number of passengers, etc.

2.3 Full Modernisation

This work would encompass the replacement of all the components of the lift which have become most affected by wear and tear and normal use over an extended period.

Major Modernisation is a reasonably straightforward exercise in that, with the exception of the car and counterweight guide rails and the counterweight itself which are retained, all other components of the lift are replaced. This will provide the College with a lift which has a life expectancy of 25 years and is compliant with current legislation.

Equipment to be replaced would be: -

- Main lift controller
- Main Hoist Unit (Geared or Gearless).
- Suspension Ropes.
- Travelling cables.
- Shaft switches.
- Car Sling.
- Car.
- Landing and car doors, frames and architraves.
- Door operator.
• Landing door locks, rollers, shoes and door closers.
• Car Operating Panel.
• Auto Dialler.
• Intercom system for machine room, car top and lift pit.
• Emergency light system for machine room and lift car.
• Fireman’s switch
• All guide shoes.
• Car top control station.
• Car/landing call buttons and car position indicator.
• Bi Directional Over speed safety governor.
• Bi Directional safety gear.
• Mains isolation.
• Consumer Unit.
• Decoration of machine room and lift shaft.
• New wiring throughout.

1.4 Lift Speed

It may be possible to increase the lift speed which would reduce travel time between floors. However, this is governed by strict lift regulations and is only possible where the clear headroom at the top of the lift well and the pit depth at the bottom of the lift well are sufficient to allow this.

2.5 Lift Car

An alternative method of improving the movement of passenger traffic is to increase the size of the lift car. However this can only be considered as an option if the lift well is of sufficient area to house all the components of the lift that are required to fit into the lift well.

The new lift cars rated load and size are to be, as far as practicable, the same as the existing lift cars. Where the car size can be increased this should be considered.
2.6 Lift Types

1.6.1 Electric Traction Lifts

Electric Traction lifts are used extensively throughout the College. To a lesser extent, hydraulic lifts also feature.

Electric traction lifts are the best suited to the College environment as they can be built to a wide range of specifications and finishes. They can be built to a very robust specification to enable them to be as resistant as possible to vandalism and misuse or abuse.

Gearless machines with variable voltage, variable frequency (VVVF) AC motors are the preferred option on all College lifts. However where existing shaft dimensions/clearances restrict the use of a gearless machine, then a geared machine with VVVF AC motor shall be fitted.

1.6.2 Machine Room-Less Lifts (MRL)

Machine Room-less lifts (MRL) are normally incorporated into new building design and not generally in refurbished buildings as the machine and other equipment that would be traditionally placed in a machine room, now need to be incorporated into the lift shaft. This would almost certainly result in a smaller capacity car where this technology to be used in existing buildings.

MRL’s are best suited to low traffic use areas.

MRL’s are not the College’s preferred option but in some instances there may be a business case to consider their installation. However they must meet the College’s standards and be of open protocol design.
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2.1 **SCOPE OF WORKS**

This part of the Specification and the Particular Specification indicate the requirements, quality and standard of the services and installation required. However, the Contractor shall inspect the specification and drawings, where supplied and, should anything have been omitted there from, which is necessary for the due and proper completion of the Works, the Contractor shall either clarify the same before submitting his tender or execute the same as if it had been specified or shown without the additional payment being claimed for such work.

The clauses in this part of the Specification cover all items which are generally standard in this type of installation, while the Particular Specification, covers the materials and method to be used in the Works, the General and Particular Specifications are to be read as one. Any conflicts shall be brought to the attention of the Contract Administrator.

The following clauses apply equally to new lift installations, major modernisation and refurbishments. Where existing installations do not comply with these standards they shall be brought up to date as far as is reasonably practicable. Any remaining sections of the existing installations that do not comply with this specification shall be highlighted and drawn to the attention of the Contract Administrator prior to completion.

2.2 **DRAWINGS**

**Tender Drawings (where supplied)**

The Contract Administrator will provide design drawings necessary for the placing of the Contract. These drawings will be known as tender drawings. The tender drawings will together have been used for the allocation of plant space and structural provision.

The positions of all fittings, equipment, plant, apparatus, etc., indicated on the drawings are intended to indicate generally the arrangements of the Works under this Contract. The Contractor shall be responsible for setting-out the whole of the Works in relation to the Works of any other tradesmen. If during the progress of the Works any error shall appear or arise in the position, levels, or dimensions of several Works, the Contractor shall disconnect and alter the Works at his own expense and to the satisfaction of the Contract Administrator if required to do so.

In the event of any discrepancy between the tender drawings and the Particular Specification the Particular Specification shall be given precedence.
2.3 **Drawings to be provided by the Contractor**

**General**

The Contractor is to carry out any design and drawing work (additional to that incorporated in the documentation provided by the Employer for tender purposes), which is necessary to ensure the suitability, compatibility and correct location within the system. This shall include sizing of cables and trunking where sizes are not specifically stated, co-ordination between components and existing structures.

Drawings necessary for accurately and properly carrying out the Works shall be prepared by the Contractor for submission for the Contract Administrator’s comments. The Contractor shall amend these drawings from time to time as necessary and shall be responsible for their accuracy.

The Contractor shall allow for providing sufficient numbers of prints to all interested parties.

All drawings shall be prepared in sufficient time (at least two weeks) to be commented on and issued to suit the Contractor’s phasing and programme of work. Any delay in preparing these drawings resulting in extra costs for cutting away, altering or reinstating will be the responsibility of the Contractor.

All drawings shall be prepared by the Contractor.

The Contractor shall provide all the necessary production drawings or details, which must be submitted and returned with comments before the work is put in hand.

Where the Contractor is installing several services or components in the vicinity of one another, he shall be responsible for determining the most suitable position for each service or components. In positions where any other services or components are to be installed in the vicinity of services or components to be installed by the Contractor he shall co-operate with any others to determine the position where each service or components shall be installed and to indicate on his drawings.

Composite and detail wiring diagrams for all controls and wiring required for equipment and plant provided under this Contract shall be provided by the Contractor.

A schedule containing the rating of all motors or other electrical items shall be prepared by the Contractor showing the correct fuse rating.

The Contractor shall also submit the following lift drawings:-

a) Manufacturers’ drawings - The Contractor shall submit to the Contract Administrator for comment all drawings showing construction and dimensions of steelwork, machinery, plant and equipment.

b) Variation drawings - The Contractor shall prepare all necessary variation drawings as a. above, in addition to which he shall keep on site a full set of drawings altered in red ink as a running record indication the variations authorised by the Contract Administrator or his approved representative.
General Arrangement

General arrangement drawings showing the proposed arrangement of the lift equipment in the machine room, well, pit and entrance areas, including the overall sizes and weights of all major items of lift equipment.

Indicate the magnitude, position and direction of all loads imposed on the building structure by the lift and its associated equipment on the general arrangement drawings.

Builders Work

Builders work drawings showing the details and extent of all builders' work which is required for the proper installation of the lift, which does not form part of the lift installation. Include these details:

a) All structure entrance openings required, including pockets, chases and holes, along with any "building-in" required around the finished lift entrances.
b) All bases, plinths, holes channels and grouting in, etc.
c) Ventilation requirements in well and machine room.
d) Permanent and temporary access requirement to well and machine room.

Schedule Drawings

Schedule drawings indicating all electrical work required for the proper installation of the lift, which does not form part of the lift installation.

Indicate lift motor running currents, starting currents and heat outputs on the schedule drawings.

Car Interior Drawings

Car interior drawings shall be provided, indicating the car interior in plan and in elevation, including details of all operating fixtures.

Combination general arrangement, builders work and schedule drawings will be accepted providing that the drawings are suitably clear and complete.

Provide three (3) copies of each drawing submitted for comment before start of manufacture.

2.4 MATERIALS

Except where otherwise stated or contradicted the materials are to be of the best quality consistent with the character of the Works. Materials are deemed to be specific in the following order of priority unless otherwise indicated:

a) Complying with current European directive/British Standards and Codes of Practice.
b) Complying in general with British Standards and Codes of Practice of European Common Market Manufacture.

The Specification provides manufacturers’ of equipment which is given as a requirement to the performance, quality and Employers Requirements which will meet the requirements of the installation. The Contractor must tender or price the requirements of the specification so that all tenders can be evaluated on a like for like basis.

However, alternatives may be submitted with tender and if so must be placed and written in the correct place within the Summary of Tender.

Branded materials are to be handled, stored, used and processes are to be carried out strictly in accordance with manufacturers' instructions and recommendations. Such materials are to be obtained direct through the manufacturers or through their accredited distributors.

2.5 STATUTORY REGULATIONS AND DESIGN CRITERIA

The Works carried out under this Contract and the Administration of the Contract by the Contractor shall be carried out in full compliance with the current requirements of the appropriate Statutory Regulations, Local Authority Bye-Laws and any requirements of Public Utility Authorities, Fire Authorities and Building Control.

General

Particular attention is drawn to the following, which lists relevant statutory instruments, regulations and standards. The list is not exhaustive and any omission from the list does not exonerate the Contractor from his duties under his duty of care.

12. The Electricity at Work Regulations 1989.
13. The Control of Noise at Work Regulations 2005
15. The Health and Safety (First-Aid) Regulations 1981.
24. British Standards and Codes of Practice.
27. IEE Regulations for Electrical Installations, 17th Edition (BS 7671 2008) including all amendments up to the date of the Contract.
28. Local Bye-Laws (including Fire Officer’s requirement).
29. Trade Association Recommendations, such as Heating Ventilation Contractors Association Recommendations.
30. CIBSE Recommendations.
32. Employers Site Access and Security Regulations.
33. The Contractor shall also comply with: -
34. Requirements of the London Fire and Civil Defence Authority (LFCDA).
35. All Standards referred to within this Specification.
36. CIBSE Publications.
37. European Lifts Directive - 95/16/EC.
38. European Standard EN 81- All parts.
41. Regulations under the Electricity Acts.
42. The Lifts Regulations 1997 (SI 1997 No. 831).
43. BS 5655 (Where Applicable)
44. BS 7255: 2001.
45. BS EN 12015 1998 Electromagnetic Compatibility (Immunity).
46. BS EN 12016 1998 Electromagnetic Compatibility (Immunity).
47. BS 7594 Code of Practice for Audio Frequency Induction Loop Systems.
48. BS 8486–1 2007 Examination and Test of New Lifts before putting into Service Electric Lifts.
49. BS 8486-2 2007 Examination and Test of New Lifts before putting into Service Hydraulic Lifts.
50. BS EN 81 -28 2003 Remote Alarms.
51. BS EN 81-70 2003 Accessibility to Lifts for Persons, Including Persons with Disability.
52. BS EN 81-71 2005 Vandal Resistant Lifts.
54. BS 5588-12 2004 Manage Fire Safety.
55. BS EN 81-80 2003 Safety Rules for the Construction and Installation of Lifts and Existing Lifts.
57. Safety Requirements for Lifts.

When specified in ‘The Particular Lift Requirements’ if the lifts are to be installed or modernised for hospitals reference is to be made to:-

a) HTM 2024 ‘Health Technical Memorandum Lifts’, where not superseded by BS EN 81, HTM 2024 to take precedence where requirements exceed those stated in BS EN 81.

b) FPN3 Fire Practice
   Note 3 – Firecode Escape
   Bed Lifts – Where not superseded by BS EN 81 and BS 5588 Part 8 and BS 5588 Part 12.

c) HTM 05 Fire code – Fire Safety in the N.H.S.

d) Model Engineering Specification N.H.S C42a and C42b
   NB. It should be noted that these specifications were last updated in November 1997.

Reference can be made to C42a and C42b, but the BS EN 81 will take precedence.


**CDM Regulations**

Comply with The Construction (Design and Management) Regulations 2007 in respect of the duties and power of the Principal Contractor under the Regulations.

Allow for allocating adequate resources to ensure compliance with and implementation of the Regulations under the supervision of a competent person experienced in the requirements of all matters related to Health and Safety at Work.

Allow for developing and implementing the Construction Phase Plan in relation to the works on site ensuring it always reflects the current situation and on Practical Completion of the Contract.
the completed document, including any relevant supporting documentation is handed to the CDM Coordinator.

Allow for ensuring all Sub-Contractors whether domestic or nominated and all site operatives and other persons authorised to be on site are aware of and comply with the requirements of the Construction Phase Plan. Allow for ensuring all information, which should be included in the Health and Safety File, is provided to the CDM Coordinator. Such information shall include all relevant data obtainable from Sub-Contractors whether domestic or nominated and all suppliers.

**Hazard Identification**

The potential hazards to be considered may include, amongst others:

a) Dangerous materials and substances, i.e. corrosive, irritant, flammable, explosive, toxic, harmful, oxidising substances and specifically asbestos sharps, legionella and lead.

b) Electricity at Work.

c) Tools (power and hand tools).

d) Working at heights (e.g. ladders, scaffold, towers, roofs, etc).

e) Falling objects.

f) Manual handling (lifting, carrying, pulling, pushing).

g) Hot work.

h) Pressure systems (air handlers, compressors, gas cylinders, etc).

i) Confined spaces (sewers, trenches, etc).

j) Fire and explosion.

k) Smoking.

l) Waste.

m) Pollution.

n) Noise.

o) Vibration.

p) Radiation.

q) Natural Gas.

r) Bomb.

s) Drugs and Alcohol.

t) PCB’s.
Risk Assessment and Method Statements

In order to comply with the requirements of the Health and Safety at Work etc, Act 1974 and the Construction (Design and Management) Regulations 2007, the Contractor will be required to provide suitable and sufficient:

- a) Written risk assessments.
- b) Specific method statements.
- c) Safe systems of work.
- d) Personnel protective equipment.

All as deemed necessary by the Employer/Contract Administrator.

NB. The various Standards and Regulations referred to in the Technical section of this Specification are also mandatory.

Competent Person and Best Practice

The Lift Contractor and any Sub-Contractor must operate a Quality Management System which complies with the requirements of BS EN ISO 9001: 2000 and the Lift Directive 95/16/ec Annexe XIII for design and manufacture.

Regulations and Standards

The materials and completed installations shall confirm to all relevant British Statutory instruments, Regulations, and Codes of Practice together with the following relevant British Standards which relate specifically to lift installations:

- b) BS 800 Specification for radio interference limits and measurements for equipment embodying small motors, contacts, control and other devices, causing similar interference.
- c) BS 921 Rubber mats for electrical purposes.
- d) BS3382 Specification for electroplated coatings on threaded components.
- e) BS3643 ISO metric screw threads.
- f) BS3692 Specification for ISO metric precision hexagon bolts, screws and nuts. Metric units.
- g) BS3832 Hoses for hydraulic installations (where applicable).
- h) BS4941 Specification for motor starters.
- i) BS4999 General Requirement for rotating electrical machines.
- j) BS EN 81EN - 72 Fire Fighting Lifts/Stairway (where applicable).
- k) BS5655 Lifts and Service Lifts (including Part 13).
<table>
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<tr>
<th>l)</th>
<th>BS6440</th>
<th>Code of Practice for Powered Lifting platforms for use by disabled persons.</th>
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<td>o)</td>
<td>BS EN 81-58</td>
<td>Examination and Tests. Landing doors fire resistance test.</td>
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2.6 DESIGN RESPONSIBILITY

The Contractor shall adopt responsibility for the integrity of the lift installations and for achieving or surpassing the design and performance criteria for all systems, components, plant, equipment, fittings, accessories, constituent materials and fixings of the installations. The Contractor shall meet the technical and other aspects of the Employer’s Requirements.

2.7 DESIGN CRITERIA

General

The Contractor shall be responsible for ensuring the selected equipment meets the functional requirements as indicated within the documentation and includes for all features included in this specification.

The equipment specified for the installation has included consideration of the following factors:

- Suitability of equipment.
- Reliability of equipment.
- Vandal resistance.
- Maintenance aspects.
- Energy efficiency.
- Capital costs.
- Running costs.
- Plant and equipment ‘life’ spans.

Suitability of Equipment

All equipment selected for these works shall be from recognised sources and shall be fully suited for the application.

Reliability of Equipment/Systems

The installation is generally to an area that is operational 24 hours a day, 365 days a year operation. The Contractor shall ensure that all equipment/system selection have proven reliability in line with minimum failure statistics.

Vandal Resistance

All equipment and the installation as a whole shall be suitably vandal resistant and particular attention is drawn to BS5655 Part 13 and BS EN 81-71.
Emergency landing door releases to be fitted.

Part 13 calls for: -

a) First available landing that permits escape onto car top.

b) Bottom floor if access to pit.

c) Top floor served.

However, emergency landing door releases shall be fitted to all floors.
Maintenance Aspects

Systems design and equipment shall ensure minimal associated maintenance requirements. Where there are other lifts sharing the same motor room the contract includes the maintenance and breakdown response of that lift from the date the project starts on site and continuing up to the end of the projects defects period. This additional cost shall be clearly declared in the summary of tender.

Energy Efficiency

Equipment shall be designed to achieve maximum economic utilisation of energy/under full and part load operation.

Capital Cost

There are particular manufacturers of plant which offer good to excellent plant in terms of reliability and life-span, but at a capital cost premium. The benefits to the Employer of items attracting a high capital cost shall be clearly identified such that the Employer can apply the appropriate judgement/directive as to the inclusion of the proposal within the scheme.

Plant and Equipment ‘Life’ Spans

Plant/equipment shall be designed/selected to obtain the best ‘life’ cycles. The 24 hour a day/365 days a year operation of the building shall also be taken into consideration when selecting plant equipment/systems. The system shall be designed to operate at maximum efficiencies throughout the full life cycle of the plant/equipment. The Contractor may be required to define the optimum ‘life cycle’ of all equipment and its effect on the overall system and the associated maintenance requirements to achieve the overall life cycle. The national lift life span is 25 years, ten years minimum for the control systems.

System Efficiencies (At Full Load and Part Load Operation)

Individual items of equipment shall be selected such as to maximise the overall system efficiency. Plant/equipment shall be selected at or near the maximum efficiency of the component taking into consideration any future growth requirements.
2.8 **CONTROL CABINETS**

**Panel and Control**

The respective main isolator (AC 23 category) for maintenance purposes shall be sited adjacent to the entrance in the machine room.

No flammable materials shall be used for the control cabinet(s) and supporting frames; it shall be securely assembled and comply with current British Standard BS 4941 and EN81. Interlocking devices shall be fitted to prevent the lift from being restarted before the motor has stopped and the control gear is in the 'OFF' position.

Electrical interlocking shall be provided as necessary to ensure that the relays and contactors operate in proper sequence. Relays/Contactor and safety switching devices shall comply with the appropriate British Standard and the conditions for use of electric safety devices in EN81-1/2.

Each control cabinet shall be complete with an internally mounted wiring diagram, or appropriate diagrams provided in a wall-mounted enclosure. Each control cabinet shall have a unique identification name/number label on its front face.

The control system shall be such that the acceleration and retardation of the cars in conjunction with the action of the brakes will be smoothly performed without discomfort to passengers.

Phase failure and reversal relay shall be fitted in each control unit arranged to disconnect the power supply to the motor in the event of one of the phases being open circuited or two of the phases being reversed.

Traction brake circuits are to be direct current at low voltage obtained through a double wound, transformer with earthed screen and full wave rectifier.

The transformer and rectifier units are to be continuously rated for the maximum load they shall be called upon to deliver. The negative terminal shall be connected to 'earth' through a removable bolted link.

The primary winding of the transformer shall be protected by an HRC fuse in the live supply line.

The main control circuit shall be 110 volt AC.

The AC control circuit shall be protected by a single pole miniature circuit breaker of the electro-magnetic type, giving instantaneous overload protection with a current of 50% above its full load rating, and having a free handle with clear indication of whether the circuit is open or closed.

The voltage of car and landing indicator lamps shall be 24 volt DC. The lamps used shall be 24 volt, L.E.D or equal.

All metal-to-metal contacts on contactors shall be of the ‘double break’ type.

The equipment within the control cabinet shall be so positioned as to permit adjustment and inspection of all components from the front of the panel. Each control cabinet shall have a minimum clear working space of 900mm, in front of the cabinet.

All terminals and equipment within control cabinets shall be provided with engraved labels (black lettering on white background) to indicate their function and with a reference corresponding with the appropriate wiring diagram.
Controller

General

The control of the lift shall be fully collective control (unless otherwise defined in the Particular Specification) arranged for operation by passengers without an attendant and serving all relevant floors. It shall incorporate control for power operated car and landing doors.

Simplex, Duplex or Group control shall be defined in the Particular Specification.

The central processor shall have ‘field proven’ components and be of a proprietary manufacture (refer to list of suppliers), suitable to be maintained by any Lift Company.

The momentary pressure on a car or landing push, activating a call, shall be stored in the system memory until answered and any number of calls so activated shall be stored.

The lift shall answer the calls in the order in which the landings are reached and once the lift has started travelling in one direction it shall answer the car and landing calls for that direction only. The lift shall not reverse until it has answered the highest or lowest outstanding call in its original direction.

When the lift becomes idle, with no calls allocated, the lift shall home to the ground floor and shall park with the doors closed. Where multiple lifts operate as duplex, triplex or multiplex the parking positions of the lifts shall be as discussed and agreed with the employer.

When a lift stops at the required floor in response to a car or landing call, the doors shall automatically open and automatically close after a time interval. This time interval shall be adjustable and shall be shortened by the operation of a floor push in the car.

Note: Advance door opening is not permitted.

Should a passenger wish to re-open the door, pressure on the ‘Door Open’ push in the car station shall reverse the motion of the doors, providing the lift has not started.

The microcomputer section of the controller shall be adequately protected such that the risk of inadvertent connections of high voltages or physical damage from falling objects is minimised.

The computer programme shall not be accessed, examined or altered within the machine room without the use of special equipment.

A summary of the features required is listed below. This list is indicative only:

a) The control panel assembly shall be designed and manufactured in compliance with the current EN81 publications.
b) Variable Frequency (VF) drive – possibly re-using the existing motor TBD.
c) Inverter drive for lift duty. Inverters rated above 22KW shall be housed separately from the main control cabinet due to heat generation.
d) ECO reduced power features required.
e) Control Full collective/Down collective (non selective collective). APB Automatic Push button.
f) 110 volt ac control voltage.
g) Fan cooled panel as required.
h) DC Brake control 110 - 220 volt DC.
i) Variable frequency door drive control.
j) Phase failure control.
k) Thermister overload control (motor windings).
l) Main contactors AC3 rated.
m) LSZH cables to BS7211.
n) Crimped wire terminations.
o) All wiring to have numbered identification.
p) MCB Miniature Circuit Breakers type 2M9 (BS3781 fault rating).
q) Fire fighters control (Where indicated in the Particular Specification)
r) Full DDA in compliance to EN81-70.
s) 24 volt digital direction and position indication on car and all floors.
t) Dual illumination for all buttons nominally 1800mm above FFL.
u) EMC protection.
v) IP54 rating (minimum).
w) Lifting eyes.
x) Interference detection/monitoring of vandal access to locks, car top etc. to signal building control systems e.g. EMU. or trend.
y) Detection of high temperature rise in the machine room local to the lift equipment.

Enclosure

All lift control cabinets shall be of the wall/floor mounted, totally enclosed, fan cooled ventilated sheet steel construction of the switchboard type in conformity with the requirements of EN81-1/2 complete with vertically hinged lockable front door cover.

The enclosure shall provide protection to IP54 standard as a minimum. Heat generated by the panel components shall be fully catered for by adequate ventilation, including fan assistance. Replaceable filters shall be fitted to prevent dust, dirt and insect ingress all as Control Cabinets.

Control Voltage

All control relays, contactors and safety circuits shall be 110 volt AC and all car and landing push feeds shall be 24 volt or equivalent extra low voltage rating.

Coils

All relay and contactor coils shall be continuously rated. Neither telephone type relays nor economy resistors with AC contactor coils shall be used. The up or down contactors, the door open and door close contactors shall be electrically and, if used for reversing AC motors, mechanically interlocked two.

Thermister Motor Protection
Thermister motor protection and associated controller equipment shall be incorporated into the main control panel.

**Heat Dissipation**

Any components which may generate significant quantities of heat shall be placed outside the controller cabinet and be suitably enclosed and ventilated, with forced ventilation where necessary. These components shall not have any affect on the operation of the panel.

Ivorine sign shall be fitted warning all of the danger of hot surfaces.

If the controller uses forced ventilation then any failure of the fan shall not cause overheating or failure of the control equipment.

**Environmental Temperatures**

The microcomputer section shall be capable of operating in environmental temperatures ranging from -5 to +40 degrees centigrade.

**Input/Output Isolation and Protection**

All input and output lines must be capable of withstanding short circuits and the application of up to 500V for short duration, i.e. megger test with permanent damage.

All outputs shall incorporate interface relays capable of switching 5 Amp at 230 volt AC.

All circuit board edge connections shall be gold plated and all input/output floor plug-in boards shall be interchangeable.

**Identification**

All parts of the equipment shall be adequately identified by Ivorine permanent labels corresponding to designations on the wiring diagrams; labels affected by heat will not be accepted. All labelling is to be to a recognised standard.

**Panel Wiring**

Panel Wiring shall be of the LSZH type to BS7211. All wiring shall be terminated by crimps accordance with the wiring diagrams. The different sections of the control wiring diagrams shall be identified in different colours to discriminate the different voltages. A list of wiring codes, mnemonics and symbols shall be incorporated on the diagrams. Wiring diagram to be encapsulated.

A key to any abbreviation and symbols shall be fixed to the inside of each cabinet. The key list shall be printed on a material that is impervious to oil, finger prints and be none fading, heat resistant etc.

**Phase Failure**
Phase failure and phase reversal protection (electronic) shall be provided, the unit shall be fuse protected in each phase. Alternatively, Purchaser approved PFRR units will be considered if offered.

**Controller Instrumentation**

**Indicators**

LED indicators shall be provided in the controller showing: -

a) Car position.
b) Car calls accepted.c) Hall calls accepted.d) Lock status.e) Car direction up or down.f) Car “In Service”.g) Car door status open, closing, closed, opening.h) Doors obstructed, doors nudging.i) Car on load by-pass.j) Car overloaded.k) Lift on test.l) Car and landing push feed status.m) Fire Fighting Service/Fireman’s Control (where applicable, see particular specification).

n) Vandal interference of locks, car top, controller.
o) Temperature risers in the machine room.

**Pushes or Switches**

Pushes, switches or other suitable means shall be permanently provided and clearly identified in the controller panel in the machine room to allow for: -

a) Car call registration.b) Door disable switch.c) Prepare to test switch.

**External Indicator**

Provision shall be made for: -

a) Landing and/or car position indicator.b) Landing and car call acceptance. (dual illumination)
c) Lift on car preference.
d) Lift out of service.

e) Lift on By-pass.

f) Lift returning to ground floor.

g) Lift on fire fighting service (where applicable, see particular specification).

h) Direction arrows.

i) Car overloaded.

j) Vandal interference.

k) Fireman’s Control (where applicable, see particular specification).

l) Evacuation Control (Where applicable, see particular specification).

Journey Counters

A seven figure electronic, none resettable, digital trip counter shall be provided to record the number of journeys for the lift.

Event Recorder

The following shall be recorded in the format of time marker, event type, intervals in real time since the last identical event, floor number/other relevant data and number of occurrences shall be displayed in plain English on a Liquid Crystal Display (LCD): -

a) Memory fault self test result.

b) Programme fault.

c) Switch-on reset sequence.

d) Primary safety circuit failure.

e) Door close protection fault.

f) Door open protection fault.

g) Landing door interlock not made up.

h) Car door interlock not made up.

i) Start failure.

j) Door open failure.

k) Lift stopped outside door zone.

l) Hall-call failure (no riser power supply).

m) Car-call failure (no power supply).

n) Failure to complete journey in “double time”.

o) Transfer timer time out.

p) Car overload.

q) Gate locks bridged.

r) Opening of locks when running.
s) LIS Status.
t) Shutdown after three successive attempts to start.
u) Stuck levellers.
v) Stuck car call.
w) Stuck landing call.
x) Lift engineer’s log.
y) Vandal interference (locks, car top).

This list is not exhaustive but is indicative of the level of recordable events required. The event recorder shall be capable of examination without affecting the normal lift control function or the continued logging of events.

The event recorders shall be provided with a Lithium battery back up capable of a minimum of 5 years. This shall be mounted on the printed circuit board.

Double Journey Counters

A timer shall be set every time a lift journey is commenced which times out after duration equal to twice the elapsed time of one full travel journey. The lift motor shall be switched off and locked out if it continues to run subsequent to the expiry of this elapsed time.

This protection device shall not be operative when the lift is switched to inspection.

Adjustment of Timers

Adjustment of all timers shall be possible without the need for special tools.

Controller Fault Handling

Degradation of Service

In the event of a malfunction, which does not result in the lift becoming “Out of Service”, the lift shall continue to give a reduced service (e.g. landing push supply failure, stuck push, doors jammed at a floor, etc.). The controller will enter the failure in the event logger and continue to serve the building in a degraded fashion, stopping at all floors in an up and down mode.

Micro Computer Self-Tests

The microcomputer shall regularly run diagnostic checks on its memory functions, I/O circuits and run a programme test. Any errors will be logged in the event recorder.
Diagnostic Aids

The controller shall provide LED indicators for all inputs and outputs of the microprocessor.

Initialisation

Whenever power is connected to the controller the microprocessor will go through an initialisation routine, clearing all hall and car call registers and all status registers. Following this zeroing procedure the microcomputer will set all times to present default values.

In the event of a power failure or whenever the lift is switched off, the controller will automatically restart on the restoration or re-connection of the power supply and cause the lift to move from its static position.

When the lift encounters a floor with auto position reset, the floor value in the controller will be reset and normal lift operation will resume.

Automatic Position Checking

The terminal floors and other selected floors shall be used by the controller to check the correct floor value. Any error found will automatically cause the lift to travel to the floor level designated for resetting.

Stuck Push Protection

The controller shall have the facility to recognise a stuck hall or car push and shall ignore the signal after a predetermined interval. The event will be recorded in the Event Recorder.

Controller Variable Frequency Drive Power System

The power system shall be variable frequency closed loop control. Closed loop control shall utilise, feedback from the hoist motor, supplied by a quadrature bi-phase pulse tacho generator.

The regulator shall control an AC motor by controlling the currents affecting the motor’s torque and flux producing components and shall be a digital drive system.

The regulator components shall accept 3 phase AC power, and provide rectified then inverted 3 phase AC power output controlled by a signal/torque/flux processing section.

Braking shall be achieved by absorption of the lift kinetic energy via the DC bus with surplus energy being absorbed by the use of dynamic braking resistors switched by use of a dynamic braking module. The lift shall reduce to zero speed at floor level to give an electrical stop.

The regulator shall incorporate a monitoring unit, which shall allow values of output current, output frequency, slip frequency, DC. link voltage, motor speed and torque demand to be monitored in real time. The monitor shall have the facility to access the regulator fault codes to allow on site fault findings.

The transistor bridge shall be adequately rated for maximum current with a peak inverse voltage of not less than 1200 volt.

Invertors rated above 22KW shall be mounted outside of the main control panel cabinet.
Door Control

The door operator control circuits shall operate the doors in direct response to the selected car and hall cars and shall provide for the following features: -

a) Provision to operate the door motor from the car top maintenance control at any position in the shaft.

b) The inclusion of circuits to connect to a positively operated switch, which makes up only when the door operator is in the fully closed position. The switch shall be incorporated into the car and landing door lock circuits.

c) If the car or landing door contact fails to make up within 10 seconds after the door close cycle initiation, then a door open cycle commences, whether the lift is committed to a journey or not. After three successive door reversals, the doors shall close against any obstruction exerting a controlled and limited force at any point on the cycle, not exceeding 4J. At the same time a buzzer shall sound in the car station.

d) Operation of the door close protection timer shall cause all car and hall calls to be cancelled or transferred if part of a group. Normal lift service shall be restored when a car call is registered thus immediately initiating a door close cycle. Operation of the door detector shall initiate a door cycle except when doors are closing under nudge control with buzzer sounding.

e) Once a hall call push is pressed at the floor where the car is parked with the doors closed, the door opening cycle shall be initiated. Once a hall call push is pressed whilst the doors are closing, a door reversal shall take place. Subsequent pressing on the hall push shall not prevent the normal door closing operation provided the lift is committed to a journey. A door open push shall be provided to control door reversal.

f) The door opening protection timer shall operate after 30 seconds if the doors fail to fully open. After a further 10 seconds the doors shall be closed so the lift may move to another floor. Failure of the lift to start its journey due to the doors being held shall cause the car calls to be cancelled after 40 seconds elapsed time.

g) The door timing shall be modified as follows to provide the following:
   • Zero - following a door reversal caused by the door detector operating.
   • 7 seconds - if a stop is caused by a registered car call.
   • 10 seconds - if a stop is caused by a registered hall call.

h) Failure of the lift to start its journey due to the doors being held shall cause the car calls to be cancelled after 40 seconds elapsed time.

i) The door operator logic circuits shall be so arranged that operation is not dependent upon a single or secondary circuit element. Failure of such elements shall not cause the doors to remain in the open condition.

j) The software must feature a Gate Lock Bridged monitor that will disable the lift motion until the fault is cleared.
k) Adequate care shall be taken to ensure that all wiring and terminal positioning associated with the lock circuits and safety devices to and from the door operator is such that no possibility of short circuits due to fracture of terminals, moisture, etc., can take place.

**Group Control**

For a group of lifts, landing calls shall operate via a dispatcherless group control in the computer. The dispatch control unit shall give optimum response time to loading calls using call timing algorithm. The system shall have built-in traffic analysis and shall be capable of being configured to allow structuring to the buildings specific requirements.

There shall be facilities to connect a PC to operate control and configuration within a “Windows® environment”. This facility shall be incorporated in the machine room and it shall be able to connect additional PC’s remote via modem or serial loom connection.

The group of lifts shall be viewed by a VGA graphical dynamic display in real time showing at least the following: -

a) All lifts position.

b) All lifts direction.

c) All lifts status.

d) All landing calls registered.

e) All car calls registered.

f) All lift door status.

The following features shall be accessible: -

g) Adjustment of system parameters, i.e. automatic parking floors, up and down peak configuration and lobby car operation.

h) Access to traffic analysis, event and fault reports.

i) Access to building floor security configuration.

j) Facility to place car calls to all lifts.

k) Facility to change strategies of set configuration.

### 2.9 ELECTRIC TRACTION LIFTS

#### Hoist Unit Assembly

Mount the hoist unit, comprising of a lift motor, brake, traction sheave, reduction gear and pedestal bearing, along with deflector sheaves (subject to available height) on a bed-plate of welded construction. The hoist unit assembly shall be mounted on to a steel fabricated raft that is supported by legs or supporting steel that spans the plant room off the lift well enclosure walls, all by lift contractor. Ensure the bedplate members are not subject to twist or deflection by incorporating welded in rib bracings and supports.
The design and construction of the bedplate, raft, and steel supports shall be such that the true alignment of the equipment under all conditions is maintained. Roll pins shall be used in the feet of all components to maintain their alignment and position.

Provide vibration isolation mountings incorporated between the bedplate and raft to prevent the transmission of noise or vibration into the building super structure or frame.

**Motors**

The motor shall be an AC type and the drive a variable voltage, variable frequency unit.

The power developed by the motor shall be transmitted directly to the driving sheave which is to be located on the same shaft as the motor. The main shaft shall be supported on two large bearings that may be of the sleeve, roller or ball race type.

Provide hoisting motors of the type specified, and recommended for lift duty.

Ensure that the hoisting motor and motor control provides smooth acceleration and deceleration, and runs with a minimum of noise and vibration (silent running).

The nominal insulation class of the vacuum - impregnated MF motoring winding to be F, with a high H class material content.

The motors to be fan cooled and to be protected by thermisters embedded in the stator winding. Low heat emission from the motor and long term operating reliability shall be achieved.

The machine shall have one encoder; providing lift position and speed feedback for control or lift motion.

**Gear Box**

Provide a lift duty gearbox of the type specified. Industrial duty boxes shall not be used.

The gear box shall be so constructed that all bearings and gears are readily replaceable and totally enclosed.

Charge the gear casing with the appropriate quantity and type of lubricating oil.

Provide means of visually ascertaining the level of oil in the gearbox without the need to open the gear casing.

Provide a readily accessible drain plug to the gear casing.

When an ‘outer bearing’ is called for it shall have a phosphor bronze sleeve bearing mounted on an A stool support, sealed for life.

**Vee/Traction Sheave**

The driving sheave shall be of the appropriate diameter (EN81 40 diameters) minimum of four rope grooves to suit the duty and type of lift to be installed. The ratio of the driving sheave diameter and ropes, etc. shall be as defined in EN81-1.

The Vee sheave hardness criteria shall be in excess of 210Bhn Brinell scale.
All sheaves shall be either of the one piece large spoke pattern or constructed with disc centres and keyed to their respective shafts by sunken keys. Keys shall be located in the respective keyways after fitting. Each worm wheel driving sheave and any other sheave shall be supported by bearings on each side. Cantilever/overhung sheaves or diverter sheaves are part of the design; details of these shall be given in the respective Appendices. Where flanges are used, fixing bolts shall be ‘fitbolt’ of high tensile steel and shall be machine fitted.

The Contractor shall refer to the Schedules for details of type of drive system to be used, i.e. single speed, two speed, variable speed, etc.

**Holding Brake**

The brake shall be EN81 compliant and be of the mechanically applied calliper shoes electrically held-off, DC operated. It shall be of sufficient construction to efficiently bring the lift to rest when travelling at full contract speed in either direction, with or without maximum contract load. Any earth fault, short circuit or residual magnetism shall not prevent the brake from being applied when the power supply to the respective lift motor is interrupted. ‘It shall fail to safety’. The brake linings shall be asbestos free rivet or bond fixed compliant to EN81-1. The brake must have a built in safety factor to be able to hold the lift with 25% overload. The brake shall be situated between the gearbox and motor.

On foot mounted motors the brake drum shall be of the split type with each half fitted to the worm shaft and motor drive shaft. The drum halves fixing bolts shall be ‘fit bolts’ of high tensile steel machine fitted. The brake shall have dual springs and have a fixed mechanical release lever.

On flange mounted motors the brake drum shall be of one piece and bolted directly to the motor shaft.

A brake release mechanism shall be provided, in each brake unit; this shall be arranged such that once pressure has been removed from the respective release lever, the brake is immediately reset. At no time must it be possible for the brake to be left in the open position unless manual pressure is being applied to the release lever.

Brake shoes shall be of the ‘self-aligning’ type.

The brake drum is to be formed as an integral part of the driving sheave and may be one of several types, depending on the type of brake. The requirements of EN81-1 must be satisfied, i.e. it must be capable of stopping the car when carrying 125% load at full speed.

The brake is used only during emergency stopping and when at rest to hold the lift car during loading. Under normal operating conditions, speed controls are employed to bring the car to rest without the use of the brake.

The squirrel-cage AC motor is to have square station limitations; the traction sheave and the brake to form a compact power unit.

2.10 **HAND WINDING GEAR**

Where applicable the Contractor shall provide each drive motor with a ‘square’ shaft extension for hand winding purposes, this extension shall have a suitable protective sleeve/cowl.
Where the hand winding wheel is not permanently attached to the motor shaft part of the brake coupling, the Contractor shall supply and fit in each machine room a smooth rimmed spoke-less hand winding wheel for the above purposes.

Adjacent to each shaft extension the Contractor shall supply and fit to the motor a plate which shall clearly indicate the direction for hand winding, i.e. ‘UP’ and ‘DOWN’.

On a geared motor system the true position of the lift shall be displayed via LCD indication on a unit mounted within easy viewing position of the hand winding wheel. This hand winding positional display unit shall also incorporate a control circuit isolation switch and buzzer when floor level is reached, powered via a rechargeable battery pack.

An appropriate means of ‘distance’ marking on the drive ropes shall be provided to show when the car is in the ‘Unloading Zone’ of a landing.

A tool board with identified positions shall be provided and fitted in the Lift Plant Room(s) (by the Contractor) for mounting the hand winding wheel (where applicable), brake release lever, control panel key and landing gate lock release keys in a safe and secure position.

2.11  GEARLESS MACHINES

The assembly of gearless machines comprises a drive motor, drive sheave, bedplate, brake rotor, supporting bearings and a deflector or double wrap sheave.

The assemblies shall be super silent in their operation and insulated from the building fabric to ensure no noise or vibration pollution affecting the building or its occupants.

The lift motor shall be of the permanent field synchronous type.

The motor shall have two separate brakes fitted with mechanical hand release. Each brake unit shall be opened individually by electrical power. Each brake shall be monitored via switches to prove lifting has occurred. Failure of the brake to disengage will result a fault condition and failure to start within the control system.

The complete assembly shall be in compliance with the requirements of EN81. The brake must be able to stop the lift when travelling at full speed and carrying 125% load.

The machines action design shall cover the EN81-1 requirements for controlling uncontrolled upward movement of the lift.

The traction sheave size shall be determined by the Lift Contractor to supply the lift speed specified.

A tacho generator shall be built onto the machine assembly, (2048 sine-cosine periods per revolution).

The lift contractor shall ensure the complete system is harmonised with the control panel inbuilt frequency inverter.

The inverter shall be a compact design built for lift duty forming with the motor a separate electrical power supply (inverter must be of the same manufacturer as the machine).

Travelling contactors, brake resistances, EMC filters and motor reactors shall be integrated into the inverter.

The EN directive regarding radio interference, suppression and mains pollution shall not be compromised. The optimum protection of the motor windings shall be ensured by a day/date<1000V/µs.
The machine design is to suit all roping configurations and with the maximum extended service life of the ropes and traction sheaves to be achieved.

The control system is to have the facility to electrically lift the brake via a battery backed UPS system that allows the lift to ‘roll with load’ for emergency evacuation purposes.

2.12 MACHINE ROOM LESS LIFT

General

The machine room less lift is to utilise permanent magnet, synchronous gearless drive technology powered by a variable frequency inverter unit matched to the machine to deliver and control the necessary torque throughout the full speed range of the machine provided.

All drive equipment is to be mounted in the lift shaft without the need for separate plant rooms. Where the control panel is required to be mounted outside of the lift shaft, within a lobby area of the building, it shall be aesthetically pleasing and preferably only 400mm wide. If there is an existing plant room at an acceptable distance from the lowest level served, this may be used for housing the control panel.

The control panel shall be suitable for mounting up to 15 metres from the lowest floor served and housed within a sheet steel enclosure, with a minimum protection rating of IP54, suitable for floor mounting, with front access only required.

When located within the lift shaft, the control panel, due to its location, must be capable of being closed and locked without the use of a key.

Encapsulated diagrams and manuals are to be supplied with each control panel within an internally mounted document pocket.

The control system shall operate from a supply voltage of 230V AC with the main control gear being selected from the Telemecanique ‘Tesys’ range of equipment with silver to silver contacts. Main contactors are rated to AC3 duty plus a minimum of 10% for inching duty.

Internal panel wiring should be tri-rated cable to BS6231 or when necessary using LSZH cable.

All electrical equipment is protected from direct finger contact with terminals selected of a shrouded pattern.

A direct acoustic communication system between the control panel and the lift car must be provided.

Microprocessor Control

The microprocessor system should be a modular system of boards, rack mounted, front wired that offers the ultimate flexibility on site. Its features should include:-

- On site programmability via built in keypad or via a PC. The PC system should use windows based software and when requested the programming software must be supplied free of charge to the installation/service company.

- Facility to programme via serial communication, digital indicators, speech synthesiser, shaft encoder and the shaft mounted inverter drive system.
• Large graphical and pictorial LCD display 128 x 64 pixel in clear English text.
• Fault and occurrence logging in real time and date with 10 year battery back up.
• Facility to enter all car and landing calls with auto run feature.
• Trace fault monitoring to detect faults in specific areas eg. Doors, positioning, motor control etc.
• Plug and play technology allowing individually configurable inputs and outputs.
• Facility to add boards for different features such as speech synthesiser, advance door opening or re-levelling, extra floors, shaft encoder etc.
• Must be suitable for full group operation up to 8 cars without the use of a separate dispatcher unit.
• Password protected.

Specific Machine Room Less Requirements

The control system must comply with the requirements of EN81-1:1998 A2 with particular reference to the following points:-

• The control cabinet must contain its own switchable internal light giving a minimum of 200 lux at the control terminal connections.
• The control panel must be fitted with its own lockable 3 phase isolator.
• Supplies via suitably rated circuit breakers must be provided for the following external devices:-
  • Car light
  • Car top socket outlet
  • Shaft lighting with two way switching facility
  • Shaft socket outlet

For the emergency release of trapped passengers the control system must incorporate the following features:-

• Hand winding position unit with LCD display, showing exact lift car floor location, with full battery back up. When switched to hand winding mode the normal control circuits must be isolated.
• Panel test facility with override function allowing the lift to be driven to floor level, when mains supply is available under certain fault conditions. The system shall allow the overriding of only the following safety devices:-
  • Over travel limits, top and bottom
  • Safety gear switch, ascending and descending
  • Over speed governor safety switches
  • Buffer switches (when fitted)
• Under mains failure conditions the system must be designed to allow the electrical operation of the brake. The brake should be allowed to energize under the operation of at least independent switches/buttons. Under this control the lift will roll with load at a maximum speed of 0.2 m/s. Floor announcement should be both audible (beep) and visual via the hand winding positional unit.

• The brake power supply must be taken from a suitably rated un-interruptible power supply (UPS). It is expected that this UPS system will also power the hand winding positional unit.

Due to the nature of machine room less lift installations it must be possible to test/check the dynamic functions of the lift, in particular:-

• Lift Speed
• Operating currents
• Direction of travel
• Safety gear test. Remote tripping and resetting must be incorporated.
• Final limit test

Additional ‘site specific’ control panel features where specified may include:-

• Trip counter to be provided inside the main control panel.
• Reduced power ‘ECO’ modes.
• Panel ‘live’ neon on outside of main control panel.
• LSZH Halogen free cable.

**Motor Control**

All installations shall utilise a gearless synchronous permanent magnet motor system for maximum efficiency.

The inverter shall be mounted local to the motor within the lift shaft. Contactor(s) for motor switching shall be contained within the inverter together with dynamic braking resistors and filtering to meet the requirements of the latest European Directive with regards to Electromagnetic Compatibility (EMC).

Wiring between the inverter and the main control panel shall be loomed and wired in screened cable.

All programming and monitoring of the inverter shall be possible via a keypad and display within the main control panel on the landing.

**Switching Requirements**

The system must be designed to operate in conjunction with a digital shaft encoder receiving its pulse information from an encoder either mounted on the over speed governor or as a belt
driven shaft/car mounted encoder system. Programming for this unit must be via a permanently connected control unit within the main control panel.

Limit switches for control of terminal stopping/slowing and over travel should be mounted within the lift shaft control via ramp fixed to the lift car.

**Additional Safety Requirements**

Due to additional equipment (over and above a conventional lift) being fitted within the lift shaft, specifically at pit level, where machinery is to be maintained or inspected from the pit and if this work requires movement of the car, or is likely to result in uncontrolled or unexpected car movement, clauses 6.4.4 of EN81-1 shall be fully complied with.

### 2.13 HYDRAULIC LIFT

**General**

The hydraulic pump machine motor shall comply with EN81-2. It shall be of the oil-immersed design directly coupled to a rotary screw type pump, operating at low pressure to ensure quiet operation with less than 80 dbA measured 1 metre from the unit. Motor bearings shall be of replaceable sleeve, oil lubricated type or equivalent.

For details of lift(s) start duties refer to the Schedules.

The Contractor shall allow in his tender for the installation of ‘oil-cooler’ unit(s) in order to maintain the desired oil temperatures, to suit the duty cycle of the respective lift(s).

The Contractor shall clearly show on his drawing the environmental conditions required for each machine room.

Each machine shall be complete with a suitable hand-pump unit for moving the car in an ‘upwards’ direction. This unit shall be fitted with appropriate tech. data notice/label in English.

The machine shall be fitted with an appropriate motor run ‘journey timer’ time limiter. This shall control the mains supply within the respective control cabinet as defined in BS5665: Part 2.

The fluid storage tank(s) shall be of the heavy gauge sheet steel construction, provided with a removable tight fitting cover. The tank(s) shall be positioned so that all sides are visible for examination. The tank shall be adequately hinged and painted to suit the working fluid. The capacity of the tank shall be such to permit sufficient fluid remaining to cover intake pipe strainers when lift car is at its highest level. Install a means of checking fluid level and indicate clearly the minimum fluid level without the need for removing cover of any part of the equipment. The tank shall be adequately vented to atmosphere and provided with appropriate breather. Incorporate a ‘full flow’ removable fluid filter, valve drain outlet and a suitable fluid temperature detecting device.

The fluid line connections from each pump unit to its respective jack(s) shall be of the steel wire – reinforced flexible hose pattern complying with BS3832 and of the type not affected by working fluid. The Contractor shall make due allowance in his tender for the location of the machine unit to each jack and if necessary provide adequate insulation protection to exposed portions of the pipe route.

The Contractor shall provide and fit adequate mechanical protection for each hose, especially when passing through walls, etc. The use of sleeve ferrules will be permitted.
Control Valves/Systems

The machine control valve assembly(s) shall incorporate all necessary components, including acceleration, slowing, and levelling valves to ensure the following:

a) Safety.

b) Smooth and progressive starting.

c) Smooth and progressive slowing.

d) Smooth running.

Construction power unit control valves to remain closed to supply whilst pump is not operating.

Arrange all electrically operated valves to fail to safety in the event of electrical supply failure.

Ensure all fittings, valves, etc., are scrupulously clean and all protective caps, etc., remain in position until system is commissioned.

The Contractor shall install the following valve units complete:

a) An appropriate ‘non-return’ valve to sustain lift car with contract load at any point of travel when pump stops of fluid pressure falls below minimum operating valve.

b) A ‘pressure relief’ valve shall be located on the bypass connection between pump and non-return valve, arranged to prevent the relief valve being isolated from the pressure system. Pre-set and seal valve to open at a value not exceeding 140% of pump working pressure. The relief valve discharge shall be connected directly to the tank and not to the suction side of the pump.

c) Size the ‘relief’ valve and bypass connection such as to allow the maximum rated capacity of pump size without raising the pressure more than 20% above the value at which the valve opens. The Contractor shall utilise two or more ‘relief’ valves if necessary to achieve the required capacity.

d) An appropriate ‘shut-off’ valve in the pipeline between the cylinder(s) and non-return valve.

e) A pressure gauge mounted on the unit in an easily seen position and connected to the ‘jack’ side of the power unit. This gauge shall be fitted with a suitable ‘shut-off’ valve.

f) ‘Rupture’ valve(s) shall be integral with the cylinder of the jack(s) and be capable of stopping the car in downward movement and maintaining it stationary.

g) A ‘restrictor’ shall be fitted to the cylinder of the jack(s) in a manner defined in EN81-2: and shall in the case of a major rupture prevent the speed of the lift in downward direction exceeding 0.3m/s.

h) Appropriate oil filter shall be provided in tank, pipe circuits, etc.

i) An ‘anti-creep’ device shall automatically limit the car movement within 75mm of the landing level. This unit shall be so arranged to start the pump and re-level the car with the landing whether or not the landing door is closed. Furthermore, this device shall remain operative, irrespective of opening of any protective electrical device fitted to the lift, other than ‘car top’ and ‘pit’ stop switches and any other safety device operating in consequence of driving motor failure.
Jack Unit(s)/RAM

The Contractor shall install complete the jack(s) detailed in the Schedules and these shall be of the steel tubular piston pattern with fine ground/polished or hard chromium finish running in bronze or equivalent bearings. Cylinders shall be of heavy seamless steel tube true ground and polished. Provide suitable stops to prevent ‘ram’ from travelling beyond cylinder limits.

Automatic hydraulic safety cushioning shall be provided at the bottom limit together with automatic over-travel protection at top and bottom limits.

A suitable means to collect any drainage from the cylinder head gland shall be included by the Contractor.

The Contractor shall provide complete adequate arrangements to permit system venting of cylinders, valves and pipes utilising air cocks. Also provide air bleed on each ‘ram’ cylinder.

Install complete where necessary appropriate guide yokes for telescopic jacks. The Contractor shall supply an adequate ‘car prop’ for use in pit. The type and location for stowage is to be agreed with the Contract Administrator.

The emergency lowering release provision shall be provided as follows:

a) Arrange equipment to permit rescue by one person in the event of person(s) becoming trapped in car.

b) Provide manual lowering valve for each machine, appropriately labelled and accessible without removal of covers. The label shall read ‘Caution – Emergency Lowering’.

c) The manual lowering valve is to automatically reset when “hand-pressure” is removed. Maintain seating of valve by pressure within lifting cylinder. Utilise springs or weights only to assist initial movement of valve mechanism to seat in closed position. Maximum lowering speed shall not exceed 0.30m/s.

2.14 RUBBER MATS

The Contractor shall supply and fit rubber mats to BS 921, located in front of each control cabinet. The size of the mats shall be at least 1000mm long x 600mm wide.

2.15 RADIO AND TELEVISION SUPPRESSION

All radio and television suppression shall be included to comply with EMC Regulations BSEN12015 for emissions and BSEN12016 for immunity.

2.16 SAFETY PROTECTION

The Contractor shall provide and fix complete in every respect, all materials and equipment necessary for the guarding of moving parts of machinery counterweights, toe guards, car roof hand rails, etc. The Contractor shall also provide all other forms of protection against hazards and accidents as detailed in EN81.

All moving parts, including sheaves, pulleys, counter weights, shall be painted yellow.
2.17 ASSOCIATED LIFT ELECTRICAL WORKS

Lift Supply

The Contractor shall test and replace if necessary the power supplies to the lifts.

Lift Room Consumer Unit

The Contractor shall install a new 9 way, (min) metal clad, consumer unit to serve the lift and motor room services, connected onto the existing consumer unit cable. From the consumer unit the Contractor shall install new circuits to the following items: -

a) Car light, emergency light.
b) Car top lighting and power.
c) Elevator Monitoring Unit (EMU).
d) Shaft Lighting.
e) Tubular Heating.
f) Machine Room Socket.
g) Pit Socket.
h) Machine Room lighting.
i) Four spare way (s).

Trunking and Conduit

The Contractor shall install 75x75mm galvanised steel trunking to perimeter of lift plant room, to suit layout, and to accommodate the local wiring.

The Contractor shall install galvanised steel conduits to all circuits and services in and around the motor room.

Socket Outlets

The Contractor shall install a 13A metal clad; surface pattern RCD protected two gang switch socket outlet adjacent to the consumer unit. A further surface pattern, two gang switch RCD protected socket outlet shall be fixed in the pit, adjacent to the pit stop switch.
**Tubular Heating**

The Contractor shall install twin 1200mm tubular heaters clear of any working space on the support steelwork below the gearbox/motor arrangement. The heaters shall be contained within the hoisting machine guarding, described elsewhere. The heaters shall be fixed using proprietary brackets and shall be connected via an industrial pattern room thermostat, set at 10°C.

The Contractor shall install a 13A, metal clad, surface pattern switched, fused connection unit with neon indicator to control the heaters.

Final connection to the heaters shall be in 2.5mm² heat resisting flexible cord.

**Car Lighting**

The Contractor shall install 20A neon indicating, metal clad switch for the car lighting. This shall be conveniently mounted in the motor room.

**Shaft Lighting**

Shaft lighting shall be supplied and fitted by the Lift Contractor. Power shall be via the consumer unit not linked directly to the lift three phase supply.

The circuit shall be a two way method between the lift machine room and the lift shaft.

Switching on the lift shaft shall be via a pull cord method. Pull cord to hang the full length of the lift shaft, positioned in the front shaft corner slamside. Cord to pass through wall fixed metal eyelets and anchored in the pit to tension the cord and eliminate stretch.

Lighting shall comprise 1200mm IP54 minimum, impact resistant fluorescent luminaries fixed adjacent to the conduit. Connection of the luminaires shall be by ‘KLIX’ type plug and socket roses. Units at very top and bottom of lift shaft and every other luminaires to have emergency self contained units fitted.

The fluorescent luminaries shall be spaced, as set out in EN81, 500mm from the shaft ceiling and pit floor and at set pitch to achieve at least 50 lux 1 metre above the car roof.

**Labels and Notices**

The Contractor shall fully label all the items he has installed. Accessories shall be engraved on the front plate in minimum 6mm high lettering clearly describing its function.

The consumer unit shall be labelled with a traffolite or equal label and shall be complete with a detailed circuit chart indicating:

a) Way number.
b) MCB size.
c) Cable size.
d) CPC size.
e) Description of load.
The circuit chart shall be on an engraved, traffolite material and wording and layout shall be agreed prior to engraving and installation.

Where main lift supply cables are installed in the shafts, labels shall be installed to upper and lower-most cable positions within the shafts to identify their purpose.

Supply and fix:

a) Electric shock treatment signs.
b) Hand winding instructions.
c) Warning notice of lift machine room.

All signs shall be fixed by brass screw and plug to the building surfaces.

Testing

The Contractor shall employ a competent specialist to fully inspect and then test the whole installation in strict accordance with BS7671 and shall issue an Inspection and Test Certificate in compliance with the National Protection Council for Electrical Installation Contractors (NICEIC).

Works

All electrical works shall comply with the following general requirements and comply fully with the IEE Wiring Regulations.

All cables shall be of a manufacturer approved by the Contract Administrator and shall be BASEC approved. All cables shall have stranded copper conductors.

Cables shall be PVC insulated 600/1000 volt grade complying with B.S. 6004 installed in conduit and/or trunking.

Conduits

Conduits shall be heavy gauge screwed and welded steel. The conduits and their associated fittings and boxes forming the conduit system shall comply with B.S. 4568 and shall have class 4 internal and external heavy protection by hot dip galvanising.

All corners shall be turned by easy sets or bends made cold without altering the section of the conduit. Factory bends or tee pieces will not be permitted.

Conduit, fixing, boxes etc. of aluminium or other alloy shall not be used.

Standard circular malleable cast iron boxes with 50.8mm fixing centres shall be used where boxes are required except where accessory mounting boxes or adaptable boxes are used. Adaptable boxes shall be grey iron with heavy duty covers.

Where surface run conduits terminate at cable trunking, distribution boards, accessory mounting boxes or any other instance into a clearance hole each connection shall be made by means of a
socket and smooth bore brass male bush screwed up through the clearance hole into the coupling the two being locked together.

The enamel shall be removed from all clearance holes.

Apply zinc metallic paint to the conduit system as follows: -

To any areas where the protective finish has been removed or damaged.

To any areas showing evidence of rusting, after first removing rust back to clean bare metal.

The conduit system shall be mechanically and electrically continuous throughout its length and shall be complete before any cables are drawn into it.

Conduits shall not be less than 20mm diameter and shall be of sufficiently large sections to allow cables to be easily drawn in or out.

The conduits shall be installed such that they are at least 150mm clear of any hot pipes or other source of heat. Additionally conduits shall be a distance of at least 13mm from the pipework of any other service.

All conduits shall be protected from the ingress of moisture or other foreign matter during the building operations by means of suitable end caps.

Where condensation has occurred in conduits they shall be thoroughly swabbed through and dried out before the installation of any cables in them proceeds.

Conduits shall be fixed by means of grey cast iron distance saddles at intervals not greater than 900mm and at 225mm on either side of bends or from boxes, trunking etc.

Flexible Conduit

Flexible conduits shall be used only for connection to equipment subject to vibration or on equipment that requires to be positioned during running adjustments. No single length shall exceed 450mm.

Flexible conduit shall be of the single leaded steel, bitumen infused paper lining, plain paper interleaf type with outer covering of PVC 'Kopex' Type LS/1/PVC as manufactured by Uni-Tubes Limited.

Circuit protective conductors shall be drawn into all flexible conduits to earth bond equipment, accessories etc. to which the conduit is connected.

Flexible conduits shall be kept as short as reasonably practicable as, in any case, shall not exceed 450mm.

Cable Trunking

Cable trunking shall be manufactured from 1.6mm thick galvanised sheet steel and shall be complete with all accessories to form a complete trunking system.

The trunking lids shall be removable over the whole length of the trunking system and shall be fixed by means of screws into either purpose threaded bushes fixed to the return edge of the trunking or to bridge pieces. Turnbuckle type fixings will not be permitted.
Adjoining lengths of trunking and connections to angle and tee pieces shall be correctly aligned and joined by means of internal connecting sleeves attached by means of screws passing through clearance holes and fitted with shake proof washers and nuts.

Two pairs of screws on either side of the joint shall be connected by tinned copper links with locking washers and nuts. Any areas on the trunking where its finish has been removed or damage shall be made good with zinc metallic paint.

Where trunking is used for vertical runs it shall be fitted with internal cable supports at 600mm centres to relieve the cables from strain.

2.18 LIFT CARS, DOORS AND EQUIPMENT

Lift Cars

Generally lift car(s) shall be of all sheet stainless steel with ‘Darvic’ or equivalent closed joints or a combination of timber panelling and sheet stainless steel construction and suitably finished unless otherwise stated in the Schedules. Each car shall be carried in a car sling fabricated from rolled or pressed formed steel members provided with adequate bracing to support the platform and car enclosure. The car sling shall be sufficiently rigid to withstand being suspended by wire ropes and the operation of the safety gear with a fully loaded car without permanent distortion of the car and to carry a live load of 25% above the contract load. No part of the enclosure sheeting shall transmit any tensile stress between the frame and lifting ropes.

The car(s) shall be effectively isolated from all sources of vibration by fit for purpose compliant mountings.

Internal car finishes shall be as indicated in the Particular Section.

Car finishes shall be applied at the Contractors works. The estimated weight of each lift car shall be given by the Contractor as part of the tender return; the actual weights shall be indicated on the Test Certificate on Completion of the installation. The internal dimension of each car shall be as defined in the Schedules.

The interior finishes for lift cars shall be as follows:

a) The car platform shall be of an all steel minimum 6mm steel plate, construction bolted into the car sling frame. For details of the floor covering, refer to the particular section. Ensure all fixings are tamperproof.

b) Enclosure walls shall be suitably finished as defined in the Schedules - 10mm sealed MDF timber backing for laminates in a steel panelled car and rigidised stainless steel with ‘Darvic’ filled closed joints for a steel panel constructed car.

c) The ceiling of zintec steel panel construction shall be finished in powder paint white and incorporate unless otherwise defined in the schedules, vandal resistant fluorescent luminaires to give an average illumination of at least 100 lux as per BS EN 81-70, lux level requirement for the lifts BS EN 81-70 specified will be 200 lux at floor level and emergency lighting as specified elsewhere in the specification.
Car and Landing Doors

All the lift entrances shall be protected by heavy-duty constructed power operated solid doors as defined in the particular section. A minimum of 1 hour fire rating is required.

The heavy duty doors shall be from the GAL range.

Toe guards to be painted yellow.

Door Construction/Box Design

Construct each door panel from sheet steel box design with ‘U’ profile ribs to produce a strong rigid flat door panel(s).

Front skin shall have a fair face finish of rigidised patterned stainless steel 316 of 1.5mm thickness. The front nosing, mask and leading edge of the door shall be all one piece that folds and returns back to fix to the back panel.

The mask on the leading edge on the fast or front door shall extend out to align with the sill edge to close out the gap between the back panel and the sill edge.

On the car fast door, the mask will be extended out but stop short of the sill edge so that the entrance sensitive edge unit can be bolted to the car door. The sensitive edge unit shall be full height of the door and fill the gap between the mask and the sill edge.

Back skin of the door will be made from 1.6mm Zintec sheet steel.

Ribs between the front skin and the back skin vertical 1.6mm zintec ‘U’ profile ribs shall be fitted.

Vision panels are not required.

Each door panel shall have a minimum of two blocks at the bottom to carry the bottom track guide shoes (jibs).

A stainless steel full width of door safety flange projecting into the door track with door track being affixed to flange must be provided. There shall be no need to lift or remove the door to enable the block or kicking plate to be replaced.

RIVNUTS’ shall not be used in the panels to fix the door furniture items.

Door Hanger

Provide each door panel with a minimum of two steel /nylon tyre suspension rollers / wheels running on a continuous door top-track / hanger. Incorporate sealed bearings of a readily renewable type. Ensure suspension rollers remain engaged with the door top-track / hanger at all points in the travel of the door panel.

At the head of the door panel reinforced 8mm thick metal plates shall be welded to the door back panel each with M10 tapped holes to receive the GAL door hanger fixing bolts. At the mid point 8mm thick plates shall be welded in to enable the GAL spring door closer and GAL coupling assembly to be bolt fixed securely.
Bottom Track

The bottom track shall be made from phosphor bronze alloy securely fixed onto a steel fabrication sill support assembly, inclusive with a steel toe guard. The track shall have slots punched in at the end of the door close position to enable debris in the track to fall out. Section of unused track shall have a blanking cover plate or track insert. Slow door track only.

The GAL landing door bronze tracks are to be supported with a full length landing support sill of minimum 5mm thickness.

Top Track

The top track shall be a GAL top track fabrication. The track shall be bolt fixed at the ends into a steel landing door frame constructed from roll steel angles. All treated against corrosion and finished in grey machine paint.

Car Operating Panel (COP)

Each car shall contain a flush mounted composite stainless steel fully automatic push button control station. The station panel shall be of the type incorporating call acceptance indicator and shall commence the operation of the lift to the floor level selected. The size and style of the COP shall comply with the requirements of Part M of the Building Regulations, BS8300, EN81-70, unless otherwise stated in the ‘Particular Lift Requirements’.

All push buttons are to be Liftstore US91–EN Compact 2 (tactile) with black contrasting background with 24 volt dual blue illumination.

In addition to the “landing selector” buttons detailed in the Schedules the car operating panel shall be fitted complete with the following (unless otherwise defined elsewhere): -

- a) An alarm push button (connected to a remote telephone monitoring station and local bell non-illuminated).
- b) A ‘door hold open’ key switch (for loading purposes).
- c) Door close button.
- d) Overload buzzer (can be achieved via speech synthesiser or an independent buzzer)

The key operated Door Hold switches shall only operate when the key is inserted and captive, withdrawal of the key shall close doors. The switch shall be labelled “car preference”.

The floor push-buttons to be tactile with Braille markings to as to correspond with the floor designations.

The push buttons shall also to be dual illuminated such that they are: -

- Semi illuminated when a call is in the system.
- Fully illuminated when a call is placed.

Ensure operation of the “Door Open” push button causes the doors to open or to reverse if already closing when the lift is stationary at a landing.

Ensure operation of the “Alarm” button sounds the lift alarms.
Allow secure access to car control station for maintenance purposes.

Illuminated, matrix style car position indication panels shall be provided in the lift car to indicate which floor is being passed during travel.

LCD type indicators shall be used – white on blue.

Prior to manufacture the Contractor shall submit for comment drawings detailing the various car panels.

Provide flush mounted duplex voice communication system with speakers/microphones behind flush perforated stainless steel panel to fully comply with the requirements of EN81-28. In lifts for use by the disabled this shall be connected to the Windcrest Auto-Dialler system. Where an existing unit exists it may be used. It shall be supplemented by a low level push immediately above the skirting. Tunstall Telecom to commission. Non disabled telephone systems to be connected to central station, terminated in plant room.

All plate finishes shall be 12SWG brushed stainless steel with tamperproof fixings. All buttons shall be tactile, illuminate with Braille markings and positioned in full compliance with Part M of the Building Regulations, The Disability Discrimination Act and BS EN 81-70.

**Load Plate**

An engraved, stainless steel load plate shall be fixed inside each car to indicate the maximum load in kg and the maximum number of persons to be carried. The Contractor’s nameplate shall be fixed inside each car. These may be incorporated as engravings on the COP.

**Car Ventilation**

Ventilation of the lift cars shall be via high and low level air scoops fixed to the outside of the car. Internal ventilation shall be achieved by reducing the height of alternate side panels to create an air gap.

**Car Overload Detection**

Provide a load weighing device to detect an overload condition within the lift car (where specified).

The Contractor shall install a suitable car overload detection strain gauge switch or pressure switch for hydraulic lifts. The gauge shall be fitted to the car crown bar/rope anchor arrangement. This switch shall override the car movement control and signal an alarm buzzer and electronic message on the car indicator until such time as the overload is reduced.

Note: Alarm buzzer not required if a speech message is generated.

Ensure, upon detection of an overload condition that the overload operates the overload buzzer and indicator system.
Car Top and Car Top Controls

To facilitate maintenance, the car roof shall be of sufficient strength to support two persons without permanent deflection. Fixed walking boards may be provided for this purpose, if deemed necessary by the Contractor.

When the counterweight is at the rear of the shaft the Contractor shall install a guard rail on the ‘car top at the rear of the car. A warning sign shall be posted on the guard rail advising all of the counterweight position.

A guard rail shall be fitted to the back or sides of the car should there be over 300mm excessive clearance between the car and the shaft walls.

A “test” limit switch associated with this car top control shall be arranged to stop each respective car when moving in an upward direction not less than 1.8m below the top of each lift shaft, or other obstruction.

It shall not be possible, by the operation of the maintenance controls, to move the lift car beyond the top test limit or the bottom terminal floor limits.

A car top control panel to BS7255:2001 shall be mounted on each car top in an easily accessible position within 1000mm from the landing edge for use by maintenance engineers. The shrouded buttons shall be clearly marked “UP”, “RUN” and “DOWN” and shall operate the respective lift at controlled speed by the continued depression of the buttons. When pressure is released from the buttons the respective control circuits shall be broken. Each car top control station shall be accessible from the top floor landing entrance with the landing doors open and the car top level with the floor.

There shall be a shrouded “changeover” switch fitted on each control panel, one position “NORMAL” and the other position “INSPECTION”. When “Inspection” is switched on all landing, car “call” controls shall be isolated, with the exception of the ‘Stop’ controls. Alongside the respective maintenance buttons, a shrouded “Stop” switch shall be fitted, this shall be clearly marked “EMERGENCY STOP”. The stop switches shall be of a distinctive pattern.

The maintenance controls shall be arranged to operate each lift at a speed not greater than 0.63m/s.

A 13 amp 3-pin RCCD protected socket outlet, fused at 5 amp, shall be fitted on the top of each lift car by the Contractor. The supply for this socket outlet shall be independent to the lift installation supply, with a residual current device provided by the Contractor within the local distribution board.

A permanent compact fluorescent light, having its own independent switch, shall also be fitted on top of each lift car. These lights shall be suitably protected by a wire cage or similar. An emergency light feature shall be fitted in case of power failure powered by an inverter that will also operate the alarm sounder.

All car top controls, etc. shall be mounted in a suitable metal control console, positioned above the level of each car top.

The car top control shall be installed to meet the requirements of BS7255 “recommended enhanced layout”.

The contractor shall supply and fit an engineer’s emergency communication system that has intercom links to the pit, car and machine room. A second control shall also provide an audible link to a 24 hour manned Windcrest station.
Safety Gear

A suitable bi-directional safety gear system shall be provided either on top of or beneath each lift car, the position being determined by the existing depth of the pit or the available shaft headroom.

Bi-directional safety gear is not required on gearless motor installations when the brake is in compliance with EN81-1 as regards to an approved method of protection against uncontrolled upward movement.

The safety gear shall operate to stop and sustain the respective lift car with contract load in the event of failure of all suspension ropes, or over-speeding of the car in either direction, etc. The safety gear shall be designed to grip each guide face and operate on both car guides simultaneously, in both directions of travel, in compliance with EN81.

Unless otherwise stated in the Schedules the safety gear shall be as follows:

a) All passenger lifts shall be fitted with safety gear, which shall be of the ‘governor’ operated type with gradual wedge type safety gear mounted either on top of or beneath the car frame. After operation, the gear is to be reset by raising the car by its own power or by hand winding of the main ropes.

b) Fit appropriate information plates to over speed governors and safety gear.

c) Instantaneous type to be used on lifts with contract speeds not exceeding 0.63m/sec.

d) Progressive type to be used on lifts with contract speeds above 0.63m/sec.

e) The manufacture design of the safety gear shall conform to EN81-1 section 9.8.

Overspeed Governor

A governor shall be provided for all passenger lifts that have a safety gear fitted. The governor assembly shall consist of a return tension weight assembly pit mounted, a car top rope hitch/torpedo release continuous rope.

The governor trip action can be either the a) rope grip design, or b) friction wheel action. Test groove to be included.

The tripping of the governor shall be as laid down in EN81-1 section 9.9.

Landing Entrances

The Contractor shall supply and fit all entrance surrounds including locks, indicators, call stations, fireman’s control, full architraves and slam posts, etc. to landing doors, to completely seal off the landing entrances.

It is considered that Fascias are also required when the landing sill/frame etc projects 120mm into the lift shaft.

Fascias manufactured from sheet steel with a minimum thickness of 1.6mm shall be provided to the entrance elevation of the lift shaft. Fascias shall extend from cill to header between all floors to give a flush shaft over the complete lift travel including overruns. Fascias shall extend a minimum of 100mm either side of the clear lift door opening.
The fascias shall be of rigid construction adequately braced and fixed to the lift landing cills and headers by flat head machine screws. Fascias shall be hot dipped galvanised with on site cut ends painted with a zinc rich solution or 'Zintec' powder coated yellow.

Where a lift car is provided with entrances on more than one side, fascias shall be provided for each face of the shaft with an entrance.

Provide door locks type-tested in accordance with BS EN 81-1 and 2 Annex B.

Permanently mount the landing door lock rollers, or equal device, on the well side of the door.

Take precautions to ensure correct car and landing door engagement within the door-unlocking zone irrespective of the wear, which may be expected to occur to the mating parts in normal service.

Provide each landing entrance with emergency unlocking device positioned on the well side of the door, with access from the landing side via an access hole and escutcheon. Ensure device and its unlocking key/tool are common to all entrances. Provide the unlocking key/tool aperture in the landing door at a maximum of 2000 mm above the landing finished floor level.

Provide duplicate keys/tools to the Contract Administrator for distribution.

Ensure when closed, the clearance between panels or between panels and jambs, headers, sills etc., does not exceed 6 mm at any position.

Couple car entrance doors with the landing entrance doors in the door unlocking zone by means of a fixed clutch (GAL/unlocking type range), permanently fixed to the car doors, which will engage with the landing doors when the car doors are driven open by the operator.

Provide protection devices of the type specified in the Schedule, to reverse the closing motion of the doors should the protective devices contact or sense an obstruction during closing.

Ensure the electronic protection devices are effective over the full height and travel of the doors.

The shaft side of each landing door shall be identified with a floor number 200mm high letters.

Spring tension door closers of the GAL type shall be fixed to each landing door.

Ensure the electronic protection devices and cloaking panels do not encroach into the running clearance and clear entrance opening.

Ensure, during closing, if the doors encounter an obstruction which has not operated the door protective devices, that the force needed to prevent door closure does not exceed 150 N.

Adjustable door buffer posts shall be fitted one at the bunch side.

On hospital lifts the landing doors when fully open must open 15mm minimum clear behind the line of the architrave and car entrance trim, to protect the doors from damage by trolleys/trucks etc. entering or leaving the lift car.
Landing Architraves, Frames and Cills

Remove entrances, architrave panels, door panels, track, sill, header, jamb and frame and fit complete new assemblies.

Landing architraves and lift car entrances must not have 2 radius edges meeting. Typically headers are to overlap side stiles by a minimum of 5mm, preferably 10mm.

All ends of architrave headers are to be filled and polished, no open ends.

Floor designation plates are to be fitted to all landing architraves and positioned on the left hand side of the architrave, close to the top.

Lift identification plates are to be fitted to all landing architraves and positioned on the left hand side of the architrave, close to the top.

Fire Resistance

Design, construct and install each door panel, track, sill, header, jamb and frame, etc to provide a complete landing entrance assembly with a minimum certified fire resistance as specified in the schedules when tested in accordance with BS EN 81-58.

Doors tested to BS476 part 22 are acceptable in the UK as being equivalent to BS EN81-58.

Test methods and criteria for the fire resistance of elements of building construction.

Provide certification of satisfactory type completion of fire test to the Contract Administrator.

Landing Control Stations

At each landing level the Contractor shall supply and fit a ‘landing call’ station.

All push buttons are to be Liftstore US91-EN Compact 2 (tactile) with black contrasting background with 240 volt dual blue illumination.

Full collective system shall comprise a single button for ground and top floors with twin buttons for intermediate floors.

Down collective and non-selective systems shall require a single ‘call’ button on each landing. The “call” button units shall be dual illuminated halo style DDA compliant. The faceplates shall be satin finish stainless with rounded rolled edges minimum 12swg thick.

Landing indication

At each landing level the Contractor shall supply and fit landing position and direction indicators 1800mm to 2500mm above the finished floor level. Indicators to have DDA compliant direction sounders.

Landing indicators are to be surface mounted angled type, fitted with and LCD indicator, white on blue, and positioned above each landing entrance.
The “call” acceptance dual illuminated indicator shall remain fully illuminated until such time as
the lift has levelled at the floor issuing the call; the illumination shall reduce to the primary
lighting level after the call has been answered.

2.19 GUIDES

Car and Balance Weight Guide Rails

Guide rails for each car and (in the case of traction drive) balance weight shall be of machined
steel tee-bars of the type detailed in BS EN 81-1 and 2 and shall be securely attached to rigid
brackets provided and fixed by the Contractor such that deflection of same shall not exceed
3mm under normal conditions.

On modernisation projects round guide and brackets shall be removed and replaced with
suitable sized T guide and brackets (submit calculations).

All necessary brackets, fixings, etc. for guide rails and guide brackets shall be provided by the
Contractor. The guide brackets shall under no circumstances be secured by wood or fibre
blocks or plugs and any shimmer packers shall be of metal.

All guide rails shall have interlocking ‘tongue and groove’ joints bolted together with machined
steel fishplates affixed to both sides of each joint, and when fixed must be true, parallel and
plumb. The tongue shall point up the shaft.

Fishplates for joining guide rail sections to each other shall be secured by appropriate nuts and
bolts in accordance with the Specification.

Guides and their fixings shall withstand the application of the safety gear when stopping in
either direction a fully loaded car or counterweight (should a safety gear device be fitted to the
counterweight). Sole plates shall be fitted to all guides. The guide securing clips shall be of
malleable iron/steel forging, and shall be so designed that rotary movement of the clip will not
release the guide.

Guide rails are to be fixed at pitches in accordance with EN81 – Annex G for both traction and
hydraulic lifts. Where possible the fixings shall be so positioned that they are opposite the guide
shoes when the car is level with each landing. The top bracket shall be located not more than
300mm from the top of the guide. Where existing guides do not comply with this requirement,
additional fittings shall be installed.

Guide rail lubricators shall be fitted to the top guide shoes of car and counterweight. These
lubricators shall distribute oil evenly to the guide rails, the rate of feed being adjustable by
means of regulating screws.

All guide rails shall have an oil catch tray fitted in the pit except where roller guide shoes are
fitted.

The Contractor shall electrically bond the guide rails at the base of each shaft in accordance
with BS7671 1992 by means of multi-stranded PVC insulated copper cables and bolted
connections.
Guide Shoes

Car guide shoes shall be fitted at the top and bottom of the car frame and shall be spring loaded, self-lubricating with plastic inserts, and designed to give smooth and quiet running under all conditions of load.

Guide shoes for both car and counterweight shall be cast iron or drop forged steel with easily replaceable anti-friction running faces of nylon or equivalent material.

On contract speeds of 1.6m/s and above roller type guide shoes shall be used.

Counterweight

The counterweight shall be designed to balance the lift car plus 50% of the contract load.

The counterweight frame shall be a manufactured design constructed from rolled steel channel uprights with steel plate cross panel making up the yoke and cradle portion of the complete welded frame assembly.

On direct rope designs the yoke shall have a wedge anchor rope fabrication sub assembly.

On indirect rope design the yoke will house a full sheave assembly with a fixed shaft key plated in situ and rope retaining pins across the frame. Guide shoe bracket shall be fixed at each corner of the frame.

The cast iron filler weight shall sit inside the frame between the yoke header and the cradle base unit. The ends of the fillers shall key into the inside of the channel uprights. An angle horizontal shall span across the channel upright side members to hold the fillers in place.

The whole frame and fillers shall be anti-rust treated and painted yellow suitable machinery paint.

Buffer plate(s) shall be welded across the underside of the cradle bottom assembly.

On modernisation lift projects, if the existing counterweight is a full cast yoke and cradle with two vertical tension rods, it shall be replaced. A new frame and weights shall be supplied as set out above.

Where a spring suspended counterweight is employed, the suspension rods shall be suitably bushed where they pass through the steel frame to avoid chaffing.

A sheet steel guard is to be fitted in the lift pit to enclose the counterweight up to a height of 2.5m from the pit floor.

On lifts serving four or more floors, an additional halfway counterweight screen shall be fitted at mid-travel where car and counterweight pass, only when the counterweight is at the rear.

Where two or more lifts are installed in a common shaft the Contractor shall install a full height screen of 10 SWG, galvanised steel mesh fixed between the lifts. The mesh gauge shall not exceed 30mm.
Ropes and Suspension

Ropes shall be flexible steel ropes of approved safety and shall be in accordance with BS302 with a safety factor of not less than 12. Ropes shall be ordinary lay unless otherwise agreed, with the appropriate test certificate.

No car or counterweight ropes shall be spliced other than for the purpose of attachment to the car, counterweight or anchorage and terminated in an appropriate manner such as filled sockets, self-tightening wedges, etc. to comply with EN81.

For types of rope, chains and respective safety factors refer to EN81: Parts 1 and 2.

Use not less than four steel wire ropes for lift suspension.

Ensure each rope is independent and is not less than 10mm in diameter.

Supply test certificates for each rope. After rope testing, deliver to site on a reel.

The method of roping shall be suitable for the type of drive selected, load and speed characteristics. An approved method of rope equalisation shall be provided and confirmed with roping method selected in the respective Schedule.

Rope gather blocks shall be used to space out the ropes to prevent rope slapping and gather ropes in as they lift or counterweight draws near to the shaft ceiling.

FOR HYDRAULIC LIFTS: When indirect direct jack units are used the Contractor shall provide appropriate safety devices (if the risk of slack rope, or chain, exists). This safety device shall stop the machine. Effective precautions shall be taken by the Contractor against ropes leaving their respective grooves or objects lodging between groves.

Anchorage

Ensure all anchorage devices comply with the relevant British Standard Specification.

Provide car and counterweight rope anchorage bolts of the screwed shank type incorporating self-tightening wedges and heart-shaped thimbles. Use a minimum of four rope clips per rope end on eyebolts. One bulldog grip to secure the rope on wedge anchor assemblies.

Provide car rope anchorage bolts incorporating rubber isolators under the car frame anchorage plate. Rope tension springs shall be fitted to one end only preferably the counterweight ends.

Deflector Sheaves

Provide new car and counterweight deflector sheaves including all support steelwork.

Multiplying pulleys, when fitted to the top of the car and counterweight, shall have effective guards fitted for the protection of maintenance personnel, and the guards shall be provided with effective handholds.

Ensure all sheaves are of minimum 40:1 ratio, sheave diameter to rope diameter.

Fit suitable steel guards to prevent any of the lift ropes from jumping out of the groove and any falling object from causing a lifting rope to leave the pulley.

Note: On MRL lifts the diverter sheaves are made of a plastic material identified as ‘Optamid’ to reduce weight and thus improve efficiency and energy saving.
Car and Counterweight Buffers

Lifts shall be provided with buffers at the bottom limit of travel of the car and counterweight. On hydraulic lifts the buffers shall be below the car.

Buffers shall be either:

- Energy accumulation type.
- Energy dissipation type.

Energy accumulation type buffers are either polyurethane compound design or spring type with linear or non linear characteristics. They shall only be used for lifts with rated speeds up to not exceeding 1m/sec.

Energy dissipation type buffers, oil/fluidic design, can be used whatever rated speed the lift is. They shall be used on lifts with rated speeds above 1m/sec.nb. On bed lifts the rated speed shall be above 0.75m/sec.

The buffer type used must meet the requirements of EN81-1 section 10.3 and EN81-2.

A data plate should be fitted in a conspicuous position on the hydraulic buffer body/reservoir providing the details of the type, grade, viscosity and quantity of oil to be used.

Test certificates and buffer technical data shall be supplied and inserted in the maintenance manuals.

2.20 LIFTING EQUIPMENT

Machine Plant room Equipment

Each major component, shall be identifiable with the other components of the same lift, i.e. switch fuse, control, cabinet, hydraulic pump unit or electric driving gear etc., these components shall be identified by a stencilled number in a prominent position on the cabinet, enclosure or steelwork as appropriate. For details of lift construction, safety, etc. the Contractor shall refer to the relevant parts of BS 5655 or EN81 is applicable. Wherever possible the requirements of EN81 shall be met.

All component parts of each lift shall be identified by a unique number. The actual numbering of the lift installations shall be consistent with the logical sequence when viewed from the majority of landings. Refer to the Employer for his lift numbering system prior to applying any numbering on site.

Supporting steelwork and lifting beams shall be as follows:

a) The Contractor shall manufacture and supply and fix all necessary supporting steelwork and lifting beams. Existing lifting beams shall be inspected for suitability and replaced if necessary

b) The lifting beams shall be load tested by the Contractor after installation or inspection and appropriately marked with the “Safe Working Load” and “Test before Use”.

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c) The positions and sizes of the above shall be clearly shown on the Contractor's drawings.

The machine plant room(s) equipment shall be arranged to allow reasonable safe access to, and install removal of any part of the lift equipment.

The Contractor shall ensure that appropriate openable floor trapdoors are available for lowering equipment on to a suitable receiving position. Details of these requirements shall be shown on the appropriate general arrangement drawings (where applicable). On existing sites where the trapdoor frame etc is in poor repair and dangerous the contractor shall report this and include monies in the tender for replacing it. Access doors including locks door furniture etc from the roof shall be treated in the same way.

The Contractor shall provide adequate warning notice for trap door(s) i.e. ‘Danger of Falling – Re-close Trap Door’ (where applicable).

Fire stop around ducts/cables/pipe routes to maintain fire integrity.

2.21 SHAFT SWITCHES AND DETECTION DEVICES

General

Automatic 'terminal' limit switches shall be provided for each lift together with an 'ultimate' limit switch fitted and arranged to operate in the event of either one of the terminal switches failing to act.

The 'terminal' and 'ultimate' switches shall be so arranged that the operation of each brings the respective car to rest from full contract speed without the car (or where applicable) balance weight striking the buffers.

Shaft ultimate limit switches shall be used, these switches shall be arranged such that should either one be brought into operation by its respective lift car the car must be moved away from the switch by operating the hand winding unit, or lowering the hydraulic ram (as the case may be) but the control circuit shall remain broken.

The operation, of the ultimate limit switches shall cause a relay in the respective control panel to be tripped; this must be reset manually before the lift can again operate under normal control.

Terminal stopping and shaft ultimate limit switches shall control at least two separate and independent main contactors in the respective controller(s), two of which shall be closed to complete the motor and (in the case of traction drive) the brake circuits for each direction of travel, unless the ultimate limit switch opens the motor and brake circuits and its contacts are directly opened mechanically.
Floor Selection and Levelling (Interfloor)

Tape Head

A tape head shall only be used for lifts with a maximum travel of 30 metres travel and a maximum speed of 1.2 metres per second.

The tape head shall be of the low profile floating detector type mounted on the car top 8-way sensor floating end arrangement.

80mm wide stainless steel tape hanging the full length of the lift shaft with magnets glued to the face. The tape is to be mounted off the main car guides with steel arms and held in place with high tensile tension springs.

The unit shall be installed in strict accordance with the manufacturer’s recommendations.

Digital Shaft Encoder

Mount a 1024 pulse per revolution encoder on the governor or main motor.

2.22 PIT LADDERS

Supply and install a pit ladder to each lift in a position so as to avoid fouling any item of fixed or moving lift equipment.

2.23 LOG BOOK

The Contractor shall provide a log book(s), which shall be kept in the Lift Machine Plant Room(s). All maintenance, breakdowns, adjustments, etc. shall be recorded in the log book(s), which shall be dated and initialled by the Contractors Service Engineer.

2.24 INSPECTIONS

The Contract Administrator will at various stages of the installation inspect the works. In addition, where it is considered by the Contract Administrator essential the Contractor shall make arrangements to allow the Contract Administrator to visit the Contractors works to inspect the manufacturer’s construction/progress of the lifts.
2.25 TESTING AND COMMISSIONING

Off Site Testing

The following equipment for incorporation in the Works will be subject to off-site testing and inspection at the works of the lift maker or of his suppliers and in the presence of the Contract Administrator and/or his representative: -

a) Suspension elements.
b) Lift control panels and supervisory panels.
c) Lift cars and entrances.
d) Landing entrances.
e) Safety gears.
f) Over-speed governors.
g) Ancillary equipment.

Provide the Contract Administrator within ten days written notice of the dates on which matters for incorporation will be ready for off-site testing and inspection.

Include for all facilities necessary for off-site testing and inspection including labour, electricity and water, fuel, stores, apparatus, instruments and other things which are required to conduct the tests and inspections to the satisfaction of the Contract Administrator and/or his representative.

On-Site Testing and Inspection

The Works or any part thereof will be subject to commissioning tests in addition to such other tests and inspections as are required by the regulations noted previously.

Provide the Contract Administrator with seven days written notice of the dates on which things for incorporation will be ready for on-site testing and inspection.

Include for all facilities necessary for on-site testing and inspection, including labour, fuels, stores, appliances, instruments and other things which are required to conduct the tests and inspections to the satisfaction of the Contract Administrator and/or his representative.

Electricity for the purposes of on-site testing and inspection will be provided free of charge by others, as may be reasonably required.

Commissioning and Witness Testing Prior to Entering Service

The lifts controller will be delivered to site with general site parameter programmed in. Ensure the lift is run and the actual site characteristics are programmed into the controller. The factory programmed settings shall not be acceptable without proof of their reliability and accuracy.

Carry out initial tests and examinations following completion of the installation.

Provide the Contract Administrator with fourteen days written notice of the dates on which the installations will be ready for commissioning and witness testing.
Include for all facilities necessary for commissioning and witness testing including labour, consumable fuels, stores, apparatus, instruments, test loads and other things which are required to conduct the tests and inspections to the satisfaction of the Contract Administrator and/or his representative.

Commissioning and witness testing shall include those tests required by the Specification, the regulations noted above and by the Contract Administrator and/or his representative. These shall include, but shall not be limited to:

   a) Demonstration of the operation of all safety devices.
   b) Demonstration of the operation of the lift control system.
   c) Demonstration of compliance with any noise and/or vibration.
   d) Requirements.
   e) Phase failure launching.
   f) Plant room inspection.
   g) Lift shaft inspection.
   h) Lift pit inspection.
   i) Test control unit testing, up down run.
   j) Phase failure.
   k) Phase reversal.
   l) Short circuit test (blow fuse) using a door lock switch furthest away from the control panel.
   m) Earth testing.
   n) Continuity testing.
   o) Up and down floor levelling.
   p) No load, ½ load, full load, 10% over load running test (1/2 load not required on hydraulic).
   q) All stop bottoms tripping.
   r) All door locks tripping.
   s) Top end bottom terminal floor switching tripping.
   t) Ultimate switches tripping.
   u) Governor tension weight switch trip.
   v) Safety gear trip switch.
   w) 1 hour test run.

Provide works and type test certificates for the following equipment, for inspection and retention:

   a) Hoisting ropes.
   b) Governor ropes.
   c) Safety gears.
d) Over-speed governors.

e) Door locks.

f) Buffers.

g) Fire-resistance, etc.

**Failure under Test**

If any of the things, subject to off-site test, or if the Works or any part thereof subject to on-site tests, fail under such test, inform the Contract Administrator immediately in writing. Include for all necessary remedial work or replacement and inform the Contract Administrator, giving seven days written notice, of the dates upon which the things, works or part thereof are ready for re-testing.

Carry out re-testing on the same basis as the original test, but include for all costs associated with the retest.

**Test Reports**

Immediately following tests or re-tests, whether on-site or off-site, provide duplicate copies of all test reports and issue to the Contract Administrator.

The Contract Administrator may require that the test results are recorded on forms provided by others.

2.26 **WORKING LIMITS: VARIABLE VOLTAGE DRIVES AND HYDRAULIC LIFTS**

The car must line sup smoothly and accurately within + 6mm with all landings served when carrying loads from No Load to Full Contract Load in either direction of travel.

The distance between the car and the landing sill nosing edge shall not exceed 30mm running clearance.

2.27 **NOTICE AND NAMEPLATES, ETC.**

The Contractor shall supply and fix the following items in the machine plant room(s): -

A permanent notice shall be fixed to the outside of the motor room door, bearing the wording in lettering not less than 13mm high.

```
DANGER – LIFT MACHINERY
UNAUTHORISED ACCESS PROHIBITED
DOOR TO BE KEPT LOCKED
```

Additional items shall be included as follows: -
a) Hand operating details.
b) Electric shock treatment instructions on a metal base.
c) The Factories Act.

2.28 ACOUSTIC PERFORMANCE

General

The Contractor shall be responsible for the acoustic performance of the lifts themselves.

a) Wherever reference is made to a British Standard (BS) a British Standard Institution recognised equivalent European Standard would also comply. Each type of equipment/material selected shall comply fully with either the BS or the European Standard as follows:

b) BS 6472: Guide to the evaluation of human exposure to vibration in buildings (1Hz to 80z).

c) BS 4142: Rating industrial noise affecting mixed residential and industrial areas.

d) BS EN 60651: Specification for sound level meters.

e) BS EN 6120: Electro acoustics. Octave band and fractional - octave - band filters.

It shall be the responsibility of the Contractor to ensure that all noise and vibration levels specified for internal and external areas are not exceeded due to the operation of the lift installation. Particular consideration shall be given by the Contractor to the following, as applicable:

a) Plant noise transmission to structure via the lift guides.
b) Plant noise transmission to structure via the counterweight guides.
c) Plant noise transmission to structure via the bedplate.
d) Plant airborne noise transmission through the plant room structures.
e) Plant structure borne noise and vibration transmission.
f) Plant noise transmission to structure by operation of doors.

The noise and vibration control equipment shall be the minimum required to meet the specified noise and vibration levels and has been selected to suit the equipment on which the designs have been based.

To ensure that the specified noise and vibration levels are achieved the Contractor shall provide, to his Specialist Manufacturer of acoustic products, details of the plant he intends to install.

A fully documented set of the Specialist Manufacturer’s calculations shall be provided to the Contract Administrator for comment four weeks prior to ordering plant and noise and vibration control equipment. These calculations shall demonstrate that the selected plant and the selected noise and vibration control equipment enable all specified noise and vibration criteria to be achieved. The Contractor shall provide, at no extra cost to the Contract, sufficient noise and vibration control equipment to meet all specified noise and vibration criteria.
The satisfaction of all specified noise and vibration levels shall be demonstrated by the Contractor. Acoustic commissioning tests shall be carried out with all plant and machinery running normally. The measurement of internal noise levels shall be undertaken in accordance with the procedures set out herein. In the case of contractual deficiency, and if requested by the Contract Administrator, the Contractor shall return at any time during the Contract and take additional readings at no additional cost to the contract in order to demonstrate the satisfaction of all specified noise and vibration criteria.

**Internal Noise Levels**

For the Contractor’s guidance noise levels produced within internal areas due to the operation of the lifts service installation shall be less than or equal to the specified noise ratings in Table 1 below.

<table>
<thead>
<tr>
<th>Area</th>
<th>Noise Rating</th>
</tr>
</thead>
<tbody>
<tr>
<td>Inside Flats</td>
<td>NR 30</td>
</tr>
<tr>
<td>External</td>
<td>NR 41</td>
</tr>
</tbody>
</table>

Specifically, the lift installation shall satisfy the following acoustic/vibration requirements and tests shall be carried out accordingly:

- a) Any vibration produced by an element of the lift installation shall comply with BS 6472 to the vibration acceleration amplitudes stated for adjacent flats.
- b) The lift installation shall not generate any noise level greater than 75dBA within the lift well.
- c) The lift installation shall not generate any noise level greater than 78dBA within the lift motor room. When measured one meter away from the traction drive unit or 80dBA when measured one metre away from the hydraulic pump unit.
- d) There shall be no noise level greater than 55dBA generated within the lift car.
- e) Lift entrances shall be constructed so as to limit the level of breakout noise to a maximum of 50dBA at 1m with doors closed and 65dBA at 1m with doors opening.
- f) The Contractor shall allow for demonstrating compliance with these acoustic levels within the witness testing of the lift installation. All sound level measurement equipment to be provided by the Contractor, complete with calibration certificate.

**External Noise Levels**

Noise levels produced at the boundary of the site by the specific installation shall not exceed the environmental noise limits required by the Local Authority.

If noise radiation from any item of plant contains any distinguishable tonal component, or other noticeable characteristic the Local Authority’s noise limits shall be reduced by 5dB(A), as suggested by BS 4142: 1997.
Penetrations in Building Fabric

Where pipe work penetrates the building fabric the pipes shall be suitably sleeved and sealed with dense flexible mastic.

Acoustic Commissioning Tests

The lifts hall be tested a set at a time if multiple or single as appropriate.

This document sets out a clearly defined test procedure for acoustic commissioning tests to establish room Noise Ratings due to the operation of the building environment engineering systems.

All sound measurements shall be complete with all the facilities required to enable the specified measurements to be obtained. As a minimum the sound measurement systems shall include:-

a) The facility to measure using both “slow” and “fast” time weighting characteristics.

b) The facility to measure both “Linear” and “A” weighted sound levels over the frequency range 20Hz to 20 kHz. The accuracy of the “A” weighting filter network shall confirm to the Type 1 requirements of BS EN 60651, or better.

c) The facility to measure octave band filtered sound. The frequency weighting characteristics of the octave filter set employed shall conform to the requirements of BS EN 61260.

The sound measurement system shall be acoustically calibrated in absolute sensitivity at a reference frequency of 1000Hz. The calibration of the sound measurement system shall be performed immediately prior to, and immediately following, each series of test measurements. Any variations in sensitivity of greater than 0.5dB shall be recorded.

In order to minimise the effects of extraneous background noise, all sound readings shall be taken with the test area of the building evacuated, with the exception of essential test personnel. In addition every effort shall be taken to minimise external noise intrusion to the building.

a) All sound readings shall be taken under the two following conditions:-

b) All specific plant and machinery running normally.

c) All other plant and machinery switched off (background noise only).

The sound level in each octave frequency band from 63Hz to 8000Hz inclusive shall be recorded at each measurement location. In addition, the overall “A” weighted sound level shall also be recorded at each measurement location.

All sound readings shall be made with the sound measurement system set to either the “Slow” time weighting, or set to “Leq” (equivalent continuous) if this facility is available.

In each area of the building tested sound readings shall be taken at a minimum of 5 separate locations except where the room has a floor area of less than 9m².

The 5 measurement locations shall be chosen such that:

a) No measurement locations shall be closer than 1.0m from any surface, including walls, floor, ceiling, desk or partition.

b) No two measurement locations shall be closer than 1.0m to each other.
c) No measurement location shall be closer than 1.0m to any ventilation system diffuser or grille.

d) Where the room has a floor area of between 4m² and 9m² two measurements shall be taken, and where the floor area is less than 4m² one measurement shall be taken. These measurements shall be taken standing head height (1.8m above floor level).

The octave band sound readings in each area shall be averaged over all measurement locations in that area. The average sound level in each octave frequency band shall then be plotted on a standard octave band Noise Rating (NR) curve. Both the background noise levels and the system’s + background noise levels shall be plotted on the same NR curve.

Where the system’s + background noise level minus the background noise level lies between 3dB and 9dB in any octave frequency band, the effects of the background noise shall be accounted for in the evaluation of the system’s noise. The corrected system’s noise level shall be used to check for contractual deficiencies in that area.

Where the system’s + background noise level minus the background noise level is less than 3dB, then an accurate evaluation of the system’s noise is not possible. In such cases in the event of contractual deficiency, the sound readings shall be deferred until the background noise decreases to at least 3dB below the system’s + background noise, (e.g. during the evening or night time periods).

The state of interior finish of the test area during the noise measurements will affect the measured noise levels. Where internal areas are not fitted out as per the occupied building, a correction factor (C) shall be added to the measured internal noise levels according to the equation.

\[
C = 10 \log_{10} \left(\frac{T_f}{T_u}\right) \quad (1)
\]

T_f is the measured or calculated reverberation time for the fully fitted out internal area under consideration;

T_u is the measured or calculated reverberation time for the internal area under consideration at the time of the acoustic tests.

The correction factor, C, shall be applied separately at each of the frequency bands measured. The correction factor shall not be applied in cases where the measured noise level is dominated by direct rather than reverberant noise.

2.29 OPERATING AND MAINTENANCE DOCUMENTATION

General

Operating and Maintenance documentation comprises Operating and Maintenance Manuals, and Record Drawings and includes those notices and drawings noted herein.

Provide draft copies of operating and maintenance documentation for comment by the Contract Administrator not less than four weeks before the date on which it is proposed to carry out the commissioning and witness tests.

Include for any subsequent revision and resubmission of the documentation as required by the Contract Administrator.
Provide final copies of the operating and maintenance documentation to the Contract Administrator within twenty-one days of satisfactory completion of the commissioning and witness testing.

Provide copies of the operating and maintenance documentation in triplicate.

**Operating and Maintenance Manuals**

Provide Operating and Maintenance Manuals of A4 size held within hardback ring binders and on CD in an acceptable and agreed format, e.g. pfd, e-mail format to be agreed. Include the following: -

a) Description and identification of the lift(s).

b) Description of the lift control and drive system, including flow charts and circuit diagrams to illustrate the sequence of events.

c) Details of all safety circuits and their effects.

d) General instructions on fault diagnosis, trouble-shooting and remedial work.

e) Procedure for manual hand winding or hand lowering of the lift.

f) Procedure for the release of passengers trapped within the car.

g) Lubrication schedule, with list of recommended lubricants.

h) Maintenance schedule.

i) List of recommended spare parts that would normally be required to be replaced due to fair wear and tear or those considered essential to maintain a lift in service.

j) Copies of all relevant works, type, and site test certificates including hoisting ropes, governor rope, locks, buffers, motors, gears, governors, safety gears, fire-test certification, etc.

**Record Drawings**

Provide reproducible negative copies of each record drawing, A1 format.

Provide copies of the following: -

a) General Arrangement drawings of the lift installation - “As Installed”.

b) Wiring Diagrams of the lift installation - “As Installed”.

“Typical” or “Model” General Arrangement drawings or Wiring Diagrams will not be accepted and drawings to be provided on CD in an agreed format as well as paper version. All drawings then provided in AutoCad as per the Colleges Standard.
Instruction

Include for the instruction of selected members of the Employer’s staff to fully acquaint them with the correct operation and routine maintenance of the lift. Include all aspects of breakdown procedure and the release of passengers trapped within the car.

Include for a total of one half day instruction.

Instruction of the Employer’s staff will take place on site following satisfactory completion of the witness tests.

2.30 ELECTRICAL PLANT AND APPARATUS

General

The Contractor shall ensure that all plant and apparatus for incorporation in the Works, complies with this Specification, is in new condition when received at Site, is protected from damage prior to installation and is left clean and in good condition when installed.

The position of all plant and apparatus shall be marked by the Contractor and the position agreed by the Employer or the Contract Administrator before the plant and apparatus is fixed.

All plant and apparatus shall be suitable for operation on a supply system of 230V single phase 50Hz of 400V three phase 50Hz as appropriate and the Contractor is to confirm the voltages when ordering the plant. For motive power single phase plant will not be allowed for rates duties of 0.75 kW and above.

Switchgear

Fuse switches and switches shall be manufactured from rust protected sheet steel and be finished in stove enamel. They shall have removable top and bottom end plates, have gasketted doors and comply with BS 5419.

Distribution boards shall be fully shrouded type to comply with BS 5486 requirements and shall house miniature circuit breakers. A 25% spare capacity shall be provided in each distribution board.

HRC fuses to BS 88 shall be fitted in the main switchgear. The fuses shall be suitable for use on a 400/230V 50Hz A.C. system, shall have a breaking capacity of 46 kA and shall provide close excess current protection, having a fuse factor not exceeding 1.5 i.e. Class Q1.

All switchgear shall be of approved manufacture and shall be purchased from the manufacturer or his accredited distributors.

All circuit breaker distribution boards and main switchgear shall be totally enclosed metal clad in accordance with current British Standard Specifications. Finishes which may subsequently deteriorate and result in rusting when located in positions liable to dampness will not be accepted.

Distribution boards shall NOT be mounted with their centres more than 2.4m from floor level unless otherwise stated in the Drawings and/or the Particular Specification.
If the Contractor does not comply with this requirement he will be required to remove and re-fix
distribution boards at the required lower level and shall re-cable the installation to the extent that
is necessary, as no joints will be accepted for such alterations.

Distribution boards shall be single, double or triple pole with or without neutral as required in the
Drawings and/or the Particular Specification.

Where a neutral bar is required it shall be fitted with terminals to enable neutral conductors to
be connected in the same order as live conductors. In all cases the neutral terminals shall
 correspond in numbers to the number of single pole ways (or equivalent if a double or triple pole
board).

All distribution boards shall be provided with earth bars. The number of ways on each shall be in
accordance with the drawings and/or the Particular Specification and as generally described
above.

All fuse switches and switch fuses shall be fitted with protected type fuses on the live pole. On
the pole connected to the neutral point of the system, they shall be fitted with a substantial
neutral link suitably drilled and fitted with pinching screws for outgoing cables. The various
circuits controlled shall be clearly marked inside the cover.

Ample space shall be provided in enclosures and panels for wiring and any fillets for dividing
purposes shall be in fireproof non-warping material.

All control gear shall be clearly labelled as specified below to identify its function and labelling
details shall correspond with schematic drawings.

**Motors**

Each motor shall be of the squirrel cage pattern unless otherwise approved and be suitable for
the application envisaged. It should be noted that the majority of motors supplied under this
contract will be required to be in operation 24 hours a day, 7 days a week.

All motors associated with the mechanical engineering equipment are to be supplied by the
manufacturer of the equipment concerned.

Motors generally shall be totally enclosed unless specifically stated otherwise for the particular
motor concerned. All motors are to be of industrially silent pattern.

Each motor shall be continuously rated and be capable of developing the necessary brake
horsepower at the required speed, running without causing noise or hum under all conditions of
loading. All motors are to be suitable for operation in dusty and damp atmospheres and the
windings shall be suitably impregnated to withstand these conditions and have not less than
Class ‘E’ insulation.

The bearings shall be of the self-oiling sleeve pattern and where necessary be provided with oil
level indicators and drain plugs. Extended lubrication pipes are to be fitted to bearings fitted
behind wire guards in order that re-oiling can be carried out whilst the unit is in service. Vertical
mounted motors are to have special end thrust bearings. The design of bearings must be such
that it is impossible to overfill the oil sump so that oil flows into the windings.

If single phase capacitor motors are supplied, the condenser unit shall be incorporated in, or
mounted on the motor casing in an accessible position.

Terminal boxes are to be ample size and be mounted in accessible position, be of cast iron or
other suitable materials and arranged for the reception of a minimum 20mm screwed conduit.
Flange coupled, or belt driven pump motors are to have the appropriate pulleys or flange couplings fitted at the motor manufacturers' works.

All necessary slide rails, foundation bolts, nuts and washer are to be provided with each motor.

Certificates of the motor manufacturers’ type tests are to be supplied to the Contract Administrator in duplicate. Approval of the certificate is to be obtained before despatch of the motor from the manufacturers’ works.

If not installed within the buildings or totally enclosed plant rooms, the motors are to be fully weatherproof, or are to be installed in suitable weather-tight enclosures provided by the Contractor.

A red mushroom headed emergency stop button with lock-off facility shall be installed adjacent to each motor.

**Motor Starters and Control Gear**

**Direct-on-Line Starters**

Direct-on-line starters are to be used for control of equipment having a rating of less than 7.5 kW.

They shall be of the air break type and comprise a magnetically operated contactor to connect the motor directly across the mains. Each starter is to be fitted with approved pattern adjustable overload trips for each phase, an inherent no-volt release, single phase preventer, (where appropriate), start/stop push buttons, and an associated lockable isolator. Ammeters are to be provided only where specified. The appropriate number of auxiliary contacts for control, identification, etc. functions shall be provided.

**Star Delta Starters**

Star Delta starters are to be used for the control of equipment having a rating of 7.5 kW and above.

They shall be of the air break, automatic type, and comprise the necessary number of magnetically operated contactors to change from ‘star’ to ‘delta’ connections, by means of a time delay adjustable between 3 and 20 seconds.

Each starter is to be fitted with approved pattern adjustable overload trips to each phase, and inherent no-volt release, single phase preventer, start/stop push buttons, and an associated lockable isolator. Ammeters are to be provided only where specified. The appropriate number of auxiliary contacts for control, indication, etc. functions shall be provided.

All motor control gear shall be of metal clad construction. When starters or isolating switch gear are supplied by others for use with equipment which they are supplying (such as circulating pumps, etc.) the gear supplied shall be fixed by the Contractor.

The Contractor will be responsible for correctly setting the trip ratings of starters, etc. to protect safely such equipment.

Any other motor control gear which the Contractor is required to provide and fix shall be in accordance with the Particular Specification.
Connections to electric motors shall be by means of cables in flexible conduit or armoured cables.

All motor control gear and isolator switches shall be clearly marked, to indicate the plant they control and their function.

Neon pilot light switches shall be of a type which will not permit removal of the lamp, without removal of cover, i.e. it must be impossible to have a free opening left to the live lamp holder.

2.31 CONDUIT AND FITTINGS

Solid drawn conduits shall be mild steel, galvanised, heavy gauge to BS 4568 and jointed with solid screwed couplings where exposed, elsewhere it shall be enamelled.

Surface conduits shall be fixed by means of single unit distance type saddles, spaced as indicated in the following table and 230 mm both sides of bends and sets:

<table>
<thead>
<tr>
<th>Size of Conduit</th>
<th>Maximum Spacing Distance</th>
<th>Straight Runs</th>
</tr>
</thead>
<tbody>
<tr>
<td>20mm</td>
<td>1200mm</td>
<td></td>
</tr>
<tr>
<td>32mm</td>
<td>1500mm</td>
<td></td>
</tr>
<tr>
<td>35mm</td>
<td>2000mm</td>
<td></td>
</tr>
</tbody>
</table>

No conduit smaller than 20 mm diameter and no manufactured elbows, bends or tees shall be used except by the express permission of the Contract Administrator.

Where new conduits are to be connected to an existing imperial sized system manufactured imperial/metric adapters shall be used.

Conduits are to be run, where possible, without too much disturbance to the structure, decorations etc. in floors, roof voids, etc. and where conduits are to be buried in the finish of walls, columns or other vertical surfaces, all conduits shall run vertically only and shall be securely fixed with crampets.

Where conduit systems are installed in floor, roof or other voids a ‘loop in’ system using back entry ‘loop in’ type conduit boxes shall be used.

When conduits are run on surfaces they are to be securely fixed by means of steel hollow back spacer bar saddles, having the saddle fixed to the bar by roundhead, non-ferrous screws, so that the conduit is spaced not less than 3 mm clear of the surface.

Each conduit shall be of adequate size to ensure that the number of cables installed does not exceed the appropriate total cable factor as set out in the IEE Regulations for Electrical Installation 17th Edition (BS 7671).

All boxes which form part of a conduit system shall be securely fixed to walls, etc. by means of at least one screw passing through the base of the box and all screws used for fixing conduit and accessory boxes shall be of the round head non-ferrous type.

The conduit and accessories of a conduit system shall be mechanically continuous throughout the system and shall be erected complete before the drawing in of cables is commenced. Every conduit system shall be so installed that it may be rewired without difficulty.

The inside surface of all conduit boxes and other accessories in the system shall be smooth and free from burrs. Where conduit is cut and/or threaded both internal and external burrs shall be removed before the conduit is assembled into the system.
Special care shall be taken to prevent the ingress of dirt, rubbish, plaster, concrete, etc., into the conduit system before completion of the work and where conduit plugs are not practicable, wooden plugs may be used. Paper, rags or similar such means must not be used for this purpose.

All boxes used in the conduit system, except where direct mounting lighting fittings or such similar accessory is mounted on the box shall be fitted with a purpose made lid. Flush mounted boxes shall have an overlapping lid and boxes mounted externally shall have a heavy pattern lid and moisture proof gasket.

Malleable iron circular boxes or sheet steel adaptable boxes, for inspection and to facilitate the drawing in of cables, shall be inserted in straight conduit runs at spacing not exceeding 18m and wherever the conduit has been set by the equivalent of two 90° bends.

Where bends or sets are required they shall be formed with conduit cold and without altering the cross section of the conduit. Where bending or setting is not practicable, subject to the express permission of the Contract Administrator, boxes may be used.

Wherever the finish of the conduit is damaged, during erection, cutting of threads etc. the damage shall be made good by painting with red lead or zinc rich paint after all rust or corrosion has been cleaned off.

Where conduits terminate in untapped conduit boxes or the untapped cases of distribution and/or control gear, a screwed coupler shall be fitted to the conduit, adjusted to butt tightly to the exterior or the box or case and a brass hexagonal bush screwed through from the interior of the box or case to form a good electrical and mechanical joint. For all circuits an additional earth protective conductor of appropriate size shall be used.

Where a lubricant is used in the curing of thread this shall be a purpose made screw cutting lubricant. Mineral oils must not be used.

Couplers shall be of the heavy duty steel or malleable iron type.

Where it is necessary to run conduits adjacent to steam or hot water pipes, they shall be sited below the hot pipes and shall be at least 150mm distant from the hot pipe. In cases of this being impracticable the Contract Administrator shall be consulted as to what action is to be taken.

Where conduit runs terminate in cable trunking, entries shall be made with flanged coupling, washer and hexagon male brass bush to form a good electrical and mechanical joint.

**Flexible Steel Conduit**

Flexible conduit complying with BS 731 shall be used for the final connection of the rigid conduit installation to the terminal boxes of all plant where vibration is likely to occur.

Unless otherwise stated flexible conduit shall comprise Kopex type LS with PVC sheath or equal and approved by the Contract Administrator and it shall be terminated using approved steel glands of Kopex manufacture or similar approved. Aluminium glands will not be accepted.

Couplings and connectors with electrical threads to BS 4568 (Parts 1 and 2) shall be cadmium plated mild steel, for heavy duty use, fitted to both ends of the conduit. An ‘end cap’ i.e. special bush shall be inserted in the ends of conduit to protect cables when drawn in.

The inside surface of conduit, ends of same and all fittings used in connection therewith to be smooth, free from burrs and all defects.
Separate PVC insulated earthing lead coloured green and yellow complying with the I.E.E Regulations, shall be installed internally and securely bonded at each end of the conduit in purpose made earthing terminals.

No flexible conduit shall exceed an un-stretched length of 800 mm and flexible conduit will not be permitted in lieu of sets and bends in rigid conduit installations.

**Cable Trunking**

Cable trunking shall be of sheet steel and of such sizes and finish as called for in the Particular Specification.

All bends, tees, reducers, couplings, etc., shall be of standard pattern and supplied by the trunking manufacturer, unless particularly specified otherwise in the Particular Specification. Welded joints must not be used without the express permission of the Contract Administrator.

At each joint between trunking lengths and between trunking fittings copper earth bonding links shall be used, fixed by means of screws.

Cable supports are to be inserted in vertical runs of trunking and cables shall be laced thereto in their respective groups.

In vertical runs a fire resisting barrier, supplied by the manufacturer, shall be inserted in the trunking at maximum centres of 3,000 mm and in all cases in the trunking where it passes through floors and ceilings, walls, etc. Cable retaining straps are to be installed at maximum centre of 600 mm.

Trunking shall be of adequate size to ensure that the number of cables installed does not exceed the appropriate total cable factor as set out in the IEE Regulations for Electrical Installation 17th Edition (BS 7671) or alternatively does not exceed a 45% space factor. The surface of trunking, both inside and outside, the ends of same and all fittings used in connection therewith shall be free from burrs and all other defects.

All open holes, slots, etc., in trunking shall have bushes or grommets using the appropriate materials obtained from the trunking manufacturer.

### 2.32 CABLES

Cables shall be one of the following types: -

a) XLPE insulated cables with copper conductors, steel wire armour and LSF outer sheath to BS 6724.

b) Mineral insulated cables with copper conductors and sheath and with LSF outer sheath to BS 6207.

c) LSF insulated cables with copper conductors (non-armoured) to BS 7211.

d) Insulated flexible cords to BS 6500.

e) Cables for higher temperature applications with insulation to BS 6746 and BS 6899.

f) Communication cables to be to CW 1308.

g) All power cables to have BASEC approval.
Cables of 2.5 mm\(^2\) and above are to have stranded conductors and no cable of a size less than 1.5 mm\(^2\) shall be used, except for mineral insulated cables and monitoring/control circuits.

No joints in cables will be permitted, unless specifically stated and then only for extending existing cables. The loop-in system is to be employed throughout. Variations to this requirement will only be permitted in special circumstances, where detailed in the Particular Specification.

Sub-main circuit cables shall be grouped and where possible enclosed in a separate conduit i.e. shall not be mixed with sub-circuit cables.

All cables inside flexible steel conduits shall be heat resisting or standard as directed in the Particular Specification. No joints in cables will be permitted between control gear and motors or any other so connected gear and motors or any so connected apparatus. Cables for mains, sub-mains and three phase circuits shall be coloured in accordance with IEE Regulations for Electrical Installation 17th Edition (BS 7671) but neutral shall be black in all cases.

Mineral insulated cable sizes of 2.5 mm\(^2\) and above shall be of the 1,000 volt grade. No light duty cables below 1.0 mm\(^2\) shall be used.

Each coil or drum of cable or flexible cord shall bear the manufacturers’ label, sealed to the coil or drum, stating the length, size, type and other relevant details.

No coil or drum which has been manufactured more than twelve months prior to its delivery to site will be accepted and the Contractor will be expected to furnish satisfactory evidence of the date of manufacture of any coil.

In the case of 1,000 volt grade cables, the Contractor shall have the cable delivered to site on a drum and he will be required to furnish manufacturers’ test sheets. The reference numbers on all cable drums shall correspond with those on the test sheets.

Cables to heating equipment shall have insulation and sheath suitable for higher temperature applications (up to 85°C) to BS 6746 and BS 6899.

Flexible cords shall be of the 450/750 volt grade with one core coloured brown, one blue and the other yellow/green. The separate insulated cores shall be twisted together to form a circular section of the whole and sheeted overall with tough rubber.

**Methods of Installation**

The routes of cables shall be so arranged that they are adequately spaced away from other services and from each other, as provided for in the IEE Regulations for Electrical Installation 17th Edition (BS 7671).

At all terminations, there shall be left a sufficient amount of slack cable to allow for future trimming without causing undue stress in the conductors.

All multiple cable runs shall be fixed to cable trays by means of single multi-way saddles and all single runs of cables shall be fixed by spacer bar saddles direct to walls.

Where cable glands are exposed to atmospheric conditions and in all instances where they are screwed into aluminium or zinc base alloy fittings, bitumastic paint shall be applied to the junction of thread before erection to eliminate the possibility of corrosion.

Where cables terminate in switchgear, busbars, etc., compression or soldered type cable lugs shall be used. Where compression type ferrules or cables lugs are used the compressing tool
shall be such type and working pressure as recommended by the manufacturer of ferrule, lug or system used.

The securing of the mineral insulated cables shall be by means of copper saddles fixed by non-ferrous screws, except that where cables are laid on and supported by the structure, PVC clips may be used to anchor the cable down. MICC cables shall be brought into switch or outlet boxes through metal glands of approved type and cables shall be sealed in accordance with the manufacturers’ instructions. Where two or more cables run side by side they will be fixed by multi way saddles or shaped PVC coated copper tape.

Cold screw-on pot type seals shall be used, complete with ring type gland and these shall be obtained from the cable manufacturer.

No heat shall be applied to any end seal or termination. Each length of cable shall be tested after the seals have been fitted.

Where required, pots shall be fitted with earthing tails insulated and identified with green/yellow sleeving.

Cable tails shall be insulated by means of insulation sleeving of the ‘Neoprene’ type. The sleeving shall be anchored and sealed into the pot type seal. Coloured sleeving must be used for identification of conductors at all terminations.

The tools necessary for the correct cutting and making of cable ends shall be obtained from the cable manufacture and used.

All cables shall be installed as straight as possible. Any final straightening necessary is to be carried out using a wooden straight edge and a hammer.

The Contractor shall supply all cable glands required for the connection to all equipment connected by MICC cables, whether the equipment is supplied under his contract or not.

The Contractor shall not employ men to terminate MICC cables who have not had full experience on this type of work.

The required size of MICC cables are given in the Particular Specification.

Infinity only will be accepted on insulation tests of mineral insulated cables.

Note: The use of draw wires, tapes, cords, etc. for the drawings of cables into conduits is not permitted except by the express agreement of the Contract Administrator.

2.33 LUMINAIRES

All luminaires shown on the drawings and listed in the lighting schedule shall comply with the BS 4533 and be supplied and installed complete with lamps. Where a choice of colour of either metal work or glass work for the luminaires and none is specified, the colour will be specified at a later date.

If different colour finishes alter the price of the luminaires the standard finish shall be on the basis on which the tender is made unless otherwise specified. All diffusers, louvres and glassware for luminaires shall be cleaned, immediately prior to handover.
Lighting Wiring

Wiring to the lamp holders of tungsten filament luminaires which are not equipped with cool wiring devices or suspended from ceiling roses shall be silicone-rubber-insulated and braided or glass fibre insulated capable of withstanding a temperature of 140°C.

Erection of Luminaires

Decorative luminaires shall be suspended by the manufacturers’ pendant sets which shall include a separate suspension wire integral with the flexible cable.

Luminaires shall be mounted at the heights given in the schedules or drawings.

Fluorescent luminaires shall have fixing and cable entry arrangements on two centres to suit the luminaires. The fixing arrangement shall be suitable for use with conduit boxes and plug and socket ceiling roses.

For luminaires in suspended ceilings the cabling or conduit system shall terminate in a BS box above the ceiling. From the conduit box to the luminaires either of the following methods of wiring may be used: -

a) An integral threaded dome cover with a cable gland for flexible cords shall be fixed to the BS box and a flexible cord shall be run from the dome cover to the fitting.

b) A three plate ceiling rose with socket and plug attachment shall be fitted to the box and a flexible cord run to the luminaires.

Flexible cords shall be 3-core 0.75 sq. mm in 5 amp circuits, 1.0 sq. mm in 10 amp circuits and 1.5 sq. mm and 15 amp circuits. The third core of the flexible cord shall be used for earth continuity and shall be securely fixed to the conduit and luminaires.

For surface mounted luminaires the cable or conduit system shall terminate in a BS box to which the luminaires is fitted.

Suspended fluorescent and industrial type tungsten luminaires shall be suspended by rigid conduit from ball-and-socket dome covers. Such dome covers shall be fitted with flexible copper connectors between the ball and socket.

Break-joint of approved colour shall be provided wherever the diameter of the ceiling rose of plate from which the luminaires is suspended, or the diameter of the gallery or the width of the spine of a surface mounted luminaires does not exceed the diameter of the aperture in the ceiling for the associated conduit box by at least 10 mm. If this requirement causes a break-joint to be provided for any luminaires, then break-joint rings shall be used for all other similar luminaires in the same room or area.

Fluorescent luminaires which are to be mounted end-to-end in continuous rows shall be provided with all necessary jointing pieces for the battens and diffusers or reflectors. The manufacturer shall be informed of the precise quantities required at the time of ordering to avoid delay. Battens for which special joint pieces are not provided shall be butted together and connected by means of smooth bore bushes and locknuts tightened up to ensure that no gap appears between adjacent battens. End caps shall be fitted only at the ends of rows.

All luminaires shall be carefully stored before erection and prior to handover, any damaged paintwork made good and the complete luminaires cleaned.
Ceiling Roses

Ceiling roses shall comply with BS 67 and be of approved manufacture. They shall be coloured white having a moulded plastic base suitable for direct mounting on to a conduit box, and three terminals plus earth terminal, the 'live' terminal being shrouded.

Lamp Holders

Lamp holders shall comply with BS 5042 and be effectively earthed where of metal construction (e.g. brass).
Where lamp holders are screwed direct to conduit systems they shall be brass, unless they are installed in a bathroom or toilet when they shall be insulated.
Lamp holders which are not electrically continuous shall be complete with Home Office pattern skirts.
Lamp holders used in conjunction with PVC sheathed cables shall be provided with a cable grip.
Batten lamp holders shall be suitable for direct mounting on circular conduit boxes.
Unless otherwise specified lamp holders for emergency lighting systems shall be SBC positioned in such a way as to place the lamp specified in its normal position.

Lamps

The sizes, types and colours of lamps are shown on the schedule or drawings.
Lamps for use at a voltage other than 230V shall be fitted with caps which prevent them from being used in 230 volt lamp holders.

Local Lighting Switches

Lighting switches shall be manufactured in accordance with the BS 3676 and shall be of the type and ratings shown in the schedules or drawings.
The mountings height to the bottom of the switch shall be 1.3 metres unless otherwise specified, and where the structure and furnishing permit, the distance from the edge of the architrave to the near edge of the switch shall be 150 mm.
Where several switches on one phase are shown at one position, a ganged box shall be used. Different phases shall not be ganged in one box unless each phase is segregated in a separate compartment which is covered by a separate internal warning plate.
Where possible the arrangement of switches in ganged boxes shall be similar to the lighting points which they control. Switches not so arranged shall be labelled in an approved manner to indicate the circuits controlled.
Flush switches shall be mounted in sheet steel or malleable cast iron boxes of minimum depth 37 mm fitted with adjustable grids to allow for variations in the thickness of plaster.
The face plates of flush switches shall be fixed square and flush with the wall. Fixing rings shall not be the only means of securing the face plates.
The swing of all doors shall be checked on site before marking out any chases for switch positions.

Surface mounted switches connected to surface conduits shall be fitted to either malleable cast iron or pressed steel boxes with cover plates giving protection to the dollies.

Watertight switches shall be in malleable cast iron boxes or die cast aluminium with spout nipple entries.

Lighting switches installed in ducts shall be of the weatherproof type.

Ceiling switches shall be fixed to circular BS boxes using break-joint rings. The switches shall be white or ivory coloured and fitted with silent interiors.

Any requirement in such rooms for sparkless switches will be particularly specified, and where they are required they shall be of the same pattern of dolly, switch plate, box and finish as the other switches in the same area or room.

Sparkless or flameproof pattern switches shall be provided in all areas classified as ‘Division 2’.

2.34 SOCKET OUTLET INSTALLATIONS – GENERAL

The requirements specified in these clauses refer to sockets on 50 Hz, A.C. supplies at a normal 240 volt. Socket for special circuits will be detailed elsewhere.

30 Amp Socket Outlets

30 amp switch socket outlets shall have quick made and break switches with separate shuttered BS gauge socket and be mounted in a cast iron case. The overlapping cover plate shall be not less than 2.5 mm thick brass, finished as specified.

15, 13 and 5 Amp Socket Outlets

Surface and flush mounted switched and un-switched socket outlets shall have shuttered sockets and A.C only switches in either malleable cast iron or pressed steel boxes with cover plates as specified.

Surface mounted switches and un-switched socket outlets connected to surface conduits shall be fitted to either malleable cast iron or pressed steel boxes with cover plates as specified.

Where socket outlets are shown together on a drawing a twin unit shall be used.

13 amp socket outlets and plugs shall comply with BS 1363. The plugs shall contain the correct rated cartridge fuse link complying with BS 1362 to protect the apparatus or appliance connected to the outlet.
Fused Connection Unit/Final Connections

All fused connection units shall be complete with galvanised metal box with earthing terminal, of the same manufacturer.

Plates, switch dollies and screws shall be of specified materials and finish.

Front plates shall be engraved as described in the Specification.

Units shall be fitted with a fuse of the correct rating to suit the appliance concerned.

Flex outlets shall be arranged via a connection unit a galvanised conduit which will be run direct to the appliance, if the appliance is fixed and permanent.

If the appliance requires a flexible connection the galvanised conduit shall run to a point close to the point of entry of the supply into the appliance. It shall terminate in a conduit box with a flex outlet cover, and cord outlet suitable for the particular flexible cable. In the case of three phase equipment, connection by means of cables drawn into ‘Kopex’ or PVC flexible conduit, running from the conduit box to the appliance shall be adopted. An earthing lead shall be connected to each appliance from suitable earthing terminal.

In certain cases, where specified, fused connector units with direct flex outlets shall be used.

2.35 ISOLATORS FOR FIXED APPLIANCES

The Contractor shall include for the supply and installation of a local isolator for every fixed appliance, whether or not such an isolator is explicitly specified.

Each isolator shall have the rating and number of poles suitable for the particular appliance, and shall be the approved type and manufacture, flush or surface mounted, as required. All isolators shall be mounted in accessible positions local to the particular appliance which they serve. They shall be generally mounted at a height of 1.3 metres above finished floor level to the centre line of switch. All isolators shall be metal clad complete with “ON” “OFF” indication and padlocking facilities where required.

2.36 GENERAL FIXING

General fixing shall be as follows:

- Lightweight equipment and conduit saddles may be fixed to the building structure by means of screws in white metal, bronze or other approved plugs. Loadings shall not exceed 50 kg per fixing.
- Fixing to brickwork shall be made in the bricks and not in the bond.
- If it is possible to make all fixing in the brickwork, then the equipment shall be positioned to enable the upper fixings to be made in the brickwork.
- Woodscrews shall be sheradized and greased before use. Machine thread screws shall be solid brass and greased before use except as other specified.
- Where fixings are made on hollow partitions the appropriate type of toggle bolt shall be employed.
- Heavy equipment shall not be fixed by plugs or shot bolts without the written approval of the Contract Administrator. Approved purpose made clamp brackets, rawl-bolts or patent fixing bolts such as rawl-bolts shall normally be used.
g) All steelwork fixings shall be galvanised or similarly protected.

h) The supply and fixing of all support, brackets, clamps and spacers and other steelwork whether or not shown in detail on the drawings or otherwise, which may be required for the proper and effective fixing of any equipment shall be deemed to be included.

i) Where cable or conduits pass through walls, partitions or ceilings, the hole provided shall, after installation, be made good with cement/sand mortar mix, plaster or similar incombustible materials to the full thickness of the wall, partition or ceiling and left ready for decoration.

2.37 CIRCUIT IDENTIFICATION

All plant and apparatus supplied under this Contract shall be provided with name plates showing manufacturers’ reference number and details of the plant. The Contractor may fix to the main switch panel only, his trade plate, provided that the same does not exceed 100 x 100 mm.

At each distribution board there shall be supplied and fixed securely, either inside the door of the distribution board or externally to the case of adjacent wall, a substantial clear plastic envelope containing a list of the circuits connected to that particular distribution board. (Note: Fixing of the envelope by adhesive or adhesive tape will not be accepted).

The circuit list shall be ‘typewritten and state clearly the outlets connected to that circuit and the current rating of the fuse or circuit breaker. A sample of the proposed circuit lists shall be submitted to the Contract Administrator for his approval before these are installed.

On the cover of each distribution board, switch fuse, isolator, contactor, control panel etc., there shall be an Ivorine or plastic laminate label of minimum size 50mm x 25mm identifying the particular item in accordance with the names of the plant, circuit etc., used in the Specification and Drawings.

Where control panels, e.g. boiler house controls, ventilation controls etc., are installed each item of equipment, i.e. indicator lamps, switches, push buttons, time switches, etc., shall be provided with an Ivorine or plastic laminate label to identify its purpose.

Where premises are connected to a three phase four wire electricity supply every distribution board and controlling switch fuse or isolator shall be provided with a coloured disc or button indicating to which phase or phases of the supply the item is connected.

Ivorine or plastic laminate labels shall have the lettering and/or numbering engraved upon them and these labels and phase identification discs or buttons shall be fixed to the particular equipment by means of self tapping screws or bolts, nuts and washers.

2.38 TESTING AND COMMISSIONING - OTHER WORKS

The Contractor shall satisfy the Contract Administrator that on completion of the installation, all circuits are operating in accordance with the design intention.

Tests shall be carried out in accordance with Chapter 16 of the IEE Regulations for Electrical Installation 17th Edition (BS 7671), and the result shall comply with the Regulations, before any section or phase is commissioned. After satisfactory tests have been completed, the Contractor shall commission the section or phase of the installation.
On the completion of the Works, test in accordance with the requirements Chapter 16 of the IEE regulations for Electrical Installations 17th Edition (BS 7671).

On completion of the works supply to the Contract Administrator with a certificate stating that the installation has been inspected, tested and is complete.

The Installation Certificate shall be as required by the current Regulations for Electrical Installations issued, in accordance with the requirements Chapter 16 of the IEE Regulations for Electrical Installations 17th Edition (BS 7671).

2.39 TESTING, COMMISSIONING AND DOCUMENTATION

General

Provide all the testing, commissioning, documentation for the complete engineering installation.

Use commissioning and testing codes produced by or authorised by the Chartered Institute of Building Services and/or Heating and Ventilating Contractors Association, National Inspection Council for Electrical Installation Contractors.

Ensure sufficient supplies of fuel, electricity and water required for the test are available.

Provide all test instruments, together with sufficient labour and skilled supervision to properly carry out the tests.

Agree details of the method of carrying out and recording the tests with the Contract Administrator.

If the tests fail to demonstrate the satisfactory nature of the installation, or portion thereof, the Contract Administrator will decide whether such failure is due to defective equipment or non-compliance with the Specification and in such cases he may reject the said installation or part thereof. In the event of such rejection the Contractor shall, at his own expense, rectify the matter and re-test to the satisfaction of the Contract Administrator.

In the event that the Contractor does not satisfactorily carry out any test or tests the Contract Administrator shall be at liberty after giving due notice to the Contractor arrange for such tests to be carried out and charge to the Contractor accordingly. Such action shall not relieve the Contractor of any of his responsibilities under the Contract.

Test Records

Provide the Contract Administrator with test records in an approved form immediately on completion of the tests.

All test records shall be provided in triplicate.

Test records shall, for hydraulic or similar tests and for tests on equipment at the manufacturer’s works, comprise test certificates showing the date of the test, the pressure applied and the period of application. For performance tests the test record shall comprise a report and record sheet showing the date of the test, a tabulated summary of the test readings and a report stating the result of the tests.
Tests at Manufacturer’s Works

The requirements of relevant British Standard Specifications with regard to works tests shall be complied with.

Specific tests of items of equipment at the manufacturers’ works, other than those called for in British Standards, shall be carried out as described in the appropriate section of the Specification.

Statutory and Insurance tests shall be carried out as necessary.

Where specifically indicated by the Contract Administrator, tests described in paragraphs 1, 2 and 3 above shall be carried out in the presence of their representative. In such cases fourteen clear days notice of each test shall be given to the Contract Administrator.

In all cases described above, the Contractor shall provide copies of test certificates.

Such certificates shall clearly state whether the certificates are for type tests, or for tests of individual items of equipment.

Setting to Work and Commissioning

Set to work the complete Works, or part thereof, at the selection of the Contract Administrator, and make all necessary adjustments to ensure correct functioning.

Before starting up any equipment, installation or part thereof ensure it is both safe and fit to do so.

Where another Contractor or Authority is providing a service or supply to a system or piece of equipment provided under the Contract the Contractor shall provide certification of fitness to accept such service or supply as a pre-requisite to its being made live by others.

Items of plant shall be run as soon as possible after installation and shall be checked for satisfactory operation.

On completion of commissioning the Contractor shall demonstrate to the Contract Administrator that:

a) The equipment provided complies with the Specification in all particulars and is of adequate capacity for the full rated duty.

b) That all items of plant and equipment operate sufficiently quietly to meet the specified requirements.

c) That all instruments, protective devices, control, etc. are correctly calibrated and accurate.

d) That all electrical circuits are properly fused and protected and that all systems and equipment are properly earthed and conduit systems electrically continuous.

e) That the systems have been properly balanced and adjusted in respect of flow signals, volumes brightness or as relevant.
2.40 **Instruction of Employer’s Staff**

Times to be agreed, instruct the Employer’s staff in the use and correct operation of the Works and ensure that such staffs are competent to take over the installation on completion.

Obtain a signature from the staff so instructed, stating this instruction has been received and properly understood.

**Provision of Record Documents**

Supply to the Contract Administrator as a pre-requisite to Practical Completion of the Works, comprehensive record documents finalised in detail and approved by the Contract Administrator. Great importance will be placed upon the quality, accuracy, clarity and completeness of the record documents and upon their being made promptly available.

Demonstrate from time to time as required by the Contract Administrator throughout the execution of the Works, that adequate and accurate records are being kept such as will ensure the ultimate completeness and accuracy of the record documents and that the record documents are themselves being progressively compiled as the work on site proceeds.

**Scope of Record Documents**

Record documents shall comprise, all as described in this Specification, the following:

a) Record Drawings and Schedules.

b) Operating and Maintenance Instructions.

c) All record documents shall be provided in triplicate, two sets for the Employer and one set for the Contract Administrator’s retention. In the case of drawings and diagrams (other than the Manufacturers’ drawings) one set of the three sets shall be on opaque material and the other two sets shall be on transparent material, one of the latter being the Contract Administrator’s copy.

d) Manufacturers’ drawings shall be on opaque material.

e) The record document shall be adequate for the following purposes:

- To record clearly the arrangements of the various sections of the Works, as actually installed and to identify and locate all component parts thereof.
- To make it possible to comprehend the extent and purpose of the Works, as actually installed and to identify and locate all component parts thereof.
- To set out clearly the extent to which maintenance and servicing is required and how, in detail, it should be executed.
- To provide sufficient and readily accessible information to properly facilitate the ordering of spares and replacements.

The Record Documents shall be correlated so that the terminology and numerical and/or other references used therein are consistent with and similar to those used in the physical identification of component parts of the Works. Reference shall also be made where appropriate, to the colour identification system.
Drawings for wiring diagrams and lift release procedures shall be laminated, framed and fixed to the lift motor room wall.

**Record Drawings and Schedules**

The Record Drawings provided by the Contractor shall comprise the following as applicable. Drawings may be first originals.

**Drawings or sets of drawings to a scale of 1:100 showing the following as installed:**

- **a)** The location, including level is buried, of Public Service connections provided, within this Contract whether carried out by the Contractor or by the appropriate Authority, together with the points of origin and termination, size and material of pipes, line pressure and/or other relevant information.

- **b)** The layout, location and extent of all piped services showing pipe sizes throughout, together with all valves for regulation, isolation and other purposes.

- **c)** Location, identity, size and details of all apparatus served by, or associated with, each of the various services. The information with respect to size and details may be present in schedule form subject to the prior approval of the Contract Administrator.

- **d)** The layout, location and extent of all air ducts including those formed in builder’s work or otherwise outside the present Contract but forming part of the system(s) showing all dampers and other equipment, acoustic silencers, grilles, diffusers or other terminal components. Each duct and each terminal component shall be marked with its size and the air quality flowing, as actually measured after approved regulation of the system or as computed by the addition of such measured quantities.

- **e)** The location and identity of each room or space housing plant, machinery or apparatus.

- **f)** Drawings or sets of drawings to a scale of 1:25 showing the following as installed:

- **g)** The detail general arrangement of all boiler houses, machinery spaces, air handling plant, tank rooms and/or other plant or apparatus including the location, identity, size and details of each piece of apparatus. The information with respect to size and details may be presented in schedule form subject to the prior approval of the Contract Administrator.

- **h)** The detailed general arrangement of service subways, ducts, meter rooms or other special sections of the Works where, in the opinion of the Contract Administrator, the smaller scale drawings cannot provide an adequate record.

- **i)** Manufacturers’ drawings showing the general arrangement and assembly of component parts of all machines and any piece of equipment which may require servicing.

- **j)** Flow diagrams indicating the principles of, the arrangement and operation of each of the various services as related to central plant, other principal components and zoning of distribution, etc.
k) Diagrams illustrating the principles of application of automatic controls and of instrumentation, present in combination with item (5) foregoing, or separately as agreed with the Contract Administrator.

l) Manufacturers’ internal wiring diagrams for each piece of electrical equipment supplied under the Contract, together with physical arrangement drawings where necessary to locate and identify the component parts.

m) Comprehensive diagrams, showing in detail, all power wiring and all control wiring and/or pneumatic or other control piping in accordance with details provided by the Contractor, including size, and type of conductors or piping used and identifying the terminal points of each.

Operating Maintenance Instructions

Operating and maintenance instructions shall be provided by the Contractor and shall comprise the following, as applicable (all contained in volumes strongly bound in flexible covers and suitable for heavy usage over a long period) written to be read in conjunction with the Record Drawings.

a) A general description of the scope, purpose and manner of working of each system or apparatus forming part of the Works.

b) A detailed description of the scope, purpose and manner of working of each system of automatic controls and/or monitoring instruments.

c) Data on general design parameters and associated normal operating temperatures, pressures, etc., based on the commissioning tests.

d) Clear and comprehensive instructions for the starting up, running and shutdown of each system or apparatus.

e) Instructions in respect of any precautionary measures from time to time necessary (e.g. against freezing or corrosion).

f) Instructions in respect of the care of apparatus normally subject to seasonal disuse.

gh) Instruction, as to the nature, extent and frequency of servicing necessary properly to maintain the Works in good condition and as to the materials to be used for the purpose. This information may be supported in detail, but not replaced, by maintenance instructions provided by the suppliers of particular components apparatus.

h) User's duties with respect to legislation, Health and Safety and the like, e.g. periodic inspection and testing.

i) Copies of manufacturers’ data with respect to the nature, type and method of operation of individual pieces of equipment, together with their detailed maintenance instructions shall also be supplied. Such data, in the form of individual booklets and the like, shall be indexed and cross-referenced to the operating and maintenance instructions and presented, suitably protected in box files or folders.
j) Receipt of record drawings, negatives, schedules and operating maintenance instructions by the Contract Administrator shall be a pre-requisite of final payment.

2.41 MAINTENANCE

The whole of the equipment shall be designed and arranged for ease of maintenance.

The maintenance period for these lifts shall therefore commence at the time of starting the refurbishment work (date of possession) and shall continue for a period of 12 months from the issue of Practical completion of all Lifts.

The maintenance work to all lifts shall be in accordance with the following:

a) The Contractor shall make at least 1 No. visit to each lift within the contract each calendar month to undertake maintenance works.

b) The duration of each visit shall be minimum 1.5 hours to each lift.

c) The Contractor's Service Engineer shall complete a ‘Service Visit Report’ that shall be forwarded to Contract Administrator, monthly.

d) All visits made by the Contractor shall be carried out by an Engineer and will require attendance to be registered by logging on/off the EMU on arrival/departure to confirm the visit.

e) EMU codes for breakdown callouts and for maintenance visits shall be advised at the pre contract handover meeting. The on site log card shall be completed for all visits.

f) The Contractor shall respond to all emergency call outs within 2 hours.

g) The Contractor shall respond to all non-emergency call outs within 24 hours.

h) The Contractor shall only respond to official emergency call outs made by the Colleges Help Desk or their Service Provider Partner.

i) The Contractor shall include for 24 hours 7 day week emergency call out/breakdown attendance of all the lists included in these works.

j) The Contractor shall complete the schedule of emergency/breakdown rates included in the appendices of this Specification. The Contractors costs, to respond to call outs the causes if which are not attributable to the Contractors works shall be based on these rates. The chargeable cost is not to exceed £300 plus VAT with without prior authorisation by the College Nominated Person.

k) The Contractor shall fully inform the employer of each and every call out, detailing in writing, the cause of the call out and works undertaken, within 24 hours of the call out being made.

The Contractor shall invoice the Client for all works which are chargeable within 28 days of the works having been carried out; failure to comply with the above requirements will result in non-payment of invoices.
**LIST OF PREFERRED SUPPLIERS**

The following list details preferred suppliers and manufacturer of equipment (equal or approved).

<table>
<thead>
<tr>
<th>ITEM</th>
<th>EQUIPMENT</th>
<th>MANUFACTURER/SUPPLIER</th>
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<tbody>
<tr>
<td>1</td>
<td>Lift Controllers (Variable Frequency)</td>
<td></td>
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<tr>
<td>a)</td>
<td>Skycom</td>
<td>International Lift Equipment Units 1 and 2 Highams Parks Industrial Estate Larkshall Road London E4 7HS Tel: 020 8527 9669</td>
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<td></td>
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<td>2</td>
<td>Main Hoist Motors</td>
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<tr>
<td>a)</td>
<td>Loher</td>
<td>International Lift Equipment Units 1 and 2 Highams Parks Industrial Estate Larkshall Road London E4 7HS Tel: 020 8527 9669</td>
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<tr>
<td></td>
<td>Sassi (when used with Sassi flange mounted gears)</td>
<td></td>
</tr>
<tr>
<td>2a</td>
<td>Gearless Machines</td>
<td></td>
</tr>
<tr>
<td>a)</td>
<td>Loher</td>
<td>International Lift Equipment Units 1 and 2 Highams Parks Industrial Estate Larkshall Road London E4 7HS Tel: 020 8527 9669</td>
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<tr>
<td></td>
<td>Sassi Gears</td>
<td>Lift Material (GB) Ltd 29-32 Broomhills Braintree, Essex CM7 7RW</td>
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<td>Gear Units</td>
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<td>a)</td>
<td>Sassi Gears</td>
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<td></td>
<td>Epoxy resin screed</td>
<td>Storvite Flooring Ltd 30 Armstrong Road Manner Industrial Estate Benfleet Essex SS7 4PW</td>
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<tr>
<td>4</td>
<td>Lift Car Flooring</td>
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<tr>
<td>a)</td>
<td>US Type with LED ‘call accepted’ Cluster illumination Vandal resistant Face Plates for landings in heavy gauge brushed of the dished type</td>
<td>Lift Store Unit A Central Park Estate Staines Road Hounslow TW4 5DJ</td>
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<td>5</td>
<td>Push Button (Tactile)</td>
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<tr>
<td></td>
<td>Overspeed Governors</td>
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<tr>
<td>a)</td>
<td>Bode Governors</td>
<td>International Lift Equipment Units 1 and 2 Highams Parks Industrial Estate Larkshall Road London E4 7HS Tel: 020 8527 9669</td>
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<tr>
<td>b)</td>
<td>M90 Overspeed Governor</td>
<td>Lift Components</td>
</tr>
<tr>
<td>c)</td>
<td>Montanari Giulio Governor Types FA, RH or RG</td>
<td>Probrook Ltd 389 Lichfield Road Aston, Birmingham B6 7SS Tel: 021 327 7909</td>
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<tr>
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<th>Door Operator</th>
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<tr>
<td>a)</td>
<td>Door Gear Type GAL MOVFR/HA/ Spring unlocking</td>
<td>International Lift Equipment Units 1 and 2 Highams Parks Industrial Estate Larkshall Road London E4 7HS Tel: 020 8527 9669</td>
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<tr>
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<th>Safety Edge</th>
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<tr>
<td>a)</td>
<td>Safe Edge (minimum 1P65 rated)</td>
<td>Memco Pana Chrome (red/green)</td>
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<tr>
<th></th>
<th>Architraves</th>
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<tr>
<td>a)</td>
<td>Landing Car and Architraves</td>
<td>Rigidised 316 grade stainless steel pattern selected following user consultation.</td>
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<tr>
<th></th>
<th>Lift Car</th>
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<tbody>
<tr>
<td></td>
<td>To be dynamically balanced on site</td>
<td>International Lift Equipment Units 1 and 2 Highams Parks Industrial Estate Larkshall Road London E4 7HS Tel: 020 8527 9669</td>
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<tr>
<th></th>
<th>Indicators</th>
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<tr>
<td>a)</td>
<td>Car Position Indicators (CPI) Scrolling Digital Indicator LCD Type</td>
<td>International Lift Equipment Units 1 and 2 Highams Parks Industrial Estate Larkshall Road London E4 7HS Tel: 020 8527 9669</td>
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<tr>
<th></th>
<th>Door Closers</th>
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<tr>
<td>a)</td>
<td>GAL (spring assisted arm)</td>
<td>International Lift Equipment Units 1 and 2 Highams Parks Industrial Estate Larkshall Road London E4 7HS Tel: 020 8527 9669</td>
</tr>
</tbody>
</table>
### Emergency Door Release

| a) | Fire Control Switch  
Express Drop Key Type  
No. SP5121SF  
Euro release on MRL’s | LCL Limited  
Unit C12  
10 Preston Park  
Poplar Business Park  
London E14 9RL |

### Stainless Steel

| a) | Approved stainless steel is available from: | Rigidised Metals Ltd (Rimex)  
Aden Road  
Ponders End  
Enfield  
Middlesex EN3 7SU  
Tel: 020 8804 0633 |
| b) | Approved stainless steel is available from: | FSC Stainless and Alloys Ltd  
Ledra Works  
Reservoir Place  
Walsall WS2 9SN  
Tel: 0922 612454 |

### Emergency Telephone System

| a) | Windcrest Autodial unit including EMU interface telephone line control, voice annunciator and communication system | Liftbits Ltd  
8 Abbey Manufacturing Estate  
Mount Pleasant  
Wembley HA0 1MR  
Tel: 0208 795 0333  
Fax: 0208 795 0444 |

### Machine Room – less Lifts (MRL)

| a) | ILE Emerald - Type 100/2000  
Optional GAL doors and operator to be utilised. | International Lift Equipment  
Units 1 and 2  
Highams Parks Industrial Estate  
Larkshall Road  
London E4 7HS  
Tel: 020 8527 9669 |

A ‘Certificate’ or documentary evidence regarding details of stainless steel supplied must be forwarded to the Contactor Administrator.

Final stainless steel patterns to be advised by Contract Administrator/Engineer order stage.
Appendix A – Typical Drawing for Car Station

TYPICAL CAR OPERATING PANEL DETAIL
Appendix B – Typical Arrangement of Landing Entrance and Angled LCD Indicator Unit

Typical Arrangement of Landing Indicator and Evacuation Units
Appendix C – Typical Arrangement of 2 SPD Landing Doors and Frame Fire Rated L.H.

**NOTES:**
1. MIN. CLEARANCE GAP BETWEEN RETURN POST, SLIDE DOOR, FAST LEVER AND SLIDE FLEXIBLE 2 PED – UNLESS VERIFIED BY DESIGNER
2. TWO-HOUR FIRE RATED DOOR 2 SPEED LANDING PACKAGE
3. CLIMBING SLIDEBOTTOM PLATE
4. SLOPES FOR TOP TRACK

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**TYPICAL ARRANGEMENT OF 2SPD LANDING DOORS AND FRAME FIRE RATED L.H.**
Appendix D – Typical Arrangement of Landing Architrave

**Item No.** | **Description** | **Drawing Number** | **QTY**
--- | --- | --- | ---
1 | UPRIGHTS ASSEMBLY | OPTD02 | 2
2 | MS SQUARE SECTION SPRING WASHER | MS SINGLE COIL SQUARE SECTION SPRING WASHER TYPE A | 23
3 | MS NORMAL FLAT WASHER | MS NORMAL FLAT WASHER GRADE C | 23
4 | M8 X 1 1/8” X HEX SCREW | M8 X 1 1/8” X HEX SCREW GRADE 8.8 | 23

![Typical Arrangement Diagram](image-url)

**TYPICAL ARRANGEMENT OF LANDING ARCHITRAVES**
Appendix E – Typical LCD Indicator Station

TYPICAL ANGLED LCD INDICATOR STATION
Appendix F – Typical Drawing for Lift Auxiliaries Schematic Layout

KEY TO FINAL CIRCUIT DETAILS

A. 2x1.5mm² + 1.5mm² CPC-LSF
B. 2x1.5mm² + 1.5mm² CPC-LSF
C. 2x1.5mm² + 1.5mm² CPC-LSF
D. 2x1.5mm² + 1.5mm² CPC-LSF
E. 2x2.5mm² + 2.5mm² CPC-LSF
F. 2x2.5mm² + 2.5mm² CPC-LSF
G. 2x2.5mm² + 2.5mm² CPC-LSF
H. 2x1.6mm² + 1.6mm² CPC-LSF

KEY TO SWITCHES

1. PIT / SHAFT LIGHTING
2. TUBULAR HEATER
3. LIFT CAR LIGHT EMERGENCY LIGHT
4. CAR TOP LIGHTING AND POWER
5. PLANT ROOM LIGHTING / EMERGENCY LIGHTING

NUMBER SIZE AND CONFIGURATION OF CONDUITS TO SUIT SITE ARRANGEMENTS
SECTION 3

PARTICULAR LIFT SPECIFICATION

NEW LIFTS
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3.1 TECHNICAL AND PARTICULAR LIFT REQUIREMENTS

3.1.1 General

Components to be replaced, together with the whole lift installation, shall be in accordance with:

- The General Specification – Section 2
- The following Particular Specification.
- Any new or updated regulations and standards at the time of tender submission.

All components shall be as described and detailed in the appendix at the end of the Standard Specification. The lists of preferred suppliers are to be “equal or approved”.

The Contractor shall include within his tender for the following items:-

- Provide any mechanical heating or ventilation systems required in the machinery spaces to maintain the ambient temperature between +15°C and +25°C in accordance with EN81-1.
- Include for unloading, moving, lifting and positioning all lift equipment and machinery.
- Provide temporary lighting for installation.
- Remove and dispose of, any rubbish, waste and redundant materials in accordance with the College’s Site Waste Management Plan.
- Erect at each landing opening adequate protection against falls by use of fall barriers, hoardings etc. Any timber used for the construction of hoarding etc should be suitably fire treated treated and must comply with the College’s Safety Code of Practice (Construction) 2007.
- Where required, the contractor must supply and install any lifting beams or eyes within the lift shaft. These should be load tested and certified.
- Where equipment requires dust protection, this should be provided and included as part of the lift package.
- Provide all scaffolding or access equipment necessary for the safe installation of the lift(s) and associated equipment. This shall include all scaffolding or access equipment for use by others, to allow for the installation of power supply cables, telephone lines, fire alarm cables etc which are to be terminated at the top of the lift shaft.
• The provision and installation of all necessary steelwork required for fixing of lift shaft and landing door equipment. The locations and associated structural loadings are to be clearly indicated on the builders work drawings for approval.

The Contractors attention is drawn to the planned preventative maintenance and call-out requirements for the lift scheme throughout the Defects Liability Period.

All snagging is to be completed within 2 weeks of handover of the each lift.

All works shall be completed out of normal hours, after 6 pm and before 9 am, unless previously agreed with the College.
3.2 SCOPE OF WORKS

3.2.1 Electric Traction Passenger Lift – Gearless

3.2.1.1 Components to be Supplied and Fitted

All Components must comply with the Standard Specification Section 2 and as follows:

a) Electric gearless hoist unit (Loher) (‘V’ sheave, brake, motor and outer bearing) mounted on support steel elevated off the existing machine room floor. The diverter sheave to be mounted on the underside of the steel raft complete with isolation pads. The ‘V’ sheave hardness criteria shall be in excess of 210Bhn Brinell scale. Direction of car movement to be identified. (up-down).

The control system is to have the facility to electrically lift the brake via a battery backed UPS system that allows the lift to ‘roll with load’ for emergency evacuation purposes.

Levelling shall be +/- 3mm. The motor shall be 240 starts per hour (minimum).

b) Main ropes (minimum of 4, not less than 10mm in diameter), 2:1 roping, hitch anchor, springs.

c) Control panel shall be variable frequency/inverter drive. Simplex, duplex or Group control to be defined in the lift specific data. ECO reduced power features required.

d) Inverters rated above 22KW shall be mounted outside of the main control panel cabinet due to heat generation.

e) Governor and tension weight, rope and linkage assembly (Bode) with encoder.

f) Lift cabin, sling steel frame and enclosure with patterned 316 stainless steel panel construction walls. Car components shall be:

- Ceiling shall be white powder coated (Zintec pre-treatment to be applied).
- Roof strong enough for 2 men and tools.
- Car light units, quantity dependant on size of car, highly vandal resistant, flush mounted for car top lamp replacement. Fittings shall comprise twin tube fluorescent or LED lights with brushed stainless steel bezel and shall incorporate 3 hour emergency lighting battery/charger unit. Car emergency light test switch should be provided.

- A combined hand and bump rail shall be fitted to two sides of the lift car. The height should be sufficient to support passengers and to protect the car internal finishes from damage. Where this may restrict the available car area the handrail should only be mounted on the car wall adjacent to the car operating panel.

- The car lining panel joints shall be closed and filled with 3mm black “Darvic” or equivalent. Car lining panels to be 316 grade stainless steel, Rimex Cambridge pattern.
• One wall to be fitted with a 6mm silver safety mirror above the handrail, full car width.

• Floor shall be 4mm Altro Monopave studded, Lake (blue) on mdf membrane with solvent sealant protection. Underside of the timber to be sheet steel panel protected with fire retardant paint.

• Car operating panel to be fitted on the car slam side, 400mm in from the door opening with car top unlocking. Push buttons to be Liftstore US91-EN Compact 2 (Tactile) with Black Contrasting Background with 24Volt Dual Blue Illumination and positioned in full compliance with Part M of the Building Regulations, The Disability Discrimination Act and BS EN 81-70. Full compliant Windcrest auto dialler to be fitted to fully comply with the requirements of EN81-28.

• Note: Please refer to Appendix A, Passenger Lift Car drawing for further information on finishes and layout.

  g) Sling cradle comprising:- top frame, crown bar, sling vertical members, tie bars wedge rope hitch, bottom floor frame and sill assembly.

  h) Roof top safety barrier and kicking strip where required. (NB: To be determined by lift contractor). Trailing cable car top terminal box to be fixed to the barrier.

  i) Bi-directional safety gear complete with governor operator linkage.

  Note: Bi-directional safety gear is not required on gearless motor installations when the brake is in compliance with EN81-1 as regards to an approved method of protection against uncontrolled upward movement.

  j) Car doors, box construction assembly with inbuilt full height sight/finger guards, including GAL top track and hangers, bronze bottom track, toe guards, to be painted yellow, nylon tyred rollers and GAL bottom shoes.

  k) Car door operators shall be a variable frequency drive (GAL: MOVFR/HA) with spring release and with an anti-interference monitor.

  l) Full height shaft fascia panels (NB: To be determined by lift contractor)

  m) GAL door coupling arms, rollers and skates.

  n) Spring loaded roller guide shoes on the car and slipper/slider shoes on the counterweight with debris guards to shoes.

  o) Car and Counterweight guide rails and brackets.

  p) Complete counterweight assembly and fillers to fully balance the VF drive, the whole frame to be painted yellow.

  q) New landing door assemblies complete with door locks (GAL).

  r) Emergency ‘drop bar key’ door release (Express type).

  s) Heavy duty GAL landing door assemblies, box construction including inbuilt full height sight/finger guards with hangers, rollers, kicking strips, bottom track guides and GAL spring tension door closers. Floor I.D. markings on the rear panel.

  t) The GAL landing door bronze tracks shall be supported with a full length landing support sill, a minimum of 5mm thick.

  u) New 316 landing architraves shall be “full wrap” design concrete filled with vertical recessed slam.
v) Lift number I.D. plates are to be fitted on all architrave headers, positioned on the left hand side. Floor number to be marked on each landing architrave, left hand side.

w) Landing architraves and lift car entrances must not have 2 radius edges meeting, typically headers to overlap side stiles by a minimum of 5mm, 10mm preferred. All ends of architrave headers are to be filled and polished, no open ends.

x) Landing push button units. Push buttons to be Liftstore US91-EN Compact 2 (tactile) with Black Contrasting Background with 24 volt dual blue illumination.

y) Landing indicator displaying direction and position located on all landings, angle box surface mounted above header complete with secret fixings. All indicators to be LCD type (scrolling) white on blue.

z) Evacuation controls to meet BS5588 Part 8 and auto change over panel for alternate power supply (Alternate power supply to be supplied by the College). Evacuation controls are to be Windcrest derived with a full set of buttons and speaker at the designated floor, other floors to have a slave station with speaker and button.

All Evacuation Stations are to be flush mounted unless specified otherwise by the Client.

Note: Please refer to Appendix D for further details.

aa) All shaft switches and support brackets including operating ramps.

bb) Floor selector system. Shaft encoder mounted on over speed governor or lift motor.

c) Buffer assemblies for the car and counterweight (hydraulic).

d) Guide base oil drip collection trays to counterweight guides.

ee) Stop buttons for machine room and pit.

ff) To aid hand winding, the true position of the lift car shall be displayed via LCD indication on a unit mounted within easy viewing position of the hand winding wheel. This hand winding positional display unit shall also incorporate a control circuit isolation switch and buzzer when floor level is reached, powered via a rechargeable battery pack.

gg) Decoration of the lift shaft, pit, plant room and all of the remaining steelwork.

hh) Landing thresholds to be finished with 5 bar 3mm aluminium checker plate or matched to existing finish eg Terrazzo marble. (Finish to be agreed with client)

ii) Lifting runway beams or lifting eyes to be load tested and certified.

jj) Heavy duty guards incorporating rope retaining pins and fixing down spring latches. All guards to be painted orange, to cover the traction sheave, diverter sheaves, governor and governor tension weight. Pinch protection alone is not acceptable.

kk) Complete wire of the machine room, shaft and landings including all cable management machine room electrical services, shaft and pit electrical services. (e.g. Isolators lockable MEM type and consumer units etc).

ll) Motor room lighting to be high frequency light units, to provide at least 200 lx at floor level.
mm) Shaft lighting to be high frequency light units to provide at least 50 lux, 1 m above the car roof and pit floor, even when all doors are closed.

nn) Emergency lighting with high frequency light units, to be fitted within the lift motor room and lift shaft. One unit to be fitted to the car top.

oo) Controller to be programmed for energy saving mode. Car lights to be disabled during out of hours and enabled when landing call button is activated.

pp) Car interior protection drapes, one set for each lift, (one set only for duplex lifts). Each set to be clearly marked with the lift number and ‘Imperial College London’. All necessary fixing studs to be provided within the lift cars.

3.2.2 Electric Traction Goods Passenger Lift (> 1.6 m/s) – Power Operated Doors

3.2.2.1 Components to be Supplied and Fitted

All Components must comply with the General Specification Section 2 and as follows: -

a) Electric gearless hoist unit (Loher) (‘V’ sheave, brake, motor and outer bearing) mounted on support steel elevated off the existing machine room floor. The diverter sheave to be mounted on the underside of the steel raft complete with isolation pads. The ‘V’ sheave hardness criteria shall be in excess of 210Bhn Brinell scale. Direction of car movement to be identified. (up-down).

The control system is to have the facility to electrically lift the brake via a battery backed UPS system that allows the lift to ‘roll with load’ for emergency evacuation purposes.

Levelling shall be +/- 3mm. The motor shall be 240 starts per hour (minimum).

c) Main ropes (minimum of 4, not less than 10mm in diameter), hitch anchor, springs.

d) Control panel shall be variable frequency/inverter drive. Simplex, duplex or Group control to be defined in the lift specific data. ECO reduced power features required.

e) Inverters rated above 22KW shall be mounted outside of the main control panel cabinet due to heat generation.

f) Lift cabin, sling steel frame and enclosure with patterned 316 stainless steel panel construction walls. Car components shall be: -

- Ceiling shall be white powder coated (Zintec pre-treatment to be applied).
- Roof strong enough for 2 men and tools.
- Car light units, quantity dependant on size of car, highly vandal resistant, flush mounted for car top lamp replacement. Fittings shall comprise twin tube fluorescent or LED lights with brushed stainless steel bezel and shall incorporate 3 hour emergency lighting battery/charger unit. Car emergency light test switch should be provided.
• Bump rails shall be fitted to the rear wall and both side walls of the lift car. The rear wall shall be fitted with 3 bump rails, and both side walls with 2 bump rails. Bump rails to be Intrad GC44 rubber, held in position by 9mm stainless steel bars. Captive nuts are to be used to enable replacement of the bump rails from inside the car. A handrail may be fitted if required.

• The car lining panel joints shall be closed and filled with 3mm grey Trovidor PVC. Car lining panels to be 316 grade stainless steel, Rimex 5WL pattern.

• One wall to be fitted with a 2mm Rimex Super 8 stainless steel mirror (Client to advise requirement) above the bump rail, full car width.

• Floor shall be either 4mm Altro Monopave studded, Lake (blue) or 6mm bar tread mild steel chequer plate, galvanised finish (Client to confirm finish required), on 22mm marine ply sub floor, mounted on a 1mm thick galvanised mild steel fire screen.

• Car operating panel to be fitted on the car slam side, 400mm in from the door opening with car top unlocking. Push buttons to be Liftstore US91-EN Compact 2 (Tactile) with Black Contrasting Background with 24Volt Dual Blue Illumination and positioned in full compliance with Part M of the Building Regulations, The Disability Discrimination Act and BS EN 81-70. Full compliant Windcrest auto dialler to be fitted to fully comply with the requirements of EN81-28.

• Note: Please refer to Appendix B, Goods Lift Car drawing for further information on finishes and layout.

h) Sling cradle comprising:- top frame, crown bar, sling vertical members, tie bars wedge rope hitch, bottom floor frame and sill assembly.

i) Roof top safety barrier and kicking strip where required. (NB: To be determined by lift contractor). Trailing cable car top terminal box to be fixed to the barrier.

j) Bi-directional safety gear complete with governor operator linkage.

k) Car doors, box construction assembly with inbuilt full height sight/finger guards, including GAL top track and hangers, bronze bottom track, toe guards, to be painted yellow, nylon tyred rollers and GAL bottom shoes.

l) Car door operators shall be a variable frequency drive (GAL: MOVFR/HA) with spring release and with an anti-interference monitor.

m) Full height shaft fascia panels (NB: To be determined by lift contractor)

n) GAL door coupling arms, rollers and skates.

o) Spring loaded roller guide shoes on the car and slipper/slider shoes on the counterweight with debris guards to shoes.

p) Car and Counterweight guide rails and brackets.

q) Complete counterweight assembly and fillers to fully balance the VF drive, the whole frame to be painted yellow.

r) New landing door assemblies complete with door locks (GAL).

s) Emergency ‘drop bar key’ door release (Express type).

t) Heavy duty GAL landing door assemblies, box construction including inbuilt full height sight/finger guards with hangers, rollers, kicking strips, bottom track guides and GAL spring tension door closers. Floor I.D. markings on the rear panel.
u) The GAL landing door bronze tracks shall be supported with a full length landing support sill, a minimum of 5mm thick.

v) New 316 landing architraves shall be “full wrap” design concrete filled with vertical recessed slam.

w) Lift number I.D. plates are to be fitted on all architrave headers, positioned on the left hand side. Floor number to be marked on each landing architrave, left hand side.

x) Landing architraves and lift car entrances must not have 2 radius edges meeting, typically headers to overlap side stiles by a minimum of 5mm, 10mm preferred. All ends of architrave headers are to be filled and polished, no open ends.

y) Landing push button units. Push buttons to be Liftstore US91-EN Compact 2 (tactile) with Black Contrasting Background with 24 volt dual blue illumination.

z) Landing indicator displaying direction and position located on all landings, angle box surface mounted above header complete with secret fixings. All indicators to be LCD type (scrolling) white on blue.

aa) Additional controls for the movement of Liquid Nitrogen.

Note: Please refer to Appendix C for further details.

bb) All shaft switches and support brackets including operating ramps.

c) Floor selector system. Shaft encoder mounted on over speed governor or lift motor.

d) Buffer assemblies for the car and counterweight (hydraulic).

e) Guide base oil drip collection trays to counterweight guides.

ff) Stop buttons for machine room and pit.

gg) To aid hand winding, the true position of the lift car shall be displayed via LCD indication on a unit mounted within easy viewing position of the hand winding wheel. This hand winding positional display unit shall also incorporate a control circuit isolation switch and buzzer when floor level is reached, powered via a rechargeable battery pack.

hh) Decoration of the lift shaft, pit, plant room and all of the remaining steelwork.

ii) Landing thresholds to be finished with 5 bar 3mm aluminium checker plate or matched to existing finish eg Terrazzo marble. (Finish to be agreed with client)

jj) Lifting runway beams or lifting eyes to be load tested and certified.

kk) Heavy duty guards incorporating rope retaining pins and fixing down spring latches. All guards to be painted orange, to cover the traction sheave, diverter sheaves, governor and governor tension weight. Pinch protection alone is not acceptable.

ll) Complete wire of the machine room, shaft and landings including all cable management machine room electrical services, shaft and pit electrical services. (e.g. Isolators lockable MEM type and consumer units etc).

mm) Motor room lighting to be high frequency light units, to provide at least 200 lx at floor level.

nn) Shaft lighting to be high frequency light units to provide at least 50 lux, 1 m above the car roof and pit floor, even when all doors are closed.
oo) Emergency lighting with high frequency light units, to be fitted within the lift motor room and lift shaft. One unit to be fitted to the car top.

pp) Controller to be programmed for energy saving mode. Car lights to be disabled during out of hours and enabled when landing call button is activated.

qq) Car interior protection drapes, one set for each lift, (one set only for duplex lifts). Each set to be clearly marked with the lift number and ‘Imperial College London’. All necessary fixing studs to be provided within the lift cars.
3.2.3 Electric Traction Goods Passenger Lift (< 1.6 m/s) – Power Operated Doors

3.2.3.1 Components to be Supplied and Fitted

All Components must comply with the General Specification Section 2 and as follows:

a) An electric geared hoist unit Sassi/Loher (Gearbox, ‘V’ sheave, brake, motor and outer bearing). The ‘V’ sheave hardness criteria will be in excess of 210Bhn Brinell scale. The hand winding wheel shall be smooth rimmed. Direction of car movement to be identified. (up – down).

b) Ac VVVF Motor control will be provided and the system will be closed loop, therefore provision must be made for the lift Machine to accept a shaft encoder (Tacho) driven by the high speed shaft. The lift motor is to be fitted with an integral cooling fan.

Roped 2:1 single wrap.

Levelling shall be +/- 3mm. The motor shall be 240 starts per hour (minimum).

c) Main ropes (minimum of 4, not less than 10mm in diameter), hitch anchor, springs.

d) Control panel shall be variable frequency/inverter drive. Simplex, duplex or Group control to be defined in the lift specific data. ECO reduced power features required.

e) Inverters rated above 22KW shall be mounted outside of the main control panel cabinet due to heat generation.

f) Governor and tension weight, rope and linkage assembly (Bode) with encoder.

g) Lift cabin, sling steel frame and enclosure with patterned 316 stainless steel panel construction walls. Car components shall be:

- Ceiling shall be white powder coated (Zintec pre-treatment to be applied).
- Roof strong enough for 2 men and tools.
- Car light units, quantity dependant on size of car, highly vandal resistant, flush mounted for car top lamp replacement. Fittings shall comprise twin tube fluorescent or LED lights with brushed stainless steel bezel and shall incorporate 3 hour emergency lighting battery/charger unit. Car emergency light test switch should be provided.
- Bump rails shall be fitted to the rear wall and both side walls of the lift car. The rear wall shall be fitted with 3 bump rails, and both side walls with 2 bump rails. Bump rails to be Intrad GC44 rubber, held in position by 9mm stainless steel bars. Captive nuts are to be used to enable replacement of the bump rails from inside the car. A handrail may be fitted if required.
- The car lining panel joints shall be closed and filled with 3mm grey Trovidor PVC. Car lining panels to be 316 grade stainless steel, Rimex 5WL pattern.
• One wall to be fitted with a 2mm Rimex Super 8 stainless steel mirror (Client to advise requirement) above the bump rail, full car width.

• Floor shall be either 4mm Altro Monopave studded, Lake (blue) or 6mm bar tread mild steel chequer plate, galvanised finish (Client to confirm finish required), on 22mm marine ply sub floor, mounted on a 1mm thick galvanised mild steel fire screen.

• Car operating panel to be fitted on the car slam side, 400mm in from the door opening with car top unlocking. Push buttons to be Liftstore US91-EN Compact 2 (Tactile) with Black Contrasting Background with 24Volt Dual Blue Illumination and positioned in full compliance with Part M of the Building Regulations, The Disability Discrimination Act and BS EN 81-70. Full compliant Windcrest auto dialler to be fitted to fully comply with the requirements of EN81-28.

• Note: Please refer to Appendix B, Goods Lift Car drawing for further information on finishes and layout.

h) Sling cradle comprising:- top frame, crown bar, sling vertical members, tie bars wedge rope hitch, bottom floor frame and sill assembly.

i) Roof top safety barrier and kicking strip where required. (NB: To be determined by lift contractor). Trailing cable car top terminal box to be fixed to the barrier.

j) Bi-directional safety gear complete with governor operator linkage.

k) Car doors, box construction assembly with inbuilt full height sight/finger guards, including GAL top track and hangers, bronze bottom track, toe guards, to be painted yellow, nylon tyred rollers and GAL bottom shoes.

l) Car door operators shall be a variable frequency drive (GAL: MOVFR/HA) with spring release and with an anti-interference monitor.

m) Full height shaft fascia panels (NB: To be determined by lift contractor)

n) GAL door coupling arms, rollers and skates.

o) Spring loaded roller guide shoes on the car and slipper/slider shoes on the counterweight with debris guards to shoes.

p) Car and Counterweight guide rails and brackets.

q) Complete counterweight assembly and fillers to fully balance the VF drive, the whole frame to be painted yellow.

r) New landing door assemblies complete with door locks (GAL).

s) Emergency ‘drop bar key’ door release (Express type).

t) Heavy duty GAL landing door assemblies, box construction including inbuilt full height sight/finger guards with hangers, rollers, kicking strips, bottom track guides and GAL spring tension door closers. Floor I.D. markings on the rear panel.

u) The GAL landing door bronze tracks shall be supported with a full length landing support sill, a minimum of 5mm thick.

v) New 316 landing architraves shall be “full wrap” design concrete filled with vertical recessed slam.

w) Lift number I.D. plates are to be fitted on all architrave headers, positioned on the left hand side. Floor number to be marked on each landing architrave, left hand side.
x) Landing architraves and lift car entrances must not have 2 radius edges meeting, typically headers to overlap side stiles by a minimum of 5mm, 10mm preferred. All ends of architrave headers are to be filled and polished, no open ends.

y) Landing push button units. Push buttons to be Liftstore US91-EN Compact 2 (tactile) with Black Contrasting Background with 24 volt dual blue illumination.

z) Landing indicator displaying direction and position located on all landings, angle box surface mounted above header complete with secret fixings. All indicators to be LCD type (scrolling) white on blue.

aa) Additional controls for the movement of Liquid Nitrogen. 

Note: Please refer to Appendix C for further details.

bb) All shaft switches and support brackets including operating ramps.

c) Floor selector system. Shaft encoder mounted on over speed governor or lift motor.

d) Buffer assemblies for the car and counterweight (hydraulic).

ee) Guide base oil drip collection trays to counterweight guides.

ff) Stop buttons for machine room and pit.

gg) To aid hand winding, the true position of the lift car shall be displayed via LCD indication on a unit mounted within easy viewing position of the hand winding wheel. This hand winding positional display unit shall also incorporate a control circuit isolation switch and buzzer when floor level is reached, powered via a rechargeable battery pack.

hh) Decoration of the lift shaft, pit, plant room and all of the remaining steelwork.

ii) Landing thresholds to be finished with 5 bar 3mm aluminium checker plate or matched to existing finish eg Terrazzo marble. (Finish to be agreed with client)

jj) Lifting runway beams or lifting eyes to be load tested and certified.

kk) Heavy duty guards incorporating rope retaining pins and fixing down spring latches. All guards to be painted orange, to cover the traction sheave, diverter sheaves, governor and governor tension weight. Pinch protection alone is not acceptable.

ll) Complete wire of the machine room, shaft and landings including all cable management machine room electrical services, shaft and pit electrical services. (e.g. Isolators lockable MEM type and consumer units etc).

mm) Motor room lighting to be high frequency light units, to provide at least 200 lx at floor level.

nn) Shaft lighting to be high frequency light units to provide at least 50 lux, 1 m above the car roof and pit floor, even when all doors are closed.

oo) Emergency lighting with high frequency light units, to be fitted within the lift motor room and lift shaft. One unit to be fitted to the car top.

pp) Controller to be programmed for energy saving mode. Car lights to be disabled during out of hours and enabled when landing call button is activated.

qq) Car interior protection drapes, one set for each lift, (one set only for duplex lifts). Each set to be clearly marked with the lift number and ‘Imperial College London’. All necessary fixing studs to be provided within the lift cars.
3.2.4 Electric Traction Goods Passenger Lift (> 1.6 m/s) – Manual Doors

Components to be Supplied and Fitted

All Components must comply with the General Specification Section 2 and as follows: -

a) Electric gearless hoist unit (Loher) (‘V’ sheave, brake, motor and outer bearing) mounted on support steel elevated off the existing machine room floor. The diverter sheave to be mounted on the underside of the steel raft complete with isolation pads. The ‘V’ sheave hardness criteria shall be in excess of 210Bhn Brinell scale. Direction of car movement to be identified. (up-down).

The control system is to have the facility to electrically lift the brake via a battery backed UPS system that allows the lift to ‘roll with load’ for emergency evacuation purposes.

Levelling shall be +/- 3mm. The motor shall be 240 starts per hour (minimum).

b) Main ropes (minimum of 4, not less than 10mm in diameter), hitch anchor, springs.

c) Control panel shall be variable frequency/inverter drive. Simplex, duplex or Group control to be defined in the lift specific data. ECO reduced power features required.

d) Inverters rated above 22KW shall be mounted outside of the main control panel cabinet due to heat generation.

e) Governor and tension weight, rope and linkage assembly (Bode) with encoder.

f) Lift cabin, sling steel frame and enclosure with patterned 316 stainless steel panel construction walls. Car components shall be:

- Ceiling shall be white powder coated (Zintec pre-treatment to be applied).
- Roof strong enough for 2 men and tools.
- Car light units, quantity dependant on size of car, highly vandal resistant, flush mounted for car top lamp replacement. Fittings shall comprise twin tube fluorescent or LED lights with brushed stainless steel bezel and shall incorporate 3 hour emergency lighting battery/charger unit. Car emergency light test switch should be provided.
- Bump rails shall be fitted to the rear wall and both side walls of the lift car. The rear wall shall be fitted with 3 bump rails, and both side walls with 2 bump rails. Bump rails to be Intrad GC44 rubber, held in position by 9mm stainless steel bars. Captive nuts are to be used to enable replacement of the bump rails from inside the car. A handrail may be fitted if required.
- The car lining panel joints shall be closed and filled with 3mm grey Trovidor PVC. Car lining panels to be 316 grade stainless steel, Rimex 5WL pattern.
- One wall to be fitted with a 2mm Rimex Super 8 stainless steel mirror (Client to advise requirement) above the bump rail, full car width.
- Floor shall be either 4mm Altro Monopave studded, Lake (blue) or 6mm bar tread mild steel chequer plate, galvanised finish (Client to confirm finish required), on 22mm marine ply sub floor, mounted on a 1mm thick galvanised mild steel fire screen.
- Car operating panel to be fitted on the car slam side, 400mm in from the door opening with car top unlocking. Push buttons to be Liftstore US91-EN Compact 2 (Tactile) with Black Contrasting Background with 24Volt Dual Blue Illumination and positioned in full compliance with Part M of the Building Regulations, The Disability Discrimination Act and BS EN 81-70. Full compliant Windcrest auto dialler to be fitted to fully comply with the requirements of EN81-28.

**Note: Please refer to Appendix B, Goods Lift Car drawing for further information on finishes and layout.**

- Sling cradle comprising:- top frame, crown bar, sling vertical members, tie bars wedge rope hitch, bottom floor frame and sill assembly.
- Roof top safety barrier and kicking strip where required. (NB: To be determined by lift contractor). Trailing cable car top terminal box to be fixed to the barrier.
- Bi-directional safety gear complete with governor operator linkage.
- Car gate manual heavy duty folding shutter gate. Imperforate galvanised leaves, mild steel scissor lattice bars and heavy duty double pickets. Top track and hangers, bottom track, toe guards, concave case hardened rollers and bottom guides. Recessed Mathews catch. Car gate to be powder coated, colour to be confirmed by Client.
- Car door switch and roller/arm.
- Full height shaft fascia panels (NB: To be determined by lift contractor)
- Spring loaded roller guide shoes on the car and slipper/sluder shoes on the counterweight with debris guards to shoes.
- Car and Counterweight guide rails and brackets.
- Complete counterweight assembly and fillers to fully balance the VF drive, the whole frame to be painted yellow.
- New landing door assemblies complete with door locks.
- Emergency ‘drop bar key’ door release (Express type).
- Landing gates heavy duty manual folding shutter gates Imperforate galvanised leaves, mild steel scissor lattice bars and heavy duty double pickets. Top track and hangers, bottom track, toe guards, concave case hardened rollers and bottom guides. Mathews catches .Floor I.D. markings on the rear panel. Fire tested to BS 476 Part 22:1987. Landing gates to be powder coated, colour to be confirmed by Client.
- Landing door tracks shall be supported with a full length landing support sill, a minimum of 5mm thick.
- New 316 landing architraves shall be “full wrap” design concrete filled with vertical recessed slam.
- Lift number I.D. plates are to be fitted on all architrave headers, positioned on the left hand side. Floor number to be marked on each landing architrave, left hand side.
w) Landing architraves and lift car entrances must not have 2 radius edges meeting, typically headers to overlap side stiles by a minimum of 5mm, 10mm preferred. All ends of architrave headers are to be filled and polished, no open ends.

x) Landing push button units. Push buttons to be Liftstore US91-EN Compact 2 (tactile) with Black Contrasting Background with 24 volt dual blue illumination.

y) Landing indicator displaying direction and position located on all landings, angle box surface mounted above header complete with secret fixings. All indicators to be LCD type (scrolling) white on blue.

z) Additional controls for the movement of Liquid Nitrogen.

Note: Please refer to Appendix C for further details.

aa) All shaft switches and support brackets including operating ramps.

bb) Floor selector system. Shaft encoder mounted on over speed governor or lift motor.

cc) Buffer assemblies for the car and counterweight (hydraulic).

dd) Guide base oil drip collection trays to counterweight guides.

ee) Stop buttons for machine room and pit.

ff) To aid hand winding, the true position of the lift car shall be displayed via LCD indication on a unit mounted within easy viewing position of the hand winding wheel. This hand winding positional display unit shall also incorporate a control circuit isolation switch and buzzer when floor level is reached, powered via a rechargeable battery pack.

gg) Decoration of the lift shaft, pit, plant room and all of the remaining steelwork.

hh) Landing thresholds to be finished with 5 bar 3mm aluminium checker plate or matched to existing finish eg Terrazzo marble. (Finish to be agreed with client)

ii) Lifting runway beams or lifting eyes to be load tested and certified.

jj) Heavy duty guards incorporating rope retaining pins and fixing down spring latches. All guards to be painted orange, to cover the traction sheave, diverter sheaves, governor and governor tension weight. Pinch protection alone is not acceptable.

kk) Complete wire of the machine room, shaft and landings including all cable management machine room electrical services, shaft and pit electrical services. (e.g. Isolators lockable MEM type and consumer units etc)

ll) Motor room lighting to be high frequency light units, to provide at least 200 lx at floor level.

mm) Shaft lighting to be high frequency light units to provide at least 50 lux, 1 m above the car roof and pit floor, even when all doors are closed.

nn) Emergency lighting with high frequency light units, to be fitted within the lift motor room and lift shaft. One unit to be fitted to the car top.

oo) Controller to be programmed for energy saving mode. Car lights to be disabled during out of hours and enabled when landing call button is activated.

pp) Car interior protection drapes, one set for each lift, (one set only for duplex lifts). Each set to be clearly marked with the lift number and ‘Imperial College London’. All necessary fixing studs to be provided within the lift cars.
3.2.5  Electric Traction Goods Passenger Lift (< 1.6 m/s) – Manual Doors

Components to be Supplied and Fitted

All Components must comply with the General Specification Section 2 and as follows: -

a) An electric geared hoist unit Sassi/Loher (Gearbox, ‘V’ sheave, brake, motor and outer bearing) The ‘V’ sheave hardness criteria will be in excess of 210Bhn Brinell scale. The hand winding wheel shall be smooth rimmed. Direction of car movement to be identified. (up – down).

b) Ac VVVF Motor control will be provided and the system will be closed loop, therefore provision must be made for the lift Machine to accept a shaft encoder (Tacho) driven by the high speed shaft. The lift motor is to be fitted with an integral cooling fan.

Roped 2:1, single wrap.

Levelling shall be +/- 3mm. The motor shall be 240 starts per hour (minimum).

c) Main ropes (minimum of 4, not less than 10mm in diameter), hitch anchor, springs.

d) Control panel shall be variable frequency/inverter drive. Simplex, duplex or Group control to be defined in the lift specific data. ECO reduced power features required.

e) Inverters rated above 22KW shall be mounted outside of the main control panel cabinet due to heat generation.

f) Governor and tension weight, rope and linkage assembly (Bode) with encoder.

g) Lift cabin, sling steel frame and enclosure with patterned 316 stainless steel panel construction walls. Car components shall be:

- Ceiling shall be white powder coated (Zintec pre-treatment to be applied).
- Roof strong enough for 2 men and tools.
- Car light units, quantity dependant on size of car, highly vandal resistant, flush mounted for car top lamp replacement. Fittings shall comprise twin tube fluorescent or LED lights with brushed stainless steel bezel and shall incorporate 3 hour emergency lighting battery/charger unit. Car emergency light test switch should be provided.
- Bump rails shall be fitted to the rear wall and both side walls of the lift car. The rear wall shall be fitted with 3 bump rails, and both side walls with 2 bump rails. Bump rails to be Intrad GC44 rubber, held in position by 9mm stainless steel bars. Captive nuts are to be used to enable replacement of the bump rails from inside the car. A handrail may be fitted if required.
- The car lining panel joints shall be closed and filled with 3mm grey Trovidor PVC. Car lining panels to be 316 grade stainless steel, Rimex 5WL pattern.
• One wall to be fitted with a 2mm Rimex Super 8 stainless steel mirror (Client to advise requirement) above the bump rail, full car width.

• Floor shall be either 4mm Altro Monopave studded, Lake (blue) or 6mm bar tread mild steel chequer plate, galvanised finish (Client to confirm finish required), on 22mm marine ply sub floor, mounted on a 1mm thick galvanised mild steel fire screen.

• Car operating panel to be fitted on the car slam side, 400mm in from the door opening with car top unlocking. Push buttons to be Liftstore US91-EN Compact 2 (Tactile) with Black Contrasting Background with 24Volt Dual Blue Illumination and positioned in full compliance with Part M of the Building Regulations, The Disability Discrimination Act and BS EN 81-70. Full compliant Windcrest auto dialler to be fitted to fully comply with the requirements of EN81-28.

• Note: Please refer to Appendix B, Goods Lift Car drawing for further information on finishes and layout.

h) Sling cradle comprising:- top frame, crown bar, sling vertical members, tie bars wedge rope hitch, bottom floor frame and sill assembly.

i) Roof top safety barrier and kicking strip where required. (NB: To be determined by lift contractor). Trailing cable car top terminal box to be fixed to the barrier.

j) Bi-directional safety gear complete with governor operator linkage.

k) Car gate manual heavy duty folding shutter gate. Imperforate galvanised leaves, mild steel scissor lattice bars and heavy duty double pickets. Top track and hangers, bottom track, toe guards, concave case hardened rollers and bottom guides. Recessed Mathews catch. Car gate to be powder coated, colour to be confirmed by Client.

l) Car door switch and roller/arm.

m) Full height shaft fascia panels (NB: To be determined by lift contractor)

n) Spring loaded roller guide shoes on the car and slipper/slider shoes on the counterweight with debris guards to shoes.

o) Car and Counterweight guide rails and brackets.

p) Complete counterweight assembly and fillers to fully balance the VF drive, the whole frame to be painted yellow.

q) New landing door assemblies complete with door locks.

r) Emergency ‘drop bar key’ door release (Express type).

s) Landing gates heavy duty manual folding shutter gates Imperforate galvanised leaves, mild steel scissor lattice bars and heavy duty double pickets. Top track and hangers, bottom track, toe guards, concave case hardened rollers and bottom guides. Mathews catches .Floor I.D. markings on the rear panel. Fire tested to BS 476 Part 22:1987. Landing gates to be powder coated, colour to be confirmed by the Client.

t) Landing door tracks shall be supported with a full length landing support sill, a minimum of 5mm thick.

u) New 316 landing architraves shall be “full wrap” design concrete filled with vertical recessed slam.
v) Lift number I.D. plates are to be fitted on all architrave headers, positioned on the left hand side. Floor number to be marked on each landing architrave, left hand side.

w) Landing architraves and lift car entrances must not have 2 radius edges meeting, typically headers to overlap side stiles by a minimum of 5mm, 10mm preferred. All ends of architrave headers are to be filled and polished, no open ends.

x) Landing push button units. Push buttons to be Liftstore US91-EN Compact 2 (tactile) with Black Contrasting Background with 24 volt dual blue illumination.

y) Landing indicator displaying direction and position located on all landings, angle box surface mounted above header complete with secret fixings. All indicators to be LCD type (scrolling) white on blue.

z) Additional controls for the movement of Liquid Nitrogen.

Note: Please refer to Appendix C for further details.

aa) All shaft switches and support brackets including operating ramps.

bb) Floor selector system. Shaft encoder mounted on over speed governor or lift motor.

c) Buffer assemblies for the car and counterweight (hydraulic).

d) Guide base oil drip collection trays to counterweight guides.

e) Stop buttons for machine room and pit.

ff) To aid hand winding, the true position of the lift car shall be displayed via LCD indication on a unit mounted within easy viewing position of the hand winding wheel. This hand winding positional display unit shall also incorporate a control circuit isolation switch and buzzer when floor level is reached, powered via a rechargeable battery pack.

gg) Decoration of the lift shaft, pit, plant room and all of the remaining steelwork.

hh) Landing thresholds to be finished with 5 bar 3mm aluminium checker plate or matched to existing finish eg Terrazzo marble. (Finish to be agreed with client)

ii) Lifting runway beams or lifting eyes to be load tested and certified.

jj) Heavy duty guards incorporating rope retaining pins and fixing down spring latches. All guards to be painted orange, to cover the traction sheave, diverter sheaves, governor and governor tension weight. Pinch protection alone is not acceptable.

kk) Complete wire of the machine room, shaft and landings including all cable management machine room electrical services, shaft and pit electrical services. (e.g. Isolators lockable MEM type and consumer units etc).

ll) Motor room lighting to be high frequency light units, to provide at least 200 lx at floor level.

mm) Shaft lighting to be high frequency light units to provide at least 50 lux, 1 m above the car roof and pit floor, even when all doors are closed.

nn) Emergency lighting with high frequency light units, to be fitted within the lift motor room and lift shaft. One unit to be fitted to the car top.

oo) Controller to be programmed for energy saving mode. Car lights to be disabled during out of hours and enabled when landing call button is activated.
pp) Car interior protection drapes, one set for each lift, (one set only for duplex lifts). Each set to be clearly marked with the lift number and ‘Imperial College London’. All necessary fixing studs to be provided within the lift cars.

3.3 TRAINING

The Contractor shall include comprehensive training to College Engineering Staff in the safe navigation and operation of and around the new lift installations.

The training shall include desktop and site specific items including visits to the lifts and motor rooms.

The training is to include a minimum of one full day and two half day visits.

The above training of Engineering Staff does not relieve the Contractor of the inherent call-out duties required under the agreed maintenance contract.

3.4 MAINTENANCE CONTRACT

The maintenance contract shall be fully comprehensive to include 24 hour, 7 days a week call out, with 4 hour response time.

The lift contractor must attend site within 20 minutes when responding for a lift entrapment.

The contract shall include for 12 scheduled service visits. Lift contractor to attend on an agreed day.

3.5 DEFECTS LIABILITY PERIOD

The defects liability period shall be for 12 months from the date of Practical Completion of the last lift in the programme.

If a lift breaks down in excess of 5 times within the 12 months defects liability period, the warranty for that lift shall be extended until reliability has been proved acceptable to the College.

3.6 LIFTING BEAMS

The existing lifting beams shall be tested and renovated as necessary as part of the lift works.
3.7 TELEPHONE LINES AND GENERAL ITEMS

The Contractor shall note that the Employer (Imperial College London) will organise telephone lines to enable communication on the lift.

The Contractor will organise the testing and replacement if necessary of the power supply to the lift motor room. The Contractor shall include a lockable isolator within the motor room.

A supply fan shall be installed within the passenger lift cars which shall operate when the emergency alarm is activated and shall run for 1 hour via a timer.

An extract fan shall be installed within the lift motor room and it shall be thermostatically controlled to suit the heat output of the lift equipment.

Passenger lifts shall be fitted with evacuation controls unless otherwise stated.

Dummy cameras shall be fitted to the interior of all lift cars. However, the lift contractor shall supply and install all necessary wiring within the motor room, lift shaft and car, for the installation of CCTV cameras.

Emergency communication shall be via a Windcrest Auto Dialler. Once operated, this shall connect to the central station located within the Sherfield Building security control room. The pre-recorded message upon activation of the alarm should state “lift alarm activated from (building name) and lift No.xx”.

Throughout the duration of the lift installation, the works shall be subject to Clerk of Work inspections. Upon completion of the lift, the Clerk of Works shall undertake witnessing of the lift test and compile a final snagging list.

Once all testing and snagging has been completed, the lift must be inspected by the College appointed insurance inspector before the lift is accepted into service.
3.8 APPENDIX

3.8.1 Appendix A – Passenger Lift Car Drawing
1. Car ceiling / Roof (Engineers platform) 1.5mm mild steel powder coated white 25mm marine ply faced with 1.5mm mild steel painted with non-slip paint.

2. Lighting - Quantity dependant on size Vandal resistant flush mounted twin tube fluorescent light. High frequency with brushed stainless steel bezel frame or where specified, LED light units.

3. Emergency lighting 300mm 12V 6W tube mounted in above light fitting

4. Entrance header 1.5mm 316 grade stainless steel - brushed finish

5. Top freeze 2mm 316 grade stainless steel brushed finish with vertical slotted natural ventilation with rear baffle plates

6. Car side and back walls 1.5mm 316 grade stainless steel - Rimerx Cambridge pattern applied to 18mm MBI plywood with 1mm thick galvanized sheet backing with joints kept to a minimum. Corring panel joints shall be closed and filled with black 3mm David or equivalent

7. Slab post 1.5mm 316 grade stainless steel - brushed finish

8. Mirror 4mm silver safety mirror to rear wall

9. Handrail 38mm diameter stainless steel - to rear wall only

10. Car operating panel Surface mounted 2mm 316 grade stainless steel - brushed Vandal resistant flush mounted twin tube fluorescent light - sliding to freeze height - bottom hinged top unlocking with chamfered slide styles projecting 50mm into car. Position indicator - Blue LCD Pushbutton - Liftstore US310 dual illuminated blue Speech synthesizer Autodialler - Windcrest

11. Bottom skirting 2mm 316 grade stainless steel - brushed finish with vertical slotted natural ventilation with rear baffle plates

12. Flooring 4mm Altro Mondopave studded - Lake (Blue)

13. Car call Phosphor bronze (on power operated doors)

14. Car door Panel arrangement to suit - finish 1.5mm 316 grade brushed stainless
3.8.2 Appendix B – Goods Lift Car Drawing
GOODS LIFT - TYPICAL LAYOUT AND FINISHES

1. Car Ceiling
   3mm mild steel powder coated white

2. Roof (Entertainment Platform)
   3mm & 2mm Aluminium tread plate

3. Lighting - Quantity and position
   Vandal resistant flush mounted twin tube fluorescent high frequency light with brushed stainless steel bezel frame.
   Emergency lighting
   300mm 12V SW tube mounted in above light fitting.

4. Entrance Header
   3mm 316 grade stainless steel
   Rimex pattern SWL

5. Floor (Entertainment Platform)
   3mm & 2mm Aluminium tread plate

6. Top Plate
   2mm 316 grade stainless steel - brushed finish with vertical slotted natural ventilation with rear baffle plate.

7. Sides and back walls
   1.5mm 316 grade stainless steel - 500mm wide panels where practical. Rimex pattern SWL. Panel separated by 9mm Black 'Danvi' strip or equivalent. Mounted on 12mm MDF clamped by 1.5mm Zintec folded panel painted black.

8. Slam Post
   1.5mm 316 grade stainless steel. Rimex pattern SWL

9. Mirror
   2mm super 8 stainless steel
   Rimex - when specified

10. Hardware
    Not fitted on goods lift

11. Car Operating Panel
    2mm 316 grade stainless steel - brushed finish mounted projecting into car face with 9mm below bump rail face. Skirting to rear height. Bottom hinged top unlocking, with side styles, lower and upper makeup panels in SWL stainless steel.
    Position indicator - blue LCD
    Push buttons - Liftstone US91 EN dual illuminated blue
    Auto-call - simplex
    Auto-Safety - Windchest (Windchest unit used for nitrogen control communication).

12. Bump Rails
    Fitted to rear of 1st floor - 3rd or rear wall at low and mid levels.
    Intracl 1000 rubber, held in place by 9mm stainless steel bars.

13. Bottom Skirt
    1.5mm 316 grade stainless steel - brushed finish with vertical slotted natural ventilation with rear baffle plate.

14. Flooring
    4mm bar tread mild steel chequer plate - galvanised finish mounted on 22mm marine ply sub floor, mounted on a 1.5mm thick galvanised mild steel fire screen.

15. Car doors
    Panel arrangement to suit
    Finish: 1.5mm 016 grade brushed stainless

16. Car Sill
    Potted Bronze (for power operated doors)

17. On Nitrogen handling cars: Tensa temporary barrier is provided
3.8.3 Appendix C – Nitrogen Control (LN2)

**Sequence of operation.**

The main level and sole control of operation is from level *(To be agreed with client)*. At this level there will be a full set of destination buttons for use when on LN2 control. These buttons will be enabled when a Key Switch (LN2 Control) at Level *(to be agreed)* has been operated. Also the car and landing speaker shall be enabled for communication.

When LN2 control is required the operator must call the lift to level *(to be agreed)*. When the lift arrives at level *(to be agreed)* the doors will automatically open.

The operator can now use LN2 control by turning on LN2 control via the key switch at level *(to be agreed).*

Once on LN2 control, the LN2 destination buttons at level *(to be agreed)* are enabled. All other call pushes are disabled when on LN2 control.

Once the nitrogen is in the lift, the operator can send the lift to any floor by first closing the doors via the close push until the doors are fully closed then entering a call to the desired level. When closing the doors, should the operator release the close push then the doors will stop closing (dead man).

Once the lift has completed its journey and the operators have finished with the lift, they will establish communication via an intercom and the lift may then be put back into normal service by returning the key switch at level *(to be agreed)* to the off position.

When on LN2 control, the operator has sole control of the lift. He may send the lift to multiple floors if necessary. The lift cannot be called by any other landing station whilst on LN2 Control.ILE will provide a volt free contact in the control panel which signals the lift has when it has been put onto LN2 control. This would be used to initiate the intercom.


NOTE:
MAT: 2mm THK STAINLESS STEEL GRADE 316

TYPICAL LN2 CONTROL STATION
3.8.4 Appendix D – Evacuation Control Station
TYPICAL SURFACE MOUNTED MAIN FLOOR EVACUATION STATION FOR DUPLEX LIFTS
NOTE:
MAT: 2.5MM THK (3 1/6 GRADE) 240 GAIT ST ST,

TYPICAL EVAC CONTROL/LANDING
PUSH STATIONS (SINGLE WAY)
HÖLSEL
4 POSN.

+ + + + +
+ + + + +
+ + + + +
+ + + + +
+ + + + +
+ + + + +
+ + + + +

3 HÖLSEL Ø35

"CALL"
PUSHBUTTON

CALL
RECOGNITION
SOUNDER

EVACUATION
INTERCOM

INTERCOM
SPEAKERS

M4 X 20 LC
ALLEN
HEAD SCREWS 4 OFF

(SEE DEVELP/ASSY
DRAWING FOR DETAIL)

ENGRAVE
LETTERING 6mm
HIGH FILL BLACK

M4 X 20 LC
STUD 8 POIN

US91-EN UP, DOWN
PUSHBUTTON BLUE
(DUAL) ILLUMINATION

EARTH STUD

M4 SOCKET
HD.SCREWS FOR
SECRET FIXING
x 4 POSN.

SEE DETAIL BELOW

PUNCHING
AND DETAILS

STUDWELDING AND
ASSEMBLY DETAILS

NOTE:
MAT. 2.5MM THK (316 GRADE) 240 GRT ST ST.

TYPICAL EVAC CONTROL/LANDING
PUSH STATIONS (TWO WAY)
SECTION 4

PARTICULAR LIFT SPECIFICATION

MAJOR MODERNISATION
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4.0 TECHNICAL AND PARTICULAR LIFT REQUIREMENTS

4.1 General

Components to be replaced, together with the whole lift installation, shall be in accordance with:

- The General Specification – Section 2
- The following Particular Specification.
- Any new or updated regulations and standards at the time of tender submission.

The following specification details:

- Lift components to be retained.
- Components to be replaced.

Where components are to be retained, they shall be fully inspected, cleaned, repaired, renovated, re-aligned and adjusted so as to bring them up to EN81 safety standards and to provide a further 25 years life expectancy.

All new components shall be as described and detailed in the appendix at the end of the Standard Specification. The lists of preferred suppliers are to be “equal or approved”.

The complete lift installation shall include all incidental and sundry components necessary for the satisfactory construction and operation of the installation, whether or not these sundry components are specified.

The new lift cars rated load and size are to be, as far as practicable, the same as the existing lift cars. Where this cannot be attained, the contractor must bring this to the attention of the CA at Tender stage.

Where the existing shaft dimensions allow, geared hoist units shall be replaced with gearless hoist units.

The Contractors attention is drawn to the planned preventative maintenance and call-out requirements for the lift scheme throughout the Defects Liability Period.

All snagging is to be completed within 2 weeks of handover of the each lift.

All works shall be completed out of normal hours, after 6 pm and before 9 am, unless previously agreed with the College.
4.2 SCOPE OF WORKS

4.2.1 Electric Traction Passenger Lift – Geared

4.2.2 Components to be Retained

The following components shall be retained where a major modernisation is being proposed:

- a) Counterweight and fillers.
- b) Guides and brackets.

4.2.3 New Components to be Supplied and Fitted

All Components must comply with the General Specification Section 2 and as follows:

- b) An electric geared hoist unit (Sassi/Loher) (Gearbox, ‘V’ sheave, brake, motor and outer bearing) The ‘V’ sheave hardness criteria will be in excess of 210Bhn Brinell scale. The hand winding wheel shall be smooth rimmed. Direction of car movement to be identified. (up – down).
- c) AC VVVF Motor (Sassi/Loher) control will be provided and the system will be closed loop, therefore provision must be made for the lift Machine to accept a shaft encoder (Tacho) driven by the high speed shaft. The lift motor is to be fitted with an integral cooling fan.
  Lift speed to be increased to the maximum speed as determined by the available pit depth and headroom.
  Levelling shall be +/- 3mm. The motor shall be 240 starts per hour (minimum).
- d) Main ropes (minimum of 4, not less than 10mm in diameter), hitch anchor, springs.
- e) Control panel shall be variable frequency/inverter drive. Simplex, duplex or Group control to be defined in the lift specific data. ECO reduced power features required.
- f) Inverters rated above 22KW shall be mounted outside of the main control panel cabinet due to heat generation.
- j) Governor and tension weight, rope and linkage assembly (Bode) with encoder.
- k) Lift cabin, sling steel frame and enclosure with patterned 316 stainless steel panel construction walls. Car components shall be:
  - Ceiling shall be white powder coated (Zintec pre-treatment to be applied).
  - Roof strong enough for 2 men and tools.
- Car light units, quantity dependant on size of car, highly vandal resistant, flush mounted for car top lamp replacement. Fittings shall comprise twin tube fluorescent or LED lights with brushed stainless steel bezel and shall incorporate 3 hour emergency lighting battery/charger unit. Car emergency light test switch should be provided.

- A combined hand and bump rail shall be fitted to two sides of the lift car. The height should be sufficient to support passengers and to protect the car internal finishes from damage. Where this may restrict the available car area the handrail should only be mounted on the car wall adjacent to the car operating panel.

- The car lining panel joints shall be closed and filled with 3mm “Darvic” or equivalent. Car lining panels to be 316 grade stainless steel, Rimex Cambridge pattern.

- One wall to be fitted with a 6mm silver safety mirror above the handrail, full car width.

- Floor shall be 4mm Altro Monopave studded, Lake (blue) on mdf membrane with solvent sealant protection. Underside of the timber to be sheet steel panel protected with fire retardant paint.

- Car operating panel to be fitted on the car slam side, 400mm in from the door opening with car top unlocking. Push buttons to be Liftstore US91-EN Compact 2 (Tactile) with Black Contrasting Background with 24Volt Dual Blue Illumination and positioned in full compliance with Part M of the Building Regulations, The Disability Discrimination Act and BS EN 81-70. Full compliant Windcrest auto dialler to be fitted to fully comply with the requirements of EN81-28.

- Note: Please refer to Appendix A, Passenger Lift Car drawing for further information on finishes and layout.

l) Sling cradle comprising:- top frame, crown bar, sling vertical members, tie bars wedge rope hitch, bottom floor frame and sill assembly.

m) Roof top safety barrier and kicking strip where required. (NB: To be determined by lift contractor). Trailing cable car top terminal box to be fixed to the barrier.

n) Bi-directional safety gear complete with governor operator linkage.

o) Car doors, box construction assembly with inbuilt full height sight/finger guards, including GAL top track and hangers, bronze bottom track, toe guards, to be painted yellow, nylon tyred rollers and GAL bottom shoes.

p) Car door operators shall be a variable frequency drive (GAL: MOVFR/HA) with spring release and with an anti-interference monitor.

q) Full height shaft fascia panels (NB: To be determined by lift contractor)

r) GAL door coupling arms, rollers and skates.

s) Spring loaded roller guide shoes on the car and slipper/slider shoes on the counterweight with debris guards to shoes.

t) Additional counter weight fillers to fully balance the VF drive, the whole frame to be painted yellow.

u) New landing door assemblies complete with door locks (GAL).
v) Emergency ‘drop bar key’ door release (Express type).
w) Heavy duty GAL landing door assemblies, box construction including inbuilt full height sight/finger guards with hangers, rollers, kicking strips, bottom track guides and GAL spring tension door closers. Floor I.D. markings on the rear panel.
x) The GAL landing door bronze tracks shall be supported with a full length landing support sill, a minimum of 5mm thick.
y) New 316 landing architraves shall be “full wrap” design concrete filled with vertical recessed slam.
z) Lift number I.D. plates are to be fitted on all architrave headers, positioned on the left hand side. Floor number to be marked on each landing architrave, left hand side.

aa) Landing architraves and lift car entrances must not have 2 radius edges meeting, typically headers to overlap side stiles by a minimum of 5mm, 10mm preferred. All ends of architrave headers are to be filled and polished, no open ends.

bb) Landing push button units. Push buttons to be Liftstore US91-EN Compact 2 (tactile) with Black Contrasting Background with 24 volt dual blue illumination.

c) Landing indicator displaying direction and position located on all landings, angle box surface mounted above header complete with secret fixings. All indicators to be LCD type (scrolling) white on blue.

d) Evacuation controls to meet BS5588 Part 8 and auto change over panel for alternate power supply. Evacuation controls are to be Windcrest derived with a full set of buttons and speaker at the designated floor, other floors to have a slave station with speaker and button. All Evacuation Stations are to be flush mounted unless specified otherwise by the Client.

Note: Please refer to Appendix D for further details.

e) All shaft switches and support brackets including operating ramps.

ff) Floor selector system. Shaft encoder mounted on over speed governor or lift motor.

gg) Buffer assemblies for the car and counterweight (hydraulic).

hh) Guide base oil drip collection trays to counterweight guides.

ii) Stop buttons for machine room and pit.

jj) To aid hand winding, the true position of the lift car shall be displayed via LCD indication on a unit mounted within easy viewing position of the hand winding wheel. This hand winding positional display unit shall also incorporate a control circuit isolation switch and buzzer when floor level is reached, powered via a rechargeable battery pack.

kk) Decoration of the landings up to the nearest corner/change of wall direction around the lift architraves. Decoration of the lift shaft, pit, plant room and all of the remaining steelwork.

ll) Landing thresholds to be finished with 5 bar 3mm aluminium checker plate or matched to existing finish e.g. Terrazzo marble. (Finish to be agreed with client)

mm) Clean off all corrosion to good metal and apply anti-rust treatment. Guides and brackets are to be painted grey.
nn) Lifting runway beams or lifting eyes to be load tested and certified.

oo) Heavy duty guards incorporating rope retaining pins and fixing down spring latches. All guards to be painted orange, to cover the traction sheave, diverter sheaves, governor and governor tension weight. Pinch protection alone is not acceptable.

pp) Complete rewire of the machine room, shaft and landings including all cable management machine room electrical services, shaft and pit electrical services. (e.g. Isolators lockable MEM type and consumer units etc).

qq) Motor room lighting to be replaced with high frequency light units, to provide at least 200 lx at floor level.

rr) Shaft lighting to be replaced with high frequency light units to provide at least 50 lux, 1 m above the car roof and pit floor, even when all doors are closed.

ss) Emergency lighting with high frequency light units, to be fitted within the lift motor room and lift shaft. One unit to be fitted to the car top.

tt) Controller to be programmed for energy saving mode. Car lights to be disabled during out of hours and enabled when landing call button is activated.

uu) Car interior protection drapes, one set for each lift, (one set only for duplex lifts). Each set to be clearly marked with the lift number and ‘Imperial College London’. All necessary fixing studs to be provided within the lift cars.

vv) Attendant builders work, holes, chases and making good.
4.2.4 Electric Traction Passenger Lift – Gearless

4.2.5 Components to be retained

The following components shall be retained where a major modernisation is being proposed: -

- Counterweight and fillers.
- Guides and brackets.

4.2.6 New Components to be supplied and fitted

All Components must comply with the General Specification Section 2 and as follows: -

b) Electric gearless hoist unit (Loher) ('V' sheave, brake, motor and outer bearing) mounted on support steel elevated off the existing machine room floor. The diverter sheave to be mounted on the underside of the steel raft complete with isolation pads. The 'V' sheave hardness criteria shall be in excess of 210Bhn Brinell scale. Direction of car movement to be identified. (up-down).

   The control system is to have the facility to electrically lift the brake via a battery backed UPS system that allows the lift to 'roll with load' for emergency evacuation purposes.

   Lift speed to be increased to the maximum speed as determined by the available pit depth and headroom

   Levelling shall be +/- 3mm. The motor shall be 240 starts per hour (minimum).

e) Main ropes (minimum of 4, not less than 10mm in diameter), 2:1 roping, hitch anchor, springs.

f) Control panel shall be variable frequency/inverter drive. Simplex, duplex or Group control to be defined in the lift specific data. ECO reduced power features required.

f) Inverters rated above 22KW shall be mounted outside of the main control panel cabinet due to heat generation.

g) Governor and tension weight, rope and linkage assembly (Bode) with encoder.

h) Lift cabin, sling steel frame and enclosure with patterned 316 stainless steel panel construction walls. Car components shall be:

   - Ceiling shall be white powder coated (Zintec pre-treatment to be applied).
   - Roof strong enough for 2 men and tools.
   - Car light units, quantity dependant on size of car, highly vandal resistant, flush mounted for car top lamp replacement. Fittings shall comprise twin tube fluorescent or LED lights with brushed stainless steel bezel and shall incorporate 3 hour emergency lighting battery/charger unit. Car emergency light test switch should be provided.
• A combined hand and bump rail shall be fitted to two sides of the lift car. The height should be sufficient to support passengers and to protect the car internal finishes from damage. Where this may restrict the available car area the handrail should only be mounted on the car wall adjacent to the car operating panel.

• The car lining panel joints shall be closed and filled with 3mm “Darvic” or equivalent. Car lining panels to be 316 grade stainless steel, Rimex Cambridge pattern.

• One wall to be fitted with a 6mm silver safety mirror above the handrail, full car width.

• Floor shall be 4mm Altro Monopave studded, Lake (blue) on mdf membrane with solvent sealant protection. Underside of the timber to be sheet steel panel protected with fire retardant paint.

• Car operating panel to be fitted on the car slam side, 400mm in from the door opening with car top unlocking. Push buttons to be Liftstore US91-EN Compact 2 (Tactile) with Black Contrasting Background with 24Volt Dual Blue Illumination and positioned in full compliance with Part M of the Building Regulations, The Disability Discrimination Act and BS EN 81-70. Full compliant Windcrest auto dialler to be fitted to fully comply with the requirements of EN81-28.

• **Note: Please refer to Appendix A, Passenger Lift Car drawing for further information on finishes and layout.**

  j) Sling cradle comprising:- top frame, crown bar, sling vertical members, tie bars wedge rope hitch, bottom floor frame and sill assembly.

  k) Roof top safety barrier and kicking strip where required. (NB: To be determined by lift contractor). Trailing cable car top terminal box to be fixed to the barrier.

  l) Bi-directional safety gear complete with governor operator linkage. 

  **Note: Bi-directional safety gear is not required on gearless motor installations when the brake is in compliance with EN81-1 as regards to an approved method of protection against uncontrolled upward movement.**

  qq) Car doors, box construction assembly with inbuilt full height sight/finger guards, including GAL top track and hangers, bronze bottom track, toe guards, to be painted yellow, nylon tyred rollers and GAL bottom shoes.

  rr) Car door operators shall be a variable frequency drive (GAL: MOVFR/HA) with spring release and with an anti-interference monitor.

  ss) Full height shaft fascia panels (NB: To be determined by lift contractor)

  tt) GAL door coupling arms, rollers and skates.

  uu) Spring loaded roller guide shoes on the car and slipper/slider shoes on the counterweight with debris guards to shoes.

  vv) Additional counter weight fillers to fully balance the VF drive, the whole frame to be painted yellow.

  ww) New landing door assemblies complete with door locks (GAL).

  xx) Emergency ‘drop bar key’ door release (Express type).
yy) Heavy duty GAL landing door assemblies, box construction including inbuilt full height sight/finger guards with hangers, rollers, kicking strips, bottom track guides and GAL spring tension door closers. Floor I.D. markings on the rear panel.

zz) The GAL landing door bronze tracks shall be supported with a full length landing support sill, a minimum of 5mm thick.

aaa) New 316 landing architraves shall be “full wrap” design concrete filled with vertical recessed slam.

bbb) Lift number I.D. plates are to be fitted on all architrave headers, positioned on the left hand side. Floor number to be marked on each landing architrave, left hand side.

ccc) Landing architraves and lift car entrances must not have 2 radius edges meeting, typically headers to overlap side stiles by a minimum of 5mm, 10mm preferred. All ends of architrave headers are to be filled and polished, no open ends.

ddd) Landing push button units. Push buttons to be Liftstore US91-EN Compact 2 (tactile) with Black Contrasting Background with 24 volt dual blue illumination.

eee) Landing indicator displaying direction and position located on all landings, angle box surface mounted above header complete with secret fixings. All indicators to be LCD type (scrolling) white on blue.

fff) Evacuation controls to meet BS5588 Part 8 and auto change over panel for alternate power supply (Alternate power supply to be supplied by the College). Evacuation controls are to be Windcrest derived with a full set of buttons and speaker at the designated floor, other floors to have a slave station with speaker and button.

All Evacuation Stations are to be flush mounted unless specified otherwise by the Client.

*Note: Please refer to Appendix D for further details.*

ggg) All shaft switches and support brackets including operating ramps.

hhh) Floor selector system. Shaft encoder mounted on over speed governor or lift motor.

iii) Buffer assemblies for the car and counterweight (hydraulic).

jjj) Guide base oil drip collection trays to counterweight guides.

kkk) Stop buttons for machine room and pit.

lll) To aid hand winding, the true position of the lift car shall be displayed via LCD indication on a unit mounted within easy viewing position of the hand winding wheel. This hand winding positional display unit shall also incorporate a control circuit isolation switch and buzzer when floor level is reached, powered via a rechargeable battery pack.

mmm) Decoration of the landings up to the nearest corner/change of wall direction around the lift architraves. Decoration of the lift shaft, pit, plant room and all of the remaining steelwork.

nnn) Landing thresholds to be finished with 5 bar 3mm aluminium checker plate or matched to existing finish eg Terrazzo marble. (Finish to be agreed with client)
Clean off all corrosion to good metal and apply anti-rust treatment. Guides and brackets are to be painted grey.

Lifting runway beams or lifting eyes to be load tested and certified.

Heavy duty guards incorporating rope retaining pins and fixing down spring latches. All guards to be painted orange, to cover the traction sheave, diverter sheaves, governor and governor tension weight. Pinch protection alone is not acceptable.

Complete rewire of the machine room, shaft and landings including all cable management machine room electrical services, shaft and pit electrical services. (e.g. Isolators lockable MEM type and consumer units etc).

Motor room lighting to be replaced with high frequency light units, to provide at least 200 lx at floor level.

Shaft lighting to be replaced with high frequency light units to provide at least 50 lux, 1 m above the car roof and pit floor, even when all doors are closed.

Emergency lighting with high frequency light units, to be fitted within the lift motor room and lift shaft. One unit to be fitted to the car top.

Controller to be programmed for energy saving mode. Car lights to be disabled during out of hours and enabled when landing call button is activated.

Car interior protection drapes, one set for each lift, (one set only for duplex lifts). Each set to be clearly marked with the lift number and ‘Imperial College London’. All necessary fixing studs to be provided within the lift cars.

Attendant builders work, holes, chases and making good.
4.2.7 Electric Traction Goods Passenger Lift – Power Operated Doors

4.2.8 Components to be retained

The following components shall be retained where a major modernisation is being proposed:

a) Counterweight and fillers.
b) Guides and brackets.

definition of the lift system.

d) AC VVVF Motor (Sassi/Loher) control will be provided and the system will be closed loop, therefore provision must be made for the lift Machine to accept a shaft encoder (Tacho) driven by the high speed shaft. The lift motor is to be fitted with an integral cooling fan.

Lift speed to be increased to the maximum speed as determined by the available pit depth and headroom.

Levelling shall be +/- 3mm. The motor shall be 240 starts per hour (minimum).

e) Main ropes (minimum of 4, not less than 10mm in diameter), hitch anchor, springs.
f) Control panel shall be variable frequency/inverter drive. Simplex, duplex or Group control to be defined in the lift specific data. ECO reduced power features required.
g) Inverters rated above 22KW shall be mounted outside of the main control panel cabinet due to heat generation.

h) Lift cabin, sling steel frame and enclosure with patterned 316 stainless steel panel construction walls. Car components shall be:

- Ceiling shall be white powder coated (Zintec pre-treatment to be applied).
- Roof strong enough for 2 men and tools.
• Car light units, quantity dependant on size of car, highly vandal resistant, flush mounted for car top lamp replacement. Fittings shall comprise twin tube fluorescent or LED lights with brushed stainless steel bezel and shall incorporate 3 hour emergency lighting battery/charger unit. Car emergency light test switch should be provided.

• Bump rails shall be fitted to the rear wall and both side walls of the lift car. The rear wall shall be fitted with 3 bump rails, and both side walls with 2 bump rails. Bump rails to be Intrada GC44 rubber, held in position by 9mm stainless steel bars. Captive nuts are to be used to enable replacement of the bump rails from inside the car. A handrail may be fitted if required.

• The car lining panel joints shall be closed and filled with 3mm grey Trovidor PVC. Car lining panels to be 316 grade stainless steel, Rimex 5WL pattern.

• One wall to be fitted with a 2mm Rimex Super 8 stainless steel mirror (Client to advise requirement) above the bump rail, full car width.

• Floor shall be either 4mm Altro Monopave studded, Lake (blue) or 6mm bar tread mild steel chequer plate, galvanised finish (Client to confirm finish required), on 22mm marine ply sub floor, mounted on a 1mm thick galvanised mild steel fire screen.

• Car operating panel to be fitted on the car slam side, 400mm in from the door opening with car top unlocking. Push buttons to be Liftstore US91-EN Compact 2 (Tactile) with Black Contrasting Background with 24Volt Dual Blue Illumination and positioned in full compliance with Part M of the Building Regulations, The Disability Discrimination Act and BS EN 81-70. Full compliant Windcrest auto dialler to be fitted to fully comply with the requirements of EN81-28.

• **Note:** Please refer to Appendix B, Goods Lift Car drawing for further information on finishes and layout

j) Sling cradle comprising:- top frame, crown bar, sling vertical members, tie bars wedge rope hitch, bottom floor frame and sill assembly.

k) Roof top safety barrier and kicking strip where required. (NB: To be determined by lift contractor). Trailing cable car top terminal box to be fixed to the barrier.

rr) Bi-directional safety gear complete with governor operator linkage.

ss) Car doors, box construction assembly with inbuilt full height sight/finger guards, including GAL top track and hangers, bronze bottom track, toe guards, to be painted yellow, nylon tyred rollers and GAL bottom shoes.

tt) Car door operators shall be a variable frequency drive (GAL: MOVFR/HA) with spring release and with an anti-interference monitor.

uu) Full height shaft fascia panels (NB: To be determined by lift contractor)

vv) GAL door coupling arms, rollers and skates.

ww) Spring loaded roller guide shoes on the car and slipper/slider shoes on the counterweight with debris guards to shoes.

xx) Additional counter weight fillers to fully balance the VF drive, the whole frame to be painted yellow.

yy) New landing door assemblies complete with door locks (GAL).
zz) Emergency ‘drop bar key’ door release (Express type).

aaa) Heavy duty GAL landing door assemblies, box construction including inbuilt full height sight/finger guards with hangers, rollers, kicking strips, bottom track guides and GAL spring tension door closers. Floor I.D. markings on the rear panel.

bbb) The GAL landing door bronze tracks shall be supported with a full length landing support sill, a minimum of 5mm thick.

ccc) New 316 landing architraves shall be “full wrap” design concrete filled with vertical recessed slam.

ddd) Lift number I.D. plates are to be fitted on all architrave headers, positioned on the left hand side. Floor number to be marked on each landing architrave, left hand side.

eee) Landing architraves and lift car entrances must not have 2 radius edges meeting, typically headers to overlap side stiles by a minimum of 5mm, 10mm preferred. All ends of architrave headers are to be filled and polished, no open ends.

fff) Landing push button units. Push buttons to be Liftstore US91-EN Compact 2 (tactile) with Black Contrasting Background with 24 volt dual blue illumination.

ggg) Landing indicator displaying direction and position located on all landings, angle box surface mounted above header complete with secret fixings. All indicators to be LCD type (scrolling) white on blue.

hhh) Additional controls for the movement of Liquid Nitrogen.

Note: Please refer to Appendix C for further details.

iii) All shaft switches and support brackets including operating ramps.

jjj) Floor selector system. Shaft encoder mounted on over speed governor or lift motor.

kkk) Buffer assemblies for the car and counterweight (hydraulic).

lll) Guide base oil drip collection trays to counterweight guides.

mmm) Stop buttons for machine room and pit.

nnn) To aid hand winding, the true position of the lift car shall be displayed via LCD indication on a unit mounted within easy viewing position of the hand winding wheel. This hand winding positional display unit shall also incorporate a control circuit isolation switch and buzzer when floor level is reached, powered via a rechargeable battery pack.

ooo) Decoration of the landings up to the nearest corner/change of wall direction around the lift architraves. Decoration of the lift shaft, pit, plant room and all of the remaining steelwork.

ppp) Landing thresholds to be finished with 5 bar 3mm aluminium checker plate or matched to existing finish eg Terrazzo marble. (Finish to be agreed with client)

qqq) Clean off all corrosion to good metal and apply anti-rust treatment. Guides and brackets are to be painted grey.

rrr) Lifting runway beams or lifting eyes to be load tested and certified.
sss) Heavy duty guards incorporating rope retaining pins and fixing down spring latches. All guards to be painted orange, to cover the traction sheave, diverter sheaves, governor and governor tension weight. Pinch protection alone is not acceptable.

ttt) Complete rewire of the machine room, shaft and landings including all cable management machine room electrical services, shaft and pit electrical services. (e.g. Isolators lockable MEM type and consumer units etc).

uuu) Motor room lighting to be replaced with high frequency light units, to provide at least 200 lx at floor level.

vvv) Shaft lighting to be replaced with high frequency light units to provide at least 50 lux, 1 m above the car roof and pit floor, even when all doors are closed.

www) Emergency lighting with high frequency light units, to be fitted within the lift motor room and lift shaft. One unit to be fitted to the car top.

xxx) Controller to be programmed for energy saving mode. Car lights to be disabled during out of hours and enabled when landing call button is activated.

yyy) Car interior protection drapes, one set for each lift, (one set only for duplex lifts). Each set to be clearly marked with the lift number and ‘Imperial College London’. All necessary fixing studs to be provided within the lift cars.

zzz) Attendant builders work, holes, chases and making good.
4.2.10 Electric Traction Goods Passenger Lift – Manual Doors

4.2.11 Components to be retained

The following components shall be retained where a major modernisation is being proposed:

- Counterweight and fillers.
- Guides and brackets.

4.2.12 New Components to be supplied and fitted

All Components must comply with the General Specification Section 2 and as follows:

a) An electric geared hoist unit (Sassi/Loher) (Gearbox, ‘V’ sheave, brake, motor and outer bearing) The ‘V’ sheave hardness criteria will be in excess of 210Bhn Brinell scale. The hand winding wheel shall be smooth rimmed. Direction of car movement to be identified. (up – down).

e) AC VVVF Motor (Sassi/Loher) control will be provided and the system will be closed loop, therefore provision must be made for the lift Machine to accept a shaft encoder (Tacho) driven by the high speed shaft. The lift motor is to be fitted with an integral cooling fan.

Lift speed to be increased to the maximum speed as determined by the available pit depth and headroom.

Levelling shall be +/- 3mm. The motor shall be 240 starts per hour (minimum).

f) Main ropes (minimum of 4, not less than 10mm in diameter), hitch anchor, springs.

g) Control panel shall be variable frequency/inverter drive. Simplex, duplex or Group control to be defined in the lift specific data. ECO reduced power features required.

h) Inverters rated above 22KW shall be mounted outside of the main control panel cabinet due to heat generation.

h) Governor and tension weight, rope and linkage assembly (Bode) with encoder.

i) Lift cabin, sling steel frame and enclosure with patterned 316 stainless steel panel construction walls. Car components shall be:

- Ceiling shall be white powder coated (Zintec pre-treatment to be applied).
- Roof strong enough for 2 men and tools.
- Car light units, quantity dependant on size of car, highly vandal resistant, flush mounted for car top lamp replacement. Fittings shall comprise twin tube fluorescent or LED lights with brushed stainless steel bezel and shall incorporate 3 hour emergency lighting battery/charger unit. Car emergency light test switch should be provided.

- Bump rails shall be fitted to the rear wall and both side walls of the lift car. The rear wall shall be fitted with 3 bump rails, and both side walls with 2 bump rails. Bump rails to be Intrad GC44 rubber, held in position by 9mm stainless steel bars. Captive nuts are to be used to enable replacement of the bump rails from inside the car. A handrail may be fitted if required.

- The car lining panel joints shall be closed and filled with 3mm grey Trovidor PVC. Car lining panels to be 316 grade stainless steel, Rimex 5WL pattern.

- One wall to be fitted with a 2mm Rimex Super 8 stainless steel mirror (Client to advise requirement) above the bump rail, full car width.

- Floor shall be either 4mm Altro Monopave studded, Lake (blue) or 6mm bar tread mild steel chequer plate, galvanised finish (Client to confirm finish required), on 22mm marine ply sub floor, mounted on a 1mm thick galvanised mild steel fire screen.

- Car operating panel to be fitted on the car slam side, 400mm in from the door opening with car top unlocking. Push buttons to be Liftstore US91-EN Compact 2 (Tactile) with Black Contrast Background with 24Volt Dual Blue Illumination and positioned in full compliance with Part M of the Building Regulations, The Disability Discrimination Act and BS EN 81-70. Full compliant Windcrest auto dialler to be fitted to fully comply with the requirements of EN81-28.

- **Note: Please refer to Appendix B, Goods Lift Car drawing for further information on finishes and layout.**

  j) Sling cradle comprising:- top frame, crown bar, sling vertical members, tie bars wedge rope hitch, bottom floor frame and sill assembly.

  k) Roof top safety barrier and kicking strip where required. (NB: To be determined by lift contractor). Trailing cable car top terminal box to be fixed to the barrier.

  qq) Bi-directional safety gear complete with governor operator linkage.

  rr) Car gate manual heavy duty folding shutter gate. Imperforate galvanised leaves, mild steel scissor lattice bars and heavy duty double pickets. Top track and hangers, bottom track, toe guards, concave case hardened rollers and bottom guides. Recessed Mathews catch. Car gate to be powder coated, colour to be confirmed by Client.

  ss) Car door switch and roller/arm.

  tt) Full height shaft fascia panels (NB: To be determined by lift contractor)

  uu) Spring loaded roller guide shoes on the car and slipper/slider shoes on the counterweight with debris guards to shoes.

  vv) Additional counter weight fillers to fully balance the VF drive, the whole frame to be painted yellow.

  ww) New landing door assemblies complete with door locks.

  xx) Emergency ‘drop bar key’ door release (Express type).

zz) Landing door tracks shall be supported with a full length landing support sill, a minimum of 5mm thick.

aaa) New 316 landing architraves shall be "full wrap" design concrete filled with vertical recessed slam.

bbb) Lift number I.D. plates are to be fitted on all architrave headers, positioned on the left hand side. Floor number to be marked on each landing architrave, left hand side.

ccc) Landing architraves and lift car entrances must not have 2 radius edges meeting, typically headers to overlap side stiles by a minimum of 5mm, 10mm preferred. All ends of architrave headers are to be filled and polished, no open ends.

ddd) Landing push button units. Push buttons to be Liftstore US91-EN Compact 2 (tactile) with Black Contrasting Background with 24 volt dual blue illumination.

ee) Landing indicator displaying direction and position located on all landings, angle box surface mounted above header complete with secret fixings. All indicators to be LCD type (scrolling) blue on white.

fff) Additional controls for the movement of Liquid Nitrogen.

   Note: Please refer to Appendix C for further details.

ggg) All shaft switches and support brackets including operating ramps.

hhh) Floor selector system. Shaft encoder mounted on over speed governor or lift motor.

iii) Buffer assemblies for the car and counterweight (hydraulic).

jjj) Guide base oil drip collection trays to counterweight guides.

kkk) Stop buttons for machine room and pit.

lll) To aid hand winding, the true position of the lift car shall be displayed via LCD indication on a unit mounted within easy viewing position of the hand winding wheel. This hand winding positional display unit shall also incorporate a control circuit isolation switch and buzzer when floor level is reached, powered via a rechargeable battery pack.

mmm) Decoration of the landings up to the nearest corner/change of wall direction around the lift architraves. Decoration of the lift shaft, pit, plant room and all of the remaining steelwork.

nnn) Landing thresholds to be finished with 5 bar 3mm aluminium checker plate or matched to existing finish eg Terrazzo marble. (Finish to be agreed with client)

ooo) Clean off all corrosion to good metal and apply anti-rust treatment. Guides and brackets are to be painted grey.

ppp) Lifting runway beams or lifting eyes to be load tested and certified.
qqq) Heavy duty guards incorporating rope retaining pins and fixing down spring latches. All guards to be painted orange, to cover the traction sheave, diverter sheaves, governor and governor tension weight. Pinch protection alone is not acceptable.

rrr) Complete rewire of the machine room, shaft and landings including all cable management machine room electrical services, shaft and pit electrical services. (e.g. Isolators lockable MEM type and consumer units etc).

sss) Motor room lighting to be replaced with high frequency light units, to provide at least 200 lx at floor level.

ttt) Shaft lighting to be replaced with high frequency light units to provide at least 50 lux, 1 m above the car roof and pit floor, even when all doors are closed.

uuu) Emergency lighting with high frequency light units, to be fitted within the lift motor room and lift shaft. One unit to be fitted to the car top.

vvv) Controller to be programmed for energy saving mode. Car lights to be disabled during out of hours and enabled when landing call button is activated.

www) Car interior protection drapes, one set for each lift, (one set only for duplex lifts). Each set to be clearly marked with the lift number and ‘Imperial College London’. All necessary fixing studs to be provided within the lift cars.

xxx) Attendant builders work, holes, chases and making good.
4.3 TRAINING

The Contractor shall include comprehensive training to College Engineering Staff in the safe navigation and operation of and around the new lift installations.

The training shall include desktop and site specific items including visits to the lifts and motor rooms.

The training is to include a minimum of one full day and two half day visits.

The above training of Engineering Staff does not relieve the Contractor of the inherent call-out duties required under the agreed maintenance contract.

4.3.1 Maintenance Contract

The maintenance contract shall be fully comprehensive to include 24 hour, 7 days a week call out, with 4 hour response time.

The lift contractor must attend site within 20 minutes when responding for a lift entrapment.

The contract shall include for 12 scheduled service visits. Lift contractor to attend on an agreed day.

4.3.2 Defects Liability Period

The defects liability period shall be for 12 months from the date of Practical Completion of the last lift in the programme.

If a lift breaks down in excess of 5 times within the 12 months defects liability period, the warranty for that lift shall be extended until reliability has been proved acceptable to the College.

4.4 LIFTING BEAMS

The existing lifting beams shall be tested and renovated as necessary as part of the lift works.

4.5 TELEPHONE LINES AND GENERAL ITEMS

The Contractor shall note that the Client (Imperial College London) will organise telephone lines to enable communication on the lift.

The Contractor will organise the testing and replacement if necessary of the power supply to the lift motor room. The Contractor shall include a lockable isolator within the motor room.

A supply fan shall be installed within the passenger lift cars which shall operate when the emergency alarm is activated and shall run for 1 hour via a timer.

An extract fan shall be installed within the lift motor room and it shall be thermostatically controlled to suit the heat output of the lift equipment.

Passenger lifts shall be fitted with evacuation controls unless otherwise stated.
Dummy cameras shall be fitted to the interior of all lift cars. However the lift contractor shall supply and install all necessary wiring within the motor room, lift shaft and car, for the installation of CCTV cameras.

Emergency communication shall be via a Windcrest Auto Dialler. Once operated this shall connect to the central station located within the Sherfield Building security control room. The pre-recorded message upon activation of the alarm should state “lift alarm activated from (building name) and lift No.'xx'”.

Throughout the duration of the lift installation, the works shall be subject to Clerk of Work inspections. Upon completion of the lift, the Clerk of Works shall undertake witnessing of the lift test and compile a final snagging list.

Once all testing and snagging has been completed the lift must be inspected by the College appointed insurance inspector before the lift is accepted into service.
4.6  APPENDIX

4.6.1  Appendix A – Passenger Lift Car Drawing
PASSENGER LIFT - TYPICAL LAYOUT AND FINISHES

1. **Car ceiling / Roof (Engineers platform)**
   - 1mm mild steel powder coated white.
   - 25mm marine ply faced with 1mm mild steel painted with non-slip paint.

2. **Emergency lighting**
   - 300mm 12V 5W tube mounted in above light fitting.

3. **Entrance header**
   - 1.5mm 316 grade stainless steel - brushed finish.

4. **Top freeze**
   - 2mm 316 grade stainless steel - brushed finish with vertical dotted natural ventilation with rear baffle plates.

5. **Car side and back walls**
   - 1.5mm 316 grade stainless steel - Rimes Cambridge pattern applied to 10mm WBP plywood with 3mm thick galvanised sheet backing with joints kept to a minimum. Car lining panel joints shall be closed and filled with black 3mm Dacor or equivalent.

6. **Slam post**
   - 1.5mm 316 grade stainless steel - brushed finish.

7. **Mirror**
   - 6mm silver safety mirror to rear wall.

8. **Handrail**
   - 38mm diameter stainless steel - to rear wall only.

9. **Car operating panel**
   - Surface mounted 2mm 316 grade stainless steel - brushed finish.
   - Skirting to freeze height - bottom hinged top unlocking with chamfered side styles projecting 30mm into car.
   - Position indicator - blue LCD.
   - Pushbuttons - Liftstore US9164 dual illuminated blue.
   - Speech synthesiser.
   - Autodialler - Windcrest.

10. **Bottom skirting**
    - 2mm 316 grade stainless steel - brushed finish with vertical dotted natural ventilation with rear baffle plates.

11. **Flooring**
    - 4mm Altro Mondovave studded - Lake (Blue).

12. **Car cells**
    - Phosphorus bronze on power operated doors.

13. **Car doors**
    - Panel arrangement to suit - finish 1.5mm 316 grade brushed stainless.
4.7 Appendix B – Goods Lift Car Drawing
GOODS LIFT - TYPICAL LAYOUT AND FINISHES

1. Car Ceiling
   3mm mild steel powder coated white

2. Roof (Engines Platform)
   3mm 5 bar Aluminium tread plate

3. Lighting Quantity dependent on site
   Vandal resistant flush mounted twin tube fluorescent high frequency light with brushed stainless steel bezel frame.

4. Emergency lighting
   500mm 12V 5W tube mounted in above light fitting.

5. Top Floor
   2mm 316 grade stainless steel - brushed finish with vertical slotted natural ventilation with rear baffle plates.

6. Car Side and back walls
   1.5mm 316 grade stainless steel - 500mm wide panels where practical. Rimex pattern SWL. Panel separated by 3mm Black "Davie" strip or equivalent. Mounted on 12mm MDF clamped by 1.5mm Zintec folded panel painted black.

7. Slim Pod
   1.5mm 316 grade stainless steel. Rimex pattern SWL

8. Mirror
   2mm mirror 8 stainless steel Rimex - when specified

9. Handrails
   Not fitted on goods lift

10. Car Operating Panel
    C2mm 316 grade stainless steel - brushed finish mounted projecting into car face with 2mm below bump rail face. Skirting to freeze height. Bottom ringed top unlocking, with slate styles, lower and upper makeup panels in SWL stainless steel. Position Indicator Blue LCD. Push buttons - LED lone USY1EN dual illuminated blue. Speech synthesizer. Autodailer - Windcrest (Windcrest unit used for Nitrogen control communication).

11. Bump Rails
    Fitted to frame A/B/C/D-E-9 off side walls and off rear wall of low and mild levels. Intraad GC44 rubber, held in place by 9mm stainless steel bars.

12. Bottom Skirting
    2mm 316 grade stainless steel - brushed finish with vertical slotted natural ventilation with rear baffle plates.

13. Flooring
    6mm bar tread mild steel chequer plate - galvanised finish mounted on 25mm marine ply sub floor, mounted on a 1mm thick galvanised mild steel fire screen.

14. Doors
    Panel arrangement to suit finish 1.5mm 316 grade brushed stainless.

15. On Nitrogen handling cars: Tensa temporary barrier is provided.
4.8 Appendix C – Nitrogen Control (LN2)

**Sequence of operation.**

The main level and sole control of operation is from level *(To be agreed with client)*. At this level there will be a full set of destination buttons for use when on LN2 control. These buttons will be enabled when a Key Switch (LN2 Control) at Level *(to be agreed)* has been operated. Also the car and landing speaker shall be enabled for communication.

When LN2 control is required the operator must call the lift to level *(to be agreed)*.

When the lift arrives at level *(to be agreed)* the doors will automatically open.

The operator can now use LN2 control by turning on LN2 control via the key switch at level *(to be agreed)*.

Once on LN2 control, the LN2 destination buttons at level *(to be agreed)* are enabled. All other call pushes are disabled when on LN2 control.

Once the nitrogen is in the lift, the operator can send the lift to any floor by first closing the doors via the close push until the doors are fully closed then entering a call to the desired level. When closing the doors, should the operator release the close push then the doors will stop closing (dead man).

Once the lift has completed its journey and the operators have finished with the lift, they will establish communication via an intercom and the lift may then be put back into normal service by returning the key switch at level *(to be agreed)* to the off position.

When on LN2 control, the operator has sole control of the lift. He may send the lift to multiple floors if necessary. The lift cannot be called by any other landing station whilst on LN2 Control. ILE will provide a volt free contact in the control panel which signals the lift has when it has been put onto LN2 control. This would be used to initiate the Intercom.
PUNCHING AND DETAILS

25 HOLES Ø3 AT 12 PITCHES
HORIZONTAL 12 PITCHES VERTICAL

10 HOLES Ø3 AT 12 PITCHES
HORIZONTAL 12 PITCHES VERTICAL

ENGRAVING LETTERING
8mm HIGH FILL - RED

LETTERING
6mm HIGH FILL - RED

WINDCREST EXTENSION
LANDING SPEAKER UNIT

0.35 HOLES TO SUIT NUMBER OF FLOORS

INTERCOM ACTIVATION KEY SWITCH

4 HOLES Ø4.5 AT 4 POSNS.

SECRET FRONT FIXING M4 ALLEN HD SCREWS AT 4 POSNS.

STUDWELDING AND ASSEMBLY DETAILS

INSET SHOWING SECTION THROUGH SECRET FIXING

NOTE:
MATS® 2MM THK STAINLESS STEEL, GRADE 316
3.8.5 Appendix D – Evacuation Control Station
TYPICAL SURFACE MOUNTED MAIN FLOOR EVACUATION STATION FOR DUPLEX LIFTS
TYPICAL EVAC CONTROL/LANDING
PUSH STATIONS (SINGLE WAY)

NOTE:
MAT: 2.5MM THK (316 GRADE) 240 GRIT ST, ST,
NOTE:
NAT: 2.5MM THK (316 GRADE) 240 CRIT ST,ST.

TYPICAL EVAC CONTROL/LANDING
PUSH STATIONS (TWO WAY)
SECTION 5

PARTICULAR LIFT SPECIFICATION

MACHINE ROOM LESS (MRL) LIFTS
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5.1 TECHNICAL AND PARTICULAR LIFT REQUIREMENTS

5.1.1 General

The complete lift installation shall include all incidental and sundry components necessary for the satisfactory construction and operation of the installation, whether or not these sundry components are specified and shall be in accordance with:

- General Specification - Section 2.
- The following Particular Specification.
- Any new or updated regulations and standards at the time of tender submission.

All new components shall be as described and detailed in the appendix at the end of this specification. The lists of preferred suppliers are to be “equal or approved”.

All specialist tools for the interrogation of the control systems and maintenance or repair of any components specific to the lift installations, are to be handed over to the Clients representative at practical completion.

The Contractor shall include within his tender for the following items:

- Provide any heating or ventilation systems required in the machinery spaces to maintain the ambient temperature between +15°C and +25°C in accordance with EN81-1.
- Include for unloading, moving, lifting and positioning of all lift equipment and machinery.
- Provide temporary lighting necessary for the safe installation of the lift(s).
- Remove and dispose of, any rubbish, waste and redundant materials in accordance with the College’s Site Waste Management Plan.
- Erect at each landing opening adequate protection against falls by use of fall barriers, hoardings etc. Any timber used for the construction of hoardings etc should be suitably fire treated and must comply with the College’s Safety Code of Practice (Construction) 2007.
- Where required, the contractor must supply and install any lifting beams or eyes within the lift shaft. These should be load tested and certified.
- Where equipment requires dust protection, this should be provided and included as part of the lift package.
• Provide all scaffolding or access equipment necessary for the safe installation of the lift(s) and associated equipment. This shall include all scaffolding or access equipment for use by others, to allow for the installation of power supply cables, telephone lines, fire alarm cables etc which are to be terminated at the top of the lift shaft.

• The provision and installation of all necessary steelwork required for fixing of lift shaft and landing door equipment. The locations and associated structural loadings are to be clearly indicated on the builders work drawings for approval.

The Contractors attention is drawn to the planned preventative maintenance and call-out requirements for the lift scheme throughout the Defects Liability Period.

All snagging is to be completed within 2 weeks of handover of the each lift.

All works shall be completed out of normal hours, after 6 pm and before 9 am, unless previously agreed with the College.
5.2 SCOPE OF WORKS

5.21 Machine Room Less (MRL) Passenger Lift

5.2.2 Components to be Supplied and Fitted

All Components must be suitable for Machine Room Less (MRL) installations and comply with the Standard Specification Section 2 and as follows:

a) An AC gearless drive motor, synchronous permanent magnet type with variable voltage variable frequency drive, electro mechanical brake and traction sheave(s). The drive unit is to be suitably mounted upon isolation pads, on a fabricated steel painted bedplate, mounted within the lift shaft or suitably fixed to the lift car and/or counterweight guide rails as applicable.

b) Main ropes (minimum 4), hitch anchor, springs.

c) The landing bottom sill units.

d) Control panel shall be variable frequency/inverter drive, simplex control. It shall be designed for mounting within the lift shaft and should be safely and easily accessible from the lift car roof or alternatively mounted in the lift pit.

e) Governor and tension weight, rope and linkage assembly (Bode) with encoder.

f) Lift cabin, sling steel frame and enclosure with patterned 316 stainless steel panel construction walls. Car components shall be:

- Ceiling shall be white powder coated (Zintec pre-treatment to be applied).
- Roof strong enough for 2 men and tools.
- Car light units, quantity dependant on size of car, highly vandal resistant, flush mounted for car top lamp replacement. Fittings shall comprise twin tube fluorescent or LED lights with brushed stainless steel bezel and shall incorporate 3 hour emergency lighting battery/charger unit. Car emergency light test switch should be provided.
- A combined hand and bump rail shall be fitted to two sides of the lift car. The height should be sufficient to support passengers and to protect the car internal finishes from damage. Where this may restrict the available car area the handrail should only be mounted on the car wall adjacent to the car operating panel.
- The car lining panel joints shall be closed and filled with 3mm “Darvic” or equivalent. Car lining panels to be 316 grade stainless steel, Rimex Cambridge pattern.
- One wall to be fitted with a 6mm silver safety mirror above the handrail, full car width.
- Floor shall be 4mm Altro Monopave studded, Lake (blue) on mdf membrane with solvent sealant protection. Underside of the timber to be sheet steel panel protected with fire retardant paint.
Car operating panel to be fitted on the car slam side, 400mm in from the door opening with car top unlocking. Push buttons to be Liftstore US91-EN Compact 2 (Tactile) with Black Contrasting Background with 24Volt Dual Blue Illumination and positioned in full compliance with Part M of the Building Regulations, The Disability Discrimination Act and BS EN 81-70. Full compliant Windcrest auto dialler to be fitted to fully comply with the requirements of EN81-28.

Note: Please refer to Appendix A, Passenger Lift Car drawing for further information on finishes and layout.

g) Sling cradle comprising:- top frame, crown bar, sling vertical members, tie bars wedge rope hitch, bottom floor frame and sill assembly.

h) Bi-directional safety gear complete with governor operator linkage.

Note: Bi-directional safety gear is not required on gearless motor installations when the brake is in compliance with EN81-1 as regards to an approved method of protection against uncontrolled upward movement.

i) Car doors, box construction assembly with inbuilt full height sight/finger guards, including GAL top track and hangers, bronze bottom track, toe guards, to be painted yellow, nylon tyred rollers and GAL bottom shoes.

j) Car door operators shall be a variable frequency drive (GAL: MOVFR/HA) with spring release and with an anti-interference monitor.

k) Full height shaft fascia panels (NB: To be determined by lift contractor)

l) GAL door coupling arms, rollers and skates.

m) Spring loaded roller guide shoes on the car and slipper/slider shoes on the counterweight with debris guards to shoes.

n) Car and Counterweight guide rails and brackets.

o) Complete counterweight assembly and fillers to fully balance the VF drive, the whole frame to be painted yellow.

p) New landing door assemblies complete with door locks (GAL).

q) Emergency door release via triangular 'Euro' release key as required by EN81-1.

r) Heavy duty GAL landing door assemblies, box construction including inbuilt full height sight/finger guards with hangers, rollers, kicking strips, bottom track guides and GAL spring tension door closers. Floor I.D. markings on the rear panel.

s) The GAL landing door bronze tracks shall be supported with a full length landing support sill, a minimum of 5mm thick.

t) Brushed stainless 316 grade landing architraves, to provide 1 hour fire rating.

u) Lift number I.D. plates are to be fitted on all architrave headers, positioned on the left hand side. Floor number to be marked on each landing architrave, left hand side.

v) Landing architraves and lift car entrances must not have 2 radius edges meeting, typically headers to overlap side stiles by a minimum of 5mm, 10mm preferred. All ends of architrave headers are to be filled and polished, no open ends.

w) Landing push button units. Push buttons to be Liftstore US91-EN Compact 2 (tactile) with Black Contrasting Background with 24 volt dual blue illumination.
x) Landing indicator displaying direction and position located on all landings, angle box surface mounted above header complete with secret fixings. All indicators to be LCD type (scrolling) white on blue.

y) Evacuation controls to meet BS5588 Part 8 and auto change over panel for alternate power supply. Evacuation controls are to be Windcrest derived with a full set of buttons and speaker at the designated floor, other floors to have a slave station with speaker and button.

All Evacuation Stations are to be flush mounted unless specified otherwise by the Client.

Note: Please refer to Appendix D for further details.

z) All shaft switches and support brackets including operating ramps.

aa) Floor selector system. Shaft encoder mounted on over speed governor or lift motor.

bb) Buffer assemblies for the car and counterweight.

c) Guide base oil drip collection trays to counterweight guides.

d) Stop buttons sited next to the drive unit and in the lift pit.

e) An emergency control panel is to be provided, located in the front wall of the lift shaft, to enable the safe and controlled movement of the lift to floor level, to facilitate the emergency release of trapped passengers in the event of a lift breakdown.

ff) Decoration of the lift shaft, pit, and all steelwork.

g) Landing thresholds to be finished with 5 bar 3mm aluminium checker plate or matched to existing finish e.g. Terrazzo marble. (Finish to be agreed with client)

hh) Lifting runway beams or lifting eyes to be load tested and certified.

ii) Provide and install complete in every respect, all materials and equipment necessary for the guarding of moving parts, machinery, or hazardous voids etc.

jj) Complete wiring of the lift shaft and landings including all cable management, electrical services, shaft and pit electrical services. (e.g. Isolators lockable MEM type, consumer units, sockets etc).

kk) Shaft lighting to be replaced with high frequency light units to provide at least 50 lux, 1 m above the car roof and pit floor, even when all doors are closed and must be suitable for Motor Room Less applications and in accordance with EN81-1.

ll) Emergency lighting with high frequency light units, to be fitted within the lift shaft and the car top.

mm) Controller to be programmed for energy saving mode. Car lights to be disabled during out of hours and enabled when landing call button is activated.

nn) Car interior protection drapes, one set for each lift, (one set only for duplex lifts). Each set to be clearly marked with the lift number and ‘Imperial College London’. All necessary fixing studs to be provided within the lift cars.
5.2.4 Components to be Supplied and Fitted

All Components must be suitable for Machine Room Less (MRL) installations and comply with the Standard Specification Section 2 and as follows:

a) An AC gearless drive motor, synchronous permanent magnet type with variable voltage variable frequency drive, electro mechanical brake and traction sheave(s). The drive unit is to be suitably mounted upon isolation pads, on a fabricated steel painted bedplate, mounted within the lift shaft or suitably fixed to the lift car and/or counterweight guide rails as applicable.

b) Main ropes (minimum 4), hitch anchor, springs.

c) The landing bottom sill units.

d) Control panel shall be variable frequency/inverter drive, simplex control. It shall be designed for mounting within the lift shaft and should be safely and easily accessible from the lift car roof or alternatively mounted in the lift pit.

i) Governor and tension weight, rope and linkage assembly (Bode) with encoder.

i) Lift cabin, sling steel frame and enclosure with patterned 316 stainless steel panel construction walls. Car components shall be:

- Ceiling shall be white powder coated (Zintec pre-treatment to be applied).
- Roof strong enough for 2 men and tools.
- Car light units, quantity dependant on size of car, highly vandal resistant, flush mounted for car top lamp replacement. Fittings shall comprise twin tube fluorescent or LED lights with brushed stainless steel bezel and shall incorporate 3 hour emergency lighting battery/charger unit. Car emergency light test switch should be provided.
- Bump rails shall be fitted to the rear wall and both side walls of the lift car. The rear wall shall be fitted with 3 bump rails, and both side walls with 2 bump rails. Bump rails to be Intrad GC44 rubber, held in position by 9mm stainless steel bars. Captive nuts are to be used to enable replacement of the bump rails from inside the car. A handrail may be fitted if required.
- The car lining panel joints shall be closed and filled with 3mm grey Trovidor PVC. Car lining panels to be 316 grade stainless steel, Rimex 5WL pattern.
- One wall to be fitted with a 2mm Rimex Super 8 stainless steel mirror (Client to advise requirement) above the bump rail, full car width.
- Floor shall be either 4mm Altro Monopave studded, Lake (blue) or 6mm bar tread mild steel chequer plate, galvanised finish (Client to confirm finish required), on 22mm marine ply sub floor, mounted on a 1mm thick galvanised mild steel fire screen.
- Car operating panel to be fitted on the car slam side, 400mm in from the door opening with car top unlocking. Push buttons to be Liftstore US91-EN Compact 2 (Tactile) with Black Contrasting Background with 24Volt Dual Blue Illumination and positioned in full compliance with Part M of the
Building Regulations, The Disability Discrimination Act and BS EN 81-70. Full compliant Windcrest auto dialler to be fitted to fully comply with the requirements of EN81-28.

- **Note:** Please refer to Appendix B, Goods Lift Car drawing for further information on finishes and layout.

m) Sling cradle comprising: top frame, crown bar, sling vertical members, tie bars wedge rope hitch, bottom floor frame and sill assembly.

n) Bi-directional safety gear complete with governor operator linkage.

**Note:** Bi-directional safety gear is not required on gearless motor installations when the brake is in compliance with EN81-1 as regards to an approved method of protection against uncontrolled upward movement.

i) Car doors box construction assembly with inbuilt full height sight/finger guards, including GAL top track and hangers, bronze bottom track, toe guards, to be painted yellow, nylon tyred rollers and GAL bottom shoes.

j) Car door operators shall be a variable frequency drive (GAL: MOVFR/HA) with spring release and with an anti-interference monitor.

k) Full height shaft fascia panels (NB: To be determined by lift contractor)

l) GAL door coupling arms, rollers and skates.

m) Spring loaded roller guide shoes on the car and slipper/slider shoes on the counterweight with debris guards to shoes.

n) Car and Counterweight guide rails and brackets.

o) Complete counterweight assembly and fillers to fully balance the VF drive, the whole frame to be painted yellow.

p) New landing door assemblies complete with door locks (GAL).

q) Emergency door release via triangular ‘Euro’ release key as required by EN81-1.

r) Heavy duty GAL landing door assemblies, box construction including inbuilt full height sight/finger guards with hangers, rollers, kicking strips, bottom track guides and GAL spring tension door closers. Floor I.D. markings on the rear panel.

s) The GAL landing door bronze tracks shall be supported with a full length landing support sill, a minimum of 5mm thick.

t) Brushed stainless 316 grade landing architraves, to provide 1 hour fire rating.

u) Lift number I.D. plates are to be fitted on all architrave headers, positioned on the left hand side. Floor number to be marked on each landing architrave, left hand side.

v) Landing architraves and lift car entrances must not have 2 radius edges meeting, typically headers to overlap side stiles by a minimum of 5mm, 10mm preferred. All ends of architrave headers are to be filled and polished, no open ends.

w) Landing push button units. Push buttons to be Liftstore US91-EN Compact 2 (tactile) with Black Contrasting Background with 24 volt dual blue illumination.

x) Landing indicator displaying direction and position located on all landings, angle box surface mounted above header complete with secret fixings. All indicators to be LCD type (scrolling) white on blue.

y) Additional controls for the movement of Liquid Nitrogen.
Note: Please refer to Appendix C for further details.

z) All shaft switches and support brackets including operating ramps.

aa) Floor selector system. Shaft encoder mounted on over speed governor or lift motor.

bb) Buffer assemblies for the car and counterweight.

c) Guide base oil drip collection trays to counterweight guides.

d) Stop buttons sited next to the drive unit and in the lift pit.

e) An emergency control panel is to be provided, located in the front wall of the lift shaft, to enable the safe and controlled movement of the lift to floor level, to facilitate the emergency release of trapped passengers in the event of a lift breakdown.

ff) Decoration of the lift shaft, pit, and all steelwork.

gg) Landing thresholds to be finished with 5 bar 3mm aluminium checker plate or matched to existing finish eg Terrazzo marble. (Finish to be agreed with client)

hh) Lifting runway beams or lifting eyes to be load tested and certified.

ii) Provide and install complete in every respect, all materials and equipment necessary for the guarding of moving parts, machinery, or hazardous voids etc.

jj) Complete wiring of the lift shaft and landings including all cable management, electrical services, shaft and pit electrical services. (e.g. Isolators lockable MEM type, consumer units, sockets etc).

kk) Shaft lighting to be replaced with high frequency light units to provide at least 50 lux, 1 m above the car roof and pit floor, even when all doors are closed and must be suitable for Motor Room Less applications and in accordance with EN81-1.

ll) Emergency lighting with high frequency light units, to be fitted within the lift shaft and the car top.

mm) Controller to be programmed for energy saving mode. Car lights to be disabled during out of hours and enabled when landing call button is activated.

nn) Car interior protection drapes, one set for each lift, (one set only for duplex lifts). Each set to be clearly marked with the lift number and ‘Imperial College London’. All necessary fixing studs to be provided within the lift cars.
5.3 TRAINING

The Contractor shall include comprehensive training to College Engineering Staff in the safe navigation and operation of and around the new lift installations.

The training shall include desktop and site specific items including visits to the lifts and motor rooms.

The training is to include a minimum of one full day and two half day visits.

The above training of Engineering Staff does not relieve the Contractor of the inherent call-out duties required under the agreed maintenance contract.

5.3.1 Maintenance Contract

The maintenance contract shall be fully comprehensive to include 24 hour, 7 days a week call out, with 4 hour response time.

The lift contractor must attend site within 20 minutes when responding for a lift entrapment.

The contract shall include for 12 scheduled service visits. Lift contractor to attend on an agreed day.

5.3.2 Defects Liability Period

The defects liability period shall be for 12 months from the date of Practical Completion of the last lift in the programme.

If a lift breaks down in excess of 5 times within the 12 months defects liability period, the warranty for that lift shall be extended until reliability has been proved acceptable to the College.

5.4 LIFTING BEAMS

The existing lifting beams shall be tested and renovated as necessary as part of the lift works.

5.5 TELEPHONE LINES AND GENERAL ITEMS

The Contractor shall note that the Employer (Imperial College London) will organise telephone lines to enable communication on the lift.

The Contractor will organise the testing and replacement if necessary of the power supply to the lift motor room. The Contractor shall include a lockable isolator within the motor room.

A supply fan shall be installed within the passenger lift cars which shall operate when the emergency alarm is activated and shall run for 1 hour via a timer.

An extract fan shall be installed within the lift motor room and it shall be thermostatically controlled to suit the heat output of the lift equipment.

Passenger lifts shall be fitted with evacuation controls unless otherwise stated.
Dummy cameras shall be fitted to the interior of all lift cars. However the lift contractor shall supply and install all necessary wiring within the motor room, lift shaft and car, for the installation of CCTV cameras.

Emergency communication shall be via a Windcrest Auto Dialler. Once operated this shall connect to the central station located within the Sherfield Building security control room. The pre-recorded message upon activation of the alarm should state “lift alarm activated from (building name) and lift No.xx”.

Throughout the duration of the lift installation, the works shall be subject to Clerk of Work inspections. Upon completion of the lift, the Clerk of Works shall undertake witnessing of the lift test and compile a final snagging list.

Once all testing and snagging has been completed the lift must be inspected by the College appointed insurance inspector before the lift is accepted into service.
5.6 APPENDIX

5.6.1 Appendix A – Passenger Lift Car Drawing
PASSENGER LIFT - TYPICAL LAYOUT AND FINISHES

1. Car ceiling / Roof (Engineers platform)
   1mm mild Steel powder coated white 25mm marine ply faced with 1mm mild steel painted with non-slip paint.

2. Lighting - Quantity dependent on size
   Vandal resistant flush mounted twin tube fluorescent light. High frequency with brushed stainless steel base frame or where specified, LED light units.

3. Emergency lighting
   300mm 12V 8W tube mounted in above light fitting

4. Entrance header
   1.5mm 316 grade stainless steel - brushed finish

5. Top freeze
   2mm 316 grade stainless steel - brushed finish with vertical slotted natural ventilation with rear baffle plates

6. Car side and back walls
   1.5mm 316 grade stainless steel - Rimex Cambridge pattern applied to 18mm WBP plywood with 1mm thick galvanised sheet backing with joints kept to a minimum. Car lining panel joints shall be closed and filled with black 3mm Durvic or equivalent.

7. Sign post
   1.5mm 316 grade stainless steel - brushed finish

8. Mirror
   8mm silver safety mirror to rear wall

9. Hnadrail
   30mm diameter stainless steel - to rear wall only

10. Car operating panel
    Surface mounted 2mm 316 grade stainless steel - brushed finish - Skirting to freeze height - bottom hinged top unlocking with chartered side styles projecting 50mm into car.

11. Position Indicator
    - Blue LCD
    - Pushbuttons - Liftstore 09713N dual illuminated blue
    - Speech synthesiser
    - Autodialer - Windcrest

12. Bottom skirting
    2mm 316 grade stainless steel - brushed finish with vertical slotted natural ventilation with rear baffle plates

13. Flooring
    4mm Alto Mondopave studded - Lake (Blue)

14. Car doors
    Panel arrangement to suit - finish 1.5mm 316 grade brushed stainless

15. Car sill
    Phosphor bronze (on power operated doors)
5.6.2 Appendix B – Goods Lift Car Drawing
5.6.3 Appendix C – Nitrogen Control (LN2)

Sequence of Operation.

The main level and sole control of operation is from level (To be agreed with client).
At this level there will be a full set of destination buttons for use when on LN2 control. These buttons will be enabled when a Key Switch (LN2 Control) at Level (to be agreed) has been operated. Also the car and landing speaker shall be enabled for communication.

When LN2 control is required the operator must call the lift to level (to be agreed).
When the lift arrives at level (to be agreed) the doors will automatically open.
The operator can now use LN2 control by turning on LN2 control via the key switch at level (to be agreed).
Once on LN2 control, the LN2 destination buttons at level (to be agreed) are enabled. All other call pushes are disabled when on LN2 control.
Once the nitrogen is in the lift, the operator can send the lift to any floor by first closing the doors via the close push until the doors are fully closed then entering a call to the desired level. When closing the doors, should the operator release the close push then the doors will stop closing (dead man).
Once the lift has completed its journey and the operators have finished with the lift, they will establish communication via an intercom and the lift may then be put back into normal service by returning the key switch at level (to be agreed) to the off position.

When on LN2 control, the operator has sole control of the lift. He may send the lift to multiple floors if necessary. The lift cannot be called by any other landing station whilst on LN2 Control.
ILE will provide a volt free contact in the control panel which signals the lift has when it has been put onto LN2 control. This would be used to initiate the intercom.
TYPICAL LN2 CONTROL STATION

NOTE:
MAT: 2MM THK STAINLESS STEEL GRADE 316
5.6.4 Appendix D – Evacuation Control Station

TYPICAL SURFACE MOUNTED MAIN FLOOR
EVACUATION STATION FOR DUPLEX LIFTS
TYPICAL EVAC CONTROL/LANDING PUSH STATIONS (SINGLE WAY)

NOTE:-
MAT: 2.5MM THK (316 GRADE) 240 GRT SS,

INSET SHOWING SECTION THROUGH SECRET FIXING
H O L E S 
4 P O S N.

Ø4

3 H O L E S Ø35

"C A L L" P U L S H B U T T O N

C A L L R E C O N I G N I T I O N
S O U N D E R

P U N C H I N G
A N D D E T A I L S

M4 x 20 LG
ALLEN
HEAD SCREWS 4 OFF

E V A C U A T I O N
INTERCOM

M4 x 20 LG
STUDS 6 POSN

( S E E D E V E L O P / A S S Y
DRAWING FOR DETAIL.)

E N G R A V E
LETTERING 8mm
HIGH FILL BLACK

M4 SOCKET
HD.SCREWS FOR
SECRET FIXING
x 4 POSN.

E A R T H
STUD

S E E D E T A I L B E L O W

S T U D W E L D I N G A N D
A S S E M B L Y D E T A I L S

M4 SOCKET HD.
ALLEN SCREWS

M4 SPRE NUT
STAINLON BLOCKS

I N S E T S H O W I N G S E C T I O N
T H R O U G H S E C R E T F I X I N G

T Y P I C A L E V A C C O N T R O L / L A N D I N G
P U S H S T A T I O N S ( T W O W A Y )