

SECTION 11: VERTICAL TRANSPORT CONTENTS

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11.1 INTRODUCTION

The section of the Design Standards provides details of the University's minimum requirements for vertical transportation.

The consultant is required to produce his own project specification which incorporates this section and other sections of the Design Standards as well as all relevant legislation, regulation, codes and standards.

Note that the consultant must use the Modification Request Form to obtain approval for any proposed departure from the Design Standards.

All project documentation is required to be submitted for review prior to tendering.

11.2 LEGISLATION, STANDARDS AND CODES

The design of the lift systems shall meet the requirements of all current regulations and the requirements of the Authorities having jurisdiction over the project and relevant to the extent of work to be carried out.

The lift system shall be designed and installed in accordance with current publications of Standards, codes and regulations, but not limited to the following:

- Occupational Health and Safety Act 2004 (Vic)
- Occupational Health and Safety Regulations 2017 (Vic)
- Disability Discrimination Act
- National Construction Code of Australia (NCC); incorporating AS1735.12 – Facilities for Persons with Disabilities
- AS1735.1 incorporating EN81.20 – Safety Rules for the Construction and Installation of Passenger & Goods Lifts.
- AS1735.20 incorporating EN81.21 – Safety Rules for the Construction and Installation of New Passenger & Goods Lifts In Existing Buildings
- AS1735.15 Safety rules for the construction and installation of lifts - Special lifts for the transport of persons and goods -- Vertical lifting platforms intended for use by persons with impaired mobility
- EN81.50 – Safety Rules for the Construction and Installation of Lifts – Examinations and Tests
- EN81-28:2003 - Remote Alarms on Passenger and Goods Passenger Lifts.
- AS3000 Wiring Rules;
- AS1657 - Fixed ladders, Platforms and Stairways
- AS 1170 Minimum design load on structures, Part 4 Earthquake Loads
- AS/NZS 4431 – Guidelines for safe working on new lift installations in new constructions
- AS/NZS 4801 – Occupational Health and Safety System.
- Referenced Standards required by the above documents

The lift designer shall also design vertical transport systems using a Safety in Design principle.

The lift Designer shall verify the publication dates of the Standards, Codes and Regulations to which the Lift System is being designed

11.3 LIFT DESIGN

11.3.1 Objectives

Vertical Transportation Services designed for the University of Melbourne shall be based on appropriate educational institution and commercial design standards and good engineering practices. The lift installation, duty and speed shall be designed to assist with the efficient circulation of students and staff during the peak operating “class change” period, where up to 50% of the student population could require vertical transportation.

11.3.2 Lift Design

The lift designer shall adopt the following when designing the lifts:

- Passenger lifts shall be wider than they are deep to allow for the ease of passenger movement into and out of the lift car. Minimum passenger lift car size shall be in accordance with the requirements of NCC incorporating AS1735.12. Note that stretcher and emergency lift requirements of the NCC shall be met where required;
- If a dedicated goods lift is not being provided a ceiling boot giving a clear internal height of at least 3m shall be provided in at least one of the lift cars. Where a passenger lift is fitted with a boot for goods service, protective blankets shall be provided to protect the interior finishes;
- A dedicated goods lift shall be considered for buildings requiring specialist goods movement. Goods passenger lifts shall be designed with the appropriate load levels as required by the University including platform point loads and car and landing sill load requirements. Lift system design shall be based on the total load of rated load plus weight of handling devices as defined in EN81.20 and shall be nominated where heavy loading conditions may apply and/or where fork lifts or loading systems are used to load the lift;
- When planning the location of the lift or lift bank architects shall ensure the lifts are central relative to the building’s circulation and are easily identifiable to assist in way finding.

11.3.3 Design Criteria

The vertical transportation design and architectural design of a building must complement each other to provide an efficient lift system design that is based on the following Key Performance Indicators:

- Waiting Interval – 30 – 50 seconds based on theoretical two-way study
- Handling Capacity – 15 - 25% of building population
- TEFMA, Best Practice, Space Planning Guidelines
- CIBSE Guide D – Transportation Systems in Buildings. Lift Planning and Selection, Universities and Education Buildings.

To maximise the effectiveness of vertical transportation it is recommended that building design complements the lift design by designing buildings in zones. This may depend on the available space and accessibility requirement but where possible the recommended zones are:

- Lecture halls and class rooms located in the lower part of the building (large population movement).
- Labs located in the mid-section of the building (moderate population movement).
- Administration and staff located in upper-section of the building (low population movement).

Dedicated Administration buildings shall be designed in accordance with Performance criteria for office buildings as indicated in CIBSE Guide D and Property Council of Australia Guide to Office Building Quality.

11.3.4 Traffic Analysis

Where floors are designed for populations of 100 persons or more and requiring a bank of lift over at least 4 floors, a traffic analysis shall be provided to demonstrate the suitability of the lift design. Where necessary simulation studies shall be provided to the University Project Manager to review and consider.

Calculated Waiting Interval and Handling Capacity criteria range shall be based on the 10 – 15 minute student and staff movement between lectures.

Simulation study outcomes shall define Average Waiting Times, Time to Destination and Demand.

The parameters upon which the calculated lift traffic analyses shall be based, are as follows:

- a) Waiting Interval is defined as the time a passenger waits after registering a call (or entering the waiting queue if a call has already been registered) until the responding lift departs that floor.
- b) Handling Capacity (HC) is the percentage of the given building population wanting to use the lifts in a 5 minute period.
- c) Estimated division of student and other traffic during a 5 minute period:
 - o 35% lift users enter the building
 - o 35% lift users exit the building
 - o 30% lift users travel between floors
- d) Stair factor is considered where the stairs are clearly visible and accessible from the lift lobby. Stair factor - ranging between 20% to 50% of potential lift users over a range of floors e.g. 1 floor 50%, 2 floors 25%, 3 floors 15% etc
- e) Home floor – Typically Ground
- f) Door dwell time – 1.0 second
- g) Door Open and Door Close times – 2.8 seconds and 3.4 seconds
- h) Passenger Loading Time – 1.0 second in and 1.0 second out
- i) Acceleration/deceleration – 1.0 m/s²
- j) Start Delay – 0.5 seconds

11.3.5 Lift Control Systems

As a minimum all lifts shall operate on the principle of a two button collective control system (or single button control for two floor projects) having at least the following features.

- Exclusive service;
- Fireman's service, as per the requirements of National Construction Code (NCC);
- Load-weighing control;
- Door nudging system;
- Anti-nuisance feature;
- Emergency Power for lighting and phones;
- HLI Access control provisions, applicable where access control is provided to the lift.

Where applicable lift group control systems shall be high speed micro-processor and software based and incorporate the latest proven demand based traffic management algorithms to optimise system response times and operating/energy efficiencies.

Lift Destination Control and similar hybrid systems shall not be used.

It is a particular requirement of the University that all equipment be of a non-proprietary (open architecture) nature. Equipment requiring proprietary service tools or user guides/codes will not be accepted unless a Modification Request Form is submitted and

approved.

The lift system shall incorporate a software protocol that allows the maintenance, servicing, tuning and adjustment of the equipment by third party service providers. The lift system hardware and software shall be provided so that the complete installation is capable of continuous unrestricted operation from the date the lift becomes the property of the University and for the life of the installation. The system must be capable of being readily maintained and adjusted on site, without the need for the use of codes, locks, external devices, external information, re-activation sequences, or the like.

Where any form of diagnostic tool is required to diagnose the lift equipment and where such a tool is required to re-program replacement components, a tool shall be provided for the exclusive use of the University for ongoing maintenance of the lift.

Drive systems shall be permanent magnet VFAC drives. Preferably of the high efficiency gearless type.

Where stand-by power is being provided to the building consideration shall be given to operating at least one lift to assist in the movement of people with disabilities.

11.3.6 **Lift Types**

When selecting the type of lift to be used the following lift types are to be considered:

- Machine Room-Less (MRL) lifts;
- Conventional overhead lift motor room traction lifts;
- Hydraulic lifts shall not be considered unless required for a particular problem-solving application or where MRL lifts cannot be provided;
- Low Rise platform lifts in accordance with AS1735.14 are limited to 1000mm maximum travel, designed for wheelchair access, for very low use applications only;
- Special lifts for the transportation of persons and goods -- Vertical lifting platforms intended for use by persons with impaired mobility in accordance with AS1735.15
- Where possible and appropriate lifts which are being refurbished shall be provided with regenerative drives.
- New building projects shall include a requirement for regenerative drives.

The lift designer is required to support the lift selection with a whole life (20 years) cost analysis and present this to the University Project Manager. The costs analysis shall include an indicative cost breakdown of the whole lift costs of the life as per the following:

- Power consumption, machine and control system efficiency;
- Consumable items, such as ropes, sheaves, bearings, guides, etc;
- Expected cost for comprehensive maintenance.

11.3.7 **Lift Interior Finishes**

Lift interior finishes shall be robust, low maintenance and vandal resistant. When designing a lift car interior, the following should be considered:

- The layout of the car shall meet the requirements of NCC incorporating AS1735.12;
- Wall finishes shall be durable. Consideration should be given to the use of the lift and the environment that it will operate in.
- Car operating panels (COP) shall generally be provided on the side walls, mounted in a vertical alignment and compliant to NCC incorporating AS1735.12;
- Handrails shall be provided adjacent to the main COP in compliance with NCC incorporating AS1735.12.
- Lift display screens indicating lift position, direction of travel and emergency messages shall be provided in the COP;
- Lift car flooring shall be durable and suitable for its application (refer also to clause

11.3.7.2)

- Lift car skirting shall be finished stainless steel;
- Lighting within the lift car shall consist of diffused LED down lights or strip lights and provide a minimum of 100 lux evenly distributed over the floor of the lift car;
- Where lifts are provided in glass lift shafts the lifts shall incorporate lift car air conditioning in accordance with the requirements of the National Construction Code (NCC);
- A GPO must be installed;
- Where glass is used it shall comply with the requirements of AS1735.1 incorporating EN81.20.

Acceptable lift interior finishes based on lift type are detailed below:

11.3.7.1 Goods Lifts

For goods lifts the lift car interior shall consist of finished or rimex stainless steel walls with at least two rows of stainless steel bump rails;

Handrails shall be of finished stainless steel finish;

Ceilings shall be white colour laminate or finished stainless steel.

LED lighting shall be provided and shall be located within pelmets and provide a minimum 100lux on the floor of the lift;

Excelon vinyl floor tiles provided by Armstrong Commercial Flooring shall be used.

11.3.7.2 Passenger Lifts

For passenger lifts predominantly used by students the car interiors shall consist of finished stainless steel and/or mirror finishes for the side walls. The rear wall shall consist of colour backed glass. The glass may include an etched image of the University logo.

Ceilings shall be white colour laminate.

Lighting shall consist of diffused LED lighting and located so that it shall not wash out the information on the COP's. Lighting shall provide a minimum of 100Lux evenly distributed over the floor of the lift.

Handrails shall be of finished stainless steel finish;

Excelon vinyl floor tiles provided by Armstrong Commercial Flooring shall be used.

11.3.8 Lift Appointments

The following requirements are applicable to car and landing appointments:

11.3.8.1 Buttons

Buttons shall be of the Dewhurst US95 or US96 type and shall be dual illuminating white/blue or other approved colour combinations. Buttons shall include Braille and tactile information as per the requirements of AS1735.12.

11.3.8.2 Car Operating Panel (COP)

Car operating panels shall be designed in line with the requirements of NCC incorporating AS1735.12 regarding location, type, height and location of buttons.

Lift number and building address details shall be engraved on the COP.

The project architect shall ensure that each level is correctly labelled

according to the University's room numbering system. Refer to Section 1 of the Design Standards, Planning and Architecture.

11.3.8.3 Lift Car Display

Displays shall be of the colour LCD PI-70 type as provided by Pixel Technologies or approved equivalent. Displays shall be capable of permanently displaying the University's logo whilst displaying lift direction and level indication. Displays shall also be capable of displaying messages relating to the lift status including the name of floor at which lift is arriving, "Exclusive Service", "Fire Service", "Out of Service", other fault/status messages as appropriate.

11.3.8.4 Hall Lanterns

One hall lantern shall be provided per lift entrance and shall indicate direction of travel of arriving lift by visible and audible means. Two sound signals for downward travel of arriving lift and one sound signal for upward travel.

Hall Lantern design shall consist of jewels projecting approximately 20mm past the hall lantern faceplate. Jewels shall be illuminated via long-life LEDs.

Car position indication shall be provided within the hall indicator and shall indicate direction of travel as well as lift position.

11.3.8.5 Hall Button Station

Hall button stations shall be located so that the button heights comply with the requirements of NCC incorporating AS1735.12. Hall button stations shall incorporate "Do not use" signage in accordance with NCC requirements. Signage shall be engraved on the landing button faceplate.

11.3.8.6 Car Fan

The lift car fan shall be operated via a push button in the car operating panel. A key switch operated fan is not acceptable. Upon activation of the fan the fan shall operate for a period of 2 to 5 minutes, adjustable.

The extractor fan shall be mounted on the car roof with sound isolated supports.

11.3.8.9 Voice Annunciation

Voice annunciation shall be provided in each lift car to the requirements of NCC incorporating AS1735.12. The volume of the voice annunciation shall be adjustable and the voice projection shall be clear and free from accent.

In addition to the above lifts shall be provided with a building evacuation speaker.

11.3.8.10 Key Switches

Key switches shall be provided at Practical Completion for Fire Service, Exclusive Service and Light Switch. The Fire Service key arrangement must comply with the requirements of NCC. The Exclusive Service key arrangement shall include ON, OFF and PARK facilities.

The keying system shall be:

Bilock 'B' – Fires Service;

TOK 3 – Exclusive Service and car light and fan;

TOK 9 – Special features such as Hazardous Goods Service.

11.3.8.11 Emergency Lights

Each lift shall contain an automatically rechargeable emergency lighting system that operates at least two emergency lights and is capable of providing at least 50 lx for 2 hrs, on each control panel.

This lighting shall come on automatically upon failure of the normal lighting supply.

11.3.8.12 Fixings

Fixings for all appointments shall be of the hidden type if possible. Alternatively, any visible fixings shall be of the security type and shall match the finish of the faceplate.

11.3.8.13 Entrance Protection

All lift entrances shall be provided with a Memco Panachrome, or approved equivalent, 3D entrance monitoring system consisting of infra-red beams continually monitoring the clear opening from 50mm above floor level to at least 1550 above floor level. The system shall be unaffected by dust, moisture, vibration and ambient light and shall comply with AS1735.12.

The system shall incorporate coloured indicators that operate on door movement. The detectors shall illuminate green when the doors are opening, flash red as they start to close, and stay red as the doors move together.

11.3.9 Accessibility Requirements

Low Rise Lifts and Special Lifts Intended for Persons with Impaired Mobility shall meet the full requirements of NCC incorporating AS1735.12. The minimum facilities considered necessary to meet the access needs of people with disabilities in compliance with the requirements the NCC and AS1735.12 for the passenger lifts, include the following:

- Minimum 600mm long handrail located adjacent to the COP ;
- Lift entrance protection system;
- Lift floor dimensions of 1100 mm wide x 1400 mm deep for all lifts which travel less than 12 metres;
- Low speed platform type lifts travel shall not exceed 12 metres
- Minimum clear door opening on 900mm wide;
- Lighting;
- Emergency hands-free self-dialling push button initiated communication system with audible feedback;
- Alarm button shall illuminate when emergency communications has been established
- Car operating panels design;
- Levelling accuracy of ± 6 mm;
- Visible, tactile and audible information on landings and within the car;
- Call buttons
- Automatic doors/gates

Vertical platform lifts compliant with AS1735 shall be an automatic type including automatic doors/gates with a height of no less than 1000mm, with a minimum weight capacity of 500kg. It shall not rely on constant pressure devices for its operation.

The vertical platform lift shall be located in an area that is easily visible and accessible to the intended user. It shall not be located behind a door of any kind that may restrict access to the lift.

Stairway platform lifts and non-automatic disable access lifts will not be accepted.

11.3.10 Car and Landing Doors

Lift car and landing doors shall preferably be of the centre opening type where possible and practical. Door opening widths and heights shall be designed to suit the lifts application. Doors shall be finished stainless steel. Full depth door jams that project past the lobby finish shall be provided to all lifts. Goods lift door jambs shall be solidly grouted.

11.3.11 HLI Access Control Security

HLI Access control shall be provided to all lifts with the exception of platform lifts. The lift designer shall specify for the provision of HLI access control even if there is no project requirement to do so. This is for possible future connection.

The card reader shall be provided behind a cut-out with perspex cover and shall be located on the COP.

11.3.12 Emergency Communication System

The lift emergency communication system shall consist of a Pixel Technologies Wireless Communication Gateway (EM-4GE2) incorporating a self-dialling hands-free telephone mounted in the car operating panel. The telephone shall be activated by means of pressing the phone button (to illuminate on pressing) on the car operating panel for 5 seconds and shall automatically dial a permanently attended location such as the University's Security Control Room. The phone system shall also be capable of receiving calls, and automatically deactivating upon time-out (adjustable), busy tone, etc.

Lifts shall have capability for dual SIM to enable dual network redundancy. The University Project Manager will obtain the SIM cards from Campus Management and provide them to the contractor. Emergency lift phones shall continue to operate during power interruptions because not all mobile phones will work inside lifts, particularly if below ground level e.g. underground car parks. Battery backup power should be supplied.

System shall comply with Australian Communications and Media Authority (ACMA) Telecommunications Cabling Provider Rules 2014 (CPRs).

The lift car and lift well communication system shall be self-diagnostic in compliance with EN81-28 and compatible with the current University standard emergency phone.

11.3.13 Automatic Rescue Device

In the event of power failure, an automatically rechargeable and permanently wired backup power supply system of sufficient capacity shall enable the lift to re-start and drive a fully loaded lift to the nearest floor and park. The lift doors shall open and remain open for at least 30 seconds to enable passengers to exit the lift. After passengers have exited, the doors shall close and the lift shall remain parked at floor level. The ventilation fan, emergency communications, emergency light and door open button shall remain on and operational for at least four (4) hours.

Supply and install all necessary controller and hardware provisions, for the lift to operate under the Automatic Rescue system; the ability to maintain and monitor battery health shall be provided.

11.3.14 Lift Well

Lift well shall be constructed in compliance with the NCC and EN81-20.

Each lift pit shall be provided with a pit sump, minimum size of 300x300x300 and shall include a non-slip sump cover. Lift pit floor shall slope towards the pit sump.

Concrete plinths or equal and approved equivalent for support of buffers, etc shall be specified.

11.3.15 Lift Pit Access

Access to the lift pit shall be in accordance with EN81-20, through the lift entrance door if the pit is less than 2.5m deep, or alternatively through a pit access door complying with the requirements of the EN81-20 if the pit is 2.5m deep or greater.

11.3.16 Electromagnetic Compatibility

Where equipment including fittings, apparatus, appliances, wiring and the like is likely to be incompatible with emission levels, harmonics and power quality for other areas of the building, all such equipment shall be provided with suitable filtering to ensure correct operation in the environment.

11.3.17 Lift Monitoring

Lifts shall be provided with BAS signals that detail when the lift alarm has been pressed or when the lift is in a fault condition.

All lifts shall have provisions for future connection to a Lift Management System (LMS). For large buildings where the lift designer considers it is warranted, an LMS shall be provided. The system shall allow the operator to select units by group and individually, and give status of major normal operating characteristics, including access control status, as well as major defects and alarms. It shall also be capable of recording the incidence of demands on all units and responses in such a way as to allow ready analysis by individual units, groups, and selected time intervals.

11.3.18 Lift Machine Room Design Requirements

The design of the lift machine room shall comply with the following:

- Lift machine rooms, where provided, shall be designed in accordance with the requirements of NCC and EN81.20;
- Be suitably ventilated or air conditioned in accordance with the control and alarm requirements as detailed NCC and EN81.20. Fresh air intake, if provided, shall be adequately filtered;
- Be suitably lit in accordance with NCC and EN81.20. Lights shall be of an LED tube or LED panel type fittings. Emergency lighting shall be of the non-maintained type;
- Entrances shall be 2-hr fire rated and shall be keyed with a B2.4 cylinder. Access keys shall only be available from the University campus security. Lift machine room entrances shall be provided with a 'Danger.....' notice in accordance with EN81.20;
- Fire extinguishers and detection shall be provided in lift machine rooms;
- A permanent 415/240V 3-phase and neutral fire-rated power supply connected to a dedicated lift switchboard;
- Finishes to walls, floor and ceiling shall be durable and painted in full gloss enamel for easy cleaning. The ceiling colour shall be white and walls off-white. Floors shall be properly sealed and receive two coats of grey coloured paving paint;
- Any required lifting beams or lifting eyes shall be fitted with SWL notices;
- Lift shop drawings shall be laminated and hung on the LMR wall. Lift wiring diagrams shall be within protective sleeves and provided in bound booklets and shall be stored in the lift controller;
- At practical completion the lift machine room shall be clean and free of tools and redundant equipment.

11.3.19 Machine-Room-Less (MRL) Requirements

The design of the MRL lift shall comply with the following:

- MRL lifts shall only be considered for passenger lifts where speeds of 1.0 to 2.5m/s are required. When a lift speed of 2.5m/s and above is required conventional overhead lift motor room traction lifts shall be provided. Overhead lift motor room lifts shall also be considered where a high rated load is required, for example large goods lifts.
- The machine space shall have lighting with a minimum of 200Lux at the controllers.
- The control cabinet at the landing shall be fire rated and have a satin stainless steel finish.

- Where a control cabinet is remotely located from the lift, where the movement of the lift for maintenance or service cannot be observed through an open landing door or by other means, closed circuit television screen shall be provided in the controller for service staff viewing only with the camera(s) mounted in the lift well.
- Provide shaft cooling where glass walled shafts are exposed to sunlight or external air temperature.
- In the event the temperature in the machine space reaches or exceeds 40 degrees Celsius, automatic means shall be installed to prevent the lift from continuing to operate once it is at a floor level and the doors have opened.

11.3.20 Ride Quality and Acoustic Treatment

As a minimum the lifts shall meet the following ride quality requirements:

- Acceleration: 0.8 – 1.1 m/s²;
- Jerk: 1.8m/s³;
- Lateral Vibration: ≤ 15 m-g (10 Hz filtered A95);
- Noise level inside car with lift running at contract speed, shall be less than 55 dB(A);
- Levelling accuracy of ±6mm.

Lift guide shoes shall be of the roller guide type.

In order to reduce noise and vibration, lift equipment such as hoisting machines, controller, and if appropriate, switchgear, sheave, guide shoes, door mechanism and rope hitch shall be mounted on appropriate isolating pads or mountings.

11.3.21 Lift Contractor List

Prior to the issuing of tender documentation, the design consultant shall obtain a list of nominated lift contractors from the University's Project Manager.

11.3.22 Energy Considerations

The lift designer shall consider the reduction of lift energy usage when designing the lift system. The following shall be considered for all lift applications:

- Automated switching of light fittings and screens in lift cars and on landings, to reduce the electrical load to the minimum allowable when lifts are idle. Lights and screens shall automatically be switched off whenever the lift has been idle for 2 minutes, except when the lift is in a special operation mode (exclusive, fire, etc), or if the lift is in a failed start or fault condition;
- The lift drives shall be based on variable frequency AC permanent magnet motors;
- Drives for lifts in new buildings shall have a regenerative capability that recovers excess energy in an overhauling condition to be returned to the electrical mains rather than rejected as heat.

11.3.23 List of Required Drawings

During the design phase of the project the following drawings shall be submitted to the University Project Manager for review:

- Lift layouts;
- Lift car interiors;
- Lift landing entrances;
- Lift car and landing faceplate appointments;
- Lift notices, labels and signs; and
- Any other item of equipment visible to a normal user of the finally installed equipment.

11.3.24 As-Built Documentation, Manuals and Related Information

Four weeks prior to practical completion of the project the University shall receive draft copies of the following documentation. Final copies are to be provided no later than four weeks after practical completion.

- Project specification;
- As installed drawings;
- Operation and Maintenance Manuals;
- Certificate of Electrical Safety;
- Testing verification in accordance with requirements of EN81-20 and EN81-50
- Plant Registration documentation in the University's name;
- Plant Design Notification documentation (if applicable);
- Hazard and Risk Assessment as provided by the lift contractor;
- All hardware, software & documentation required for diagnostics and maintenance activities;
- Details of the following performance at the point of handover:
 - Ride Quality results
 - Door open and close times
 - Door dwell times
 - Floor levelling accuracy
 - Acceleration and deceleration rates
 - Jerk rate
 - Contract speed
 - Flight times (door open to door open) for one, two and four floor runs

11.3.25 Maintenance Records

The project documentation is to include a requirement that the lift contractor is responsible for all maintenance (including breakdown, preventative etc) and servicing requirements during the 12 month defect liability period. A comprehensive record of maintenance carried out during the defects liability period shall be kept on site for all preventative maintenance, breakdown calls and repairs carried out. Copies of these records shall also be forwarded to the Engineering Services Manager.

At the end of the first six-months of the maintenance period the maintenance contractor shall produce a performance report giving details of operation versus design parameters.

All maintenance records shall be submitted to the University on expiration of the defects liability period.

11.3.26 Escalators

The University of Melbourne will not accept the use of escalators.

11.4 BUILDING MAINTENANCE UNIT DESIGN

The selection and design of Building Maintenance Unit (BMU) services installed at the University shall meet the requirements of the Design Standards. The designer shall produce their own specification incorporating the following information and submit all designs for review and approval prior to tender or any works commencing on site.

This design standard details the minimum requirements applicable to certain components of the BMU installation and details the design intent. The designer must use the

Modification Request Form to seek approval for any departure from any clause in the Design Standards.

11.4.1 Applicable Standards

The design of BMU systems shall comply with the current regulations and requirements of the Authorities having jurisdiction over the project.

The BMU shall meet the requirements of relevant Australian Standards and Work Health and Safety regulations. The BMU designer, installer and maintenance provider shall identify, eliminate and/or control all hazards to health and safety associated with the installation, commissioning, decommissioning, dismantling, erection and use of the BMU.

The BMU system shall be designed and installed in accordance with the following codes and regulations and shall conform to a Safety in Design principle:

- AS1418.1 Cranes, Hoists and Winches – General Requirements
- AS1418.13 Cranes (including Hoists and Winches) – Building Maintenance Units
- AS 2550.13 Cranes, Hoists and Winches – Safe Use - Building Maintenance Units
- Occupational Health and Safety Act and Regulations.
- National Construction Code of Australia (NCC);
- AS3000 Wiring Rules;
- Equipment (Public Safety) Regulations
- Authorities having jurisdiction over the works.

The contractor is to ensure that the BMU design is registered with Work Safe Victoria in the name of “The University of Melbourne” as the owner.

11.4.2 Design Objectives

The BMU Services shall be based on appropriate commercial design standards, and good engineering practices, incorporating:

- Space in which plant is to be installed shall ensure that the intended equipment can be properly accommodated without alteration to the base building design.
- Minimum design life is to be 25 years or longer as required in order to meet the design life of the building structure and the façade to be serviced,
- Facility for garaging the BMU is recommended for longevity,
- All metal within the structure of a building maintenance unit shall be treated to prevent corrosion,
- Appropriately designed stable working platform that ensures safe access and egress, includes safety harness anchor points and means for a restraint system,
- Safe means of access and facilities to enable inspection and maintenance of the BMU,
- Weatherproof control cabinet and operating panel,
- Emergency rescue provisions shall be designed in to the system which may include the ability to land the platform at the bottom of the building in all platform drop positions,
- A permanently connected communication system shall be provided as per the requirements of Section 8 of AS1418.13,
- The BMU shall be provided with detailed operator instructions and shall include appropriate security systems and procedures that ensure only trained operators are able to use the BMU.

11.4.3 BMU Installation and Operation

All BMU installation and operational activities shall be carried out by competent persons who have the training and experience necessary to carry out the works.

11.4.4 As Installed Equipment Label

The BMU shall be provided with a permanent and legible installation information plate with the following details (in English):

- Australian Standard to which the equipment is installed
- Date installed/upgraded
- Statutory registration details
- Manufacturer's name, installer's information.
- Country of manufacture.
- Serial number or other identifying number.
- Safe working load on the components (of a davit system).
- Safe working load of the platform.
- Details of the wire ropes used, as follows:
 - (i) Nominal size.
 - (ii) Grade.
 - (iii) Construction.
 - (iv) Minimum breaking strength.
 - (v) Rope lengths.
- Basic operating instructions on the drive unit and working platform.
- An instruction notice stating that the building maintenance unit shall be parked in a nominated parking position (where applicable).
- Contact telephone number for the University's Security Control Room.

11.4.5 List of Required Design Information

During the design phase of the project the following information shall be submitted to the University Project Manager for review:

- Roof layouts showing position of each platform drop,
- Track or runway details including anchor points,
- Platform restraint details;
- Drive unit details including operating and travelling speed
- Loads on building structure,
- Lift notices, labels and signs; and
- Any other item of equipment visible to a normal user of the finally installed equipment.

11.4.6 As-Built Documentation, Manuals and Related Documentation

Four weeks prior to Practical Completion of the project the University shall be provided with draft copies of the following documentation:

- Project specification;
- As-built documentation;
- Operation and Maintenance Manuals;
- Certificate of Electrical Safety;
- Testing verification in accordance with requirements of AS 1418.13

- Plant Registration documentation in the University's name;
- Plant Design Notification documentation (if applicable);
- Hazard and Risk Assessment as provided by the BMU contractor;
- All hardware, software & documentation required for diagnostics and maintenance activities;

Final copy documents are required prior to 4 weeks after Practical Completion. Refer to the University CAD Standards document (located in the Associated Documents section of the Design Standards web page) for the detailed requirements for as-built documents etc.

11.4.7 Maintenance

The project documentation is to include a requirement that all maintenance (including preventative and breakdown) and servicing during the defects liability period is to be undertaken by the installation contractor. The BMU shall be maintained in a safe working condition and a preventive maintenance programme shall include periodic and routine maintenance carried out quarterly in accordance with the requirements of AS 2550.13.

11.4.8 Maintenance Records

A comprehensive record of maintenance carried out during the defects liability period shall be kept on site for all preventative maintenance, breakdown calls and repairs carried out. Copies of these records shall also be forwarded to the Manager Engineering and Infrastructure.

At the end of the first six-months of the defects liability period the maintenance contractor shall produce a performance report giving details of operation versus design parameters.

All maintenance records shall be submitted to the University's Manager Engineering and Infrastructure on expiration of the defects liability period.

11.5 DESIGN CHANGE AUTHORISATION

All requests for changes to the requirements of the Design Standards must be made on the Modification Request Form. No design work is to proceed on the basis of the proposed modification until the modification request has been approved in writing.

A schedule of all design change requests together with signed copy of all approved modification request forms must be provided at project handover.