

# Vertical Transport Services Design Standards



**MACQUARIE**  
University

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## TABLE OF CONTENTS

|   |          |    |
|---|----------|----|
| <b>1. PURPOSE</b>   | <b>1</b> |    |
| <b>2. SCOPE</b>   | <b>2</b> |    |
| <b>3. Glossary of Terms</b>                                       | <b>3</b> |    |
| <b>4. Authorities and Responsibilities</b>                        | <b>4</b> |    |
| <b>5. Technical Requirements</b>                                  | <b>5</b> |    |
| 5.1. INTRODUCTION   |          | 5  |
| 5.2. STANDARDS  |          | 5  |
| 5.3. DESIGN AND DOCUMENTATION                                     |          | 5  |
| DESIGN APPROACH   |          | 5  |
| DESIGN INPUTS AND PROCESS   |          | 6  |
| ENGINEERING FUNCTIONS REQUIRED FROM DESIGN CONSULTANTS            |          | 6  |
| CALCULATIONS  |          | 6  |
| DESIGN CONDITIONS   |          | 6  |
| TypeS of Lift Drive & Escalators                                  |          | 6  |
| Gearless  |          | 6  |
| Escalators shall comply with the following:                       |          | 6  |
| Minimum Requirements for Persons with Disabilities                |          | 7  |
| Provision of Stretchers and Emergency Lifts                       |          | 8  |
| Performance Requirements  |          | 8  |
| GENERAL Performance Criteria Parameters                           |          | 8  |
| Contract Speed  |          | 8  |
| Administrative and Office Buildings                               |          | 8  |
| Tutorial Rooms, Class Rooms, & Lecture Theatres,                  |          | 9  |
| Research Facilities and Laboratories,                             |          | 9  |
| HAZARDOUS GOODS SERVICE – GOODS LIFTS                             |          | 9  |
| Lifts Cars  |          | 12 |
| Lift ENTRANCE PROTECTION  |          | 12 |
| Passenger Lifts   |          | 12 |
| Goods Lifts   |          | 13 |
| 5.4. COMMISIONING TESTING   |          | 14 |
| 5.5. MAINTENANCE  |          | 16 |
| 5.4.1. Maintainability  |          | 16 |
| Independent Maintainability                                       |          | 16 |
| Supported Maintainability   |          | 16 |
| 5.4.2. Integration with Existing Maintenance Procedures           |          | 16 |
| Operational Maintenance During The Defects Liability Period (DLP) |          | 17 |
| 5.6. PREFERRED SUPPLIERS  |          | 17 |



## 1. PURPOSE

This Vertical Transport services standard sets out Macquarie University's minimum requirements for the design, construction and maintenance of Vertical Transport systems. Vertical Transport systems also refers to lifts, elevators, moving pathways, escalators, service lifts etc. The objective of this standard is to provide guidance and minimum standards of compliance to ensure that systems are designed, constructed, commissioned, and maintained to achieve energy efficiency, fitness for purpose, quality and durability, design performance in operation, maintainability and safety for access and operation, low environmental impact, and low life cycle cost.

Applicable requirements documented in Work Health and Safety legislation, Disability Discrimination legislation, State Environmental Planning legislation, Commonwealth and State legislation, Natural Construction Codes (NCC), Macquarie University Design Guides and Australian Standards (AS) are the minimum and mandatory compliance requirements. British Standards shall be used where no Australian Standard exists.

Reference is also made to CIBSE Guide D Transportation Systems in Buildings.

Where any ambiguity exists between this standard and the aforementioned mandatory requirements then:

- a. The highest performance requirements must apply
- b. Applicable requirements must follow this order of precedence
  - i. Work Health and Safety legislation
  - ii. Disability Discrimination legislation
  - iii. State Environmental Planning and Assessment legislation
  - iv. All other Commonwealth and State legislation
  - v. This Standard and Macquarie University Design Guides
  - vi. NCC
  - vii. AS/NZS



## 2. SCOPE

These Standards describe the minimum requirements for the design, construction and maintenance of all Vertical Transport services throughout all buildings owned, operated and managed by Macquarie University Property.

The Standard applies to planners, project managers, consultants, contractors, sub-contractors, tenants, managing agents and University staff involved in the design, construction, commissioning and maintenance of existing, new and proposed University buildings and facilities.

The Vertical Transport Services Standard provides:

- A reference document to enable consistency with the design and engineering objectives;
- Guidance on design considerations;
- Details of the minimum performance requirements;
- Details of the minimum quality requirements;
- Guidance in regards to provisions for maintenance and access;
- Commissioning requirements for acceptance by the University.



### 3. GLOSSARY OF TERMS

|            |   |
|------------|---|
| Consultant | The mechanical design consultant/engineer                   |
| AS         | Australian Standard   |
| ATT        | Average travel Time   |
| AWT        | Average Waiting Time  |
| BCA        | Building Code of Australia, now replaced by NCC (See below) |
| BMCS       | Building Management Control System                          |
| Consultant | The mechanical design consultant/engineer                   |
| D&C        | Design and Construct  |
| HLI        | High Level Interface  |
| LCD/LED    | Liquid Crystal Display/Light Emitting Diode                 |
| MSDS       | Material safety data sheets                                 |
| MUP        | Macquarie University Property                               |
| NATA       | National Association of Testing Authorities                 |
| NCC        | National Construction Code                                  |
| O&M        | Operations and Maintenance                                  |
| PC         | Practical Completion  |
| VT         | Vertical Transport System                                   |
| WHS        | Work Health and Safety                                      |



#### 4. **AUTHORITIES AND RESPONSIBILITIES**

This standard is owned by MUP. MUP is responsible for maintaining the standard and keeping it up to date. Always check to see if there has been an update to this standard before committing to its use for any particular project. It is the responsibility of the user to ensure they are using the latest version.





## 5. TECHNICAL REQUIREMENTS

### 5.1. INTRODUCTION

The aim of this manual is to assist consultants, Project managers, D & C Contractors and Builders. Generally, the relevant Australian standards are to be complied with unless the University requires that a higher standard be met. Variations from the standard are to be approved by MUP. For the avoidance of doubt the VTS of a University building may include structural/building elements, or any other trade works other than the elevator trade which are contingent on the functioning of the VTS. (Eg. Building Trade – access control contractor, etc

It should also be noted that the University is a long term owner of the property and so appropriate considerations are to be made in terms of quality of installation, efficiency in operation, ease of maintenance and safety, long term reliability, and flexibility for change of use (where feasible).

The Technical Services Manager shall be consulted if any confusion arises before applying this Standard Guide. Approved variations must always be in writing or they will not be accepted.

### 5.2. STANDARDS

The following standards apply:

|                   |  |
|-------------------|--|
| NCC               | National Construction Code                                   |
| AS1735.1 (2016)   | General Requirements   |
| AS1735.2          | Passenger and goods lift – Electric                          |
| AS1735.12         | Facilities for persons with disabilities                     |
| EN81 20/50 (2017) | General Requirements   |
| AS3000            | Australian Wiring Rules                                      |
|                   | Disabilities (Access to Premises – Buildings) Standards 2010 |
|                   | WorkCover NSW  |
|                   | The NSW Fire Service   |
|                   | Australian Telecommunications Regulations                    |
|                   | NSW Work Health and Safety Regulations 2017                  |

The above list is not an exhaustive list of relevant standards. The design and installation shall consider all relevant standards required under legislation or authority requirements, and also consider international codes and standards if required to satisfy the technical, operational and functional requirements of the brief.

If the VTS is installed in a jurisdiction not noted above with the rules and regulations of all authorities having jurisdiction over them in that location shall apply.

### 5.3. DESIGN AND DOCUMENTATION

#### DESIGN APPROACH

The University expects consultants and designers to provide designs that meet the project brief. The following are priorities that consultants and designers must be aware of and consider in their design:

- a. A consultant's return brief shall be provided for approval that confirms all aspects of the project brief, design allowances, building fabric, usage and operating conditions, environmental criteria, design approach and options to be considered as part of the concept design process;
- b. Provide environmental conditions that meet the project brief;
- c. Take a long term balanced view of capital costs, energy costs, maintenance costs and



longevity of equipment;

- d. Accessibility, ease of operation, and ease of maintenance;
- e. Control systems shall be designed with simplicity and reliability in mind. Often controls are made overly complicated which can lead to issues in commissioning, multiple points of failure and an overly onerous maintenance burden;

## DESIGN INPUTS AND PROCESS

The University expects consultants and designers to proactively inform, advise and contribute to the design process.

## ENGINEERING FUNCTIONS REQUIRED FROM DESIGN CONSULTANTS

The university expects consultants and designers to be fully qualified, experienced and capable of carrying out all engineering design, calculations, equipment selection, construction quality checks, overview and verification of commissioning.

## CALCULATIONS

Use of computer modelling/simulation/estimation programs must be performed and show that the minimum design criteria required by the MUP have been met. This must be part of the design advice for all services to verify the building performance.

## DESIGN CONDITIONS

For 2 and 3 storey buildings there is a minimum requirement to provide a lift for the vertical movement of furniture, goods and persons with disabilities.

Where the height of a building exceeds 10.5 metres or there are more than 3 floors served, consideration should be given to more than one lift being installed.

## TYPES OF LIFT DRIVE & ESCALATORS

The type of lift drive shall be based on the following:

- Electro-hydraulic – These lifts shall be used if upgrading existing lifts remaining the sole discretion of the University and ONLY if utilising the latest Variable Frequency Hydro such as designed by Bucher (or similar high quality product)
- Lifts designed for restricted access (such as AS1735 Part 14,15 & 16) – shall not be used
- Geared – These lifts shall not be used, unless upgrading existing lift installations.
- Underslung basement drive lifts - These lifts shall not be used

## GEARLESS

All new lifts shall be with speeds up to 2.5 metres per second shall be machine room less lifts. Lifts with higher speeds shall require a machine room at the top of the shaft.

The hoisting machine motor shall be a modern high efficiency induction motor and correctly matched to the new VVVF drive, lift car loads and speed for the lifts' correct and efficient operation.

All lifts shall use regenerative braking, with the excess power to supply feeding back into the buildings electrical network. It shall be filtered so as not to cause interference to other building electrical, communications or data services.

Should normal electrical power be lost the lift shall have its own emergency power supply (by UPS or other appropriate means) to allow the lift to travel to the nearest landing, open the doors, allow any passenger to leave the lift car and then shut down to await the return of normal electrical supply

## ESCALATORS SHALL COMPLY WITH THE FOLLOWING:

- Step chains shall have a service life of at least 100,000 hours.
- All step chain rollers are to have roller or ball bearings not bushes



- The use of nylon or other “soft” materials shall not be used for major items such as drive and handrail sprockets
- Automatic lubricators shall have sufficient capacity to provide lubrication at appropriate levels for periods of at least 1 (one) month without topping up.
- All handrail returns (newels) are to have roller guides not sliders.
- Balustrades are to be made of substantial materials other than glass unless otherwise approved by the University.
- There shall be at least 3 level steps at the entry and exit of each escalator, transition area.
- The speed of any escalator shall be limited to no more than 0.5 mps
- Shall have speed reduction when not in use
- Shall have regenerative drives

#### MINIMUM REQUIREMENTS FOR PERSONS WITH DISABILITIES

All lifts installed at any of the University campuses or buildings shall comply with at least the National Construction Code of Australia requirement for Facilities for People with Disabilities Clause E3.6, the Disability (Access to premises buildings) Standards 2010, plus all lift car control buttons shall comply with clause 8.3.4 Tactile Labelling of AS 1735.12

Only lifts complying with, AS 1735 Parts 1 or EN81 20 shall be used for providing access for people with disabilities.

Unless prior approval from the University is given the following lifts **shall not be used** for the access of people with disabilities:

|            |   |
|------------|---|
| AS 1735.13 | Lifts for persons with limited mobility - manually powered                                    |
| AS 1735.14 | Lifts for persons with limited mobility - restricted use - low rise platforms                 |
| AS 1735.15 | Lifts for persons with limited mobility - restricted use - non-automatically controller lifts |
| AS 1735.16 | Lifts for persons with limited mobility - restricted use - automatically controlled           |

Where the need is clearly identified for the specific use for access of people with disabilities then Part 12 of AS 1735 shall be applied to the lift or all the lifts, if more than one lift is being installed in a group.

Where AS 1735 Part 12 is applied clause 8.1, Automatic Audible Information for the lift car position indicator and operation of all lift car buttons shall be by oral announcement only.



**PROVISION OF STRETCHERS AND EMERGENCY LIFTS**

Provision shall be made for the use of stretchers and emergency lifts as detailed in the latest version of the NCC at the time when the lift documents go out for tender pricing. A minimum lift car depth of 2000mm shall be provided.

**PERFORMANCE REQUIREMENTS**

**GENERAL PERFORMANCE CRITERIA PARAMETERS**

The following performance criteria shall apply to all lifts:

Door Times - Speeds (+ or - 5%)

|             |             |
|-------------|-------------|
| Open Doors  | 2.0 Seconds |
| Close Doors | 2.5 Seconds |

Door time measurement shall be made manually by stopwatch and shall be measured from start of door movement to completion of the opening or closing function, as the case may be.

Door Times - Dwells (maximum)

|            |             |
|------------|-------------|
| Car Call   | 3.0 Seconds |
| Lobby Call | 3.0 Seconds |

- Maximum acceleration rate of 1.0 mps.
- Maximum deceleration rate of 1.0 mps.
- Maximum jerk rate of 1.5 mps.
- Maximum lateral and vertical vibration 20 mg.
- Floor level accuracy +/- 6mm or better.
- Noise in lift car in motion at any point in the lift shaft with fan off no more than 55 dBA.
- Door operation noise shall not be more than 60 dBA.
- Lift car fan shall not be more than 60 dBA.

Note. All car noise measurements shall be taken in the middle of the lift car at approximately 1 metre above the floor.

**CONTRACT SPEED**

When measured in an agreed manner, the full speed of any lift up and down including the rates of acceleration and deceleration shall not vary from the values as stated on the original Equipment's design registration and/or original manufacturer parameters by more than plus or minus 5%.

**ADMINISTRATIVE AND OFFICE BUILDINGS**

The minimum car size if not clearly defined in tender documentation shall be 17 passenger 1275kg with Goods Class A loading. Car size 1400mm wide x 2000mm deep.

If a normal passenger lift service, as distinct from goods service or Facilities for Disabled Persons lift, is deemed necessary under the design concept it shall be designed to meet the following design criteria:

Average Waiting Interval - the maximum up peak average departure interval from the main lowest floor landing for administrative and office buildings.

|                            |            |
|----------------------------|------------|
| 1 to 4 floors served       | 45 second  |
| 5 to 8 floors served       | 35 seconds |
| 8 and higher floors served | 30 seconds |

Handling Capacity - Minimum 5-minute handling capacity expressed as a percentage of building population above the main lowest floor landing for administrative and office buildings:

|                            |        |
|----------------------------|--------|
| 1 to 4 floors served       | 10.0 % |
| 5 to 8 floors served       | 12.5 % |
| 8 and higher floors served | 15.0 % |

**TUTORIAL ROOMS, CLASS ROOMS, & LECTURE THEATRES,**

The minimum car size if not clearly defined in tender documentation shall be 17 passenger 1275kg with Goods Class A loading. Car size 1400mm wide x 2000mm deep.

Lift installation in a buildings or parts of buildings of this type requires an accurate theoretical traffic analysis. A detailed study is to carry out and a full written report is to be provided by an appropriate independent consultant or at least 3 separate studies supplied by 3 potential tendering lift companies.

The basic requirement for classrooms up to 4 floors served shall have a waiting interval as a maximum of 45 seconds with a handling capacity of a minimum of 15% up to a maximum of 50%.

For classrooms in buildings over 5 floors special consideration will be required for the correct lift system and layout for the particular application. The use of escalators at least in part, shall be seriously considered.

**RESEARCH FACILITIES AND LABORATORIES,**

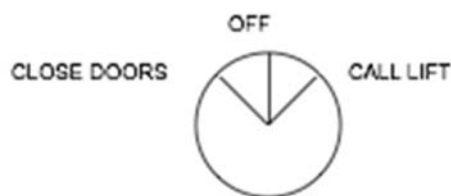
Lift installation in a buildings or parts of buildings of this type require goods carrying ability. The minimum car size if not clearly defined in tender documentation shall be 17 passenger 1275kg with Goods Class A loading. Car size 1400mm wide x 2000mm deep.

The minimum door width shall be 1100mm wide by 2100mm high.

These lifts shall incorporate a hazardous goods service function, as defined herein.

**HAZARDOUS GOODS SERVICE – GOODS LIFTS**

All landing panels (LOP) for goods lifts will be provided with a three-position key operated switch labelled “HAZARDOUS GOODS OPERATION” with the positions labelled as follows:



The lock will be spring return to the “OFF” position from both other positions.

In addition to normal switches, there will be a two-position switch in the car operating panel (COP) labelled “HAZARDOUS GOODS OPERATION”. The two positions will be labelled “OFF” and “ON” and the key can be withdrawn in either position.

The key switches in both the COP and the LOP will be of the Bi-Lock type.

- When the hazardous goods service (HGS) key switch is in the “OFF” position the designated lift will operate normally and where applicable as part of a lift group.
- The attendant turns the key switch in the landing operating panel (LOP) clockwise from the “OFF” to the “CALL LIFT” position.
- An in-car announcement is made.
- “Please exit at the next stop, this lift is required for special service”. Note, this audio announcement will repeat approximately every 10 seconds
- An illuminated flashing sign in the lift COP will light “Special service operation”
- Hall call response is inhibited
- The lift will travel to answer the next registered lift car call in its direction of travel, the doors will open, all other lift car calls will be cancelled and new lift car calls will not be accepted. All passengers are expected to leave the lift car. The doors will close and the lift travel directly to answer the HSG key switch. If the lift is idle it will immediately travel directly in answer to the HSG key switch.
- The lift will travel (non-Stop) to the “calling” floor (at which the HGS switch is selected.)
- Open its doors.
- The lift will remain at that floor with the doors open.
- The attendant will remove the key switch from the landing fixture in the “OFF” position.
- The lift will remain “captive” in the HGS mode of operation for 60 seconds.
- (If the process does not proceed to the next stage, the lift will return to normal service.)
- The HGS car operating panel (COP) key switch is turned to the “ON” position.
- The key is removed in the “ON” position.
- The goods are loaded.
- The key is inserted into the hall switch and turned counter clockwise to the “CLOSE DOORS” POSITION. The doors close and the key returns to the central “OFF” position and withdrawn.
- The attendant travels via other lift or stairs, to the “destination” floor.
- The attendant then turns the HGS key switch in the LOP to the “CALL LIFT” position at the “destination” floor.
- The lift travels to the “destination” floor.
- The doors open.
- The goods are removed.
- The key is removed from the “destination” landing HGS key switch.
- The COP HGS key switch is returned to the “OFF” position.
- The key is removed.
- The lift returns to normal service.

The HGS mode of operation will not initiate if

- The Hall or Car Fire Service is operated. (HFS & CFS)
- The lift is in Inspection mode. (INS)
- The lift is on Independent Service. (INDS)

Selection of the Hall Fire Service mode while the lift is on HGS will return the lift to a designated floor for unloading.



If the HFS mode is selected while the lift is on HGS, there will be an announcement in the lift car, advising the attendant (passenger) to abandon the use of the lift and exit the lift before the doors close and the lift returns to the designated floor.



## LIFTS CARS

The minimum size of lift cars shall be 17 persons for all passenger lifts.

All controls are to have vandal resistant controls and communication systems.

All buttons in research and laboratory areas shall be anti bacterial.

All lift shall also have provision for CCTV (security cameras) and access control (Card readers) installed between the car and controller, with all necessary boards and connections supplied, to enable connection at any time by the University.

Any lift car emergency phone system shall be directly connected to the University's Security Office for 24-hour monitoring.

No less than one (1) Car Operating panel in each lift car will incorporate functional key switches of the bi-lock type for the following functions:

- Car light on/off/ emergency test
- Car fan on/off
- Fire Service (AS1735 compliance)
- Exclusive Service

All lift cars must have a roof trap door.

The lift car emergency lighting must comply with or exceed AS 1735.2 - 2001 Clause 23.25.2.9 (not AS1735.1 Amendment 2006). EN81 compliance is not acceptable. In particular there must be a minimum of 50 lux on each control panel.

## LIFT ENTRANCE PROTECTION

All lifts shall be provided with a Memco PanaChrome or approved equivalent 3D door protection monitoring system (light rays). Inclusive of green/ red illumination when doors opening and closing respectively.

The light ray detection areas shall comply with As1735.12.

## PASSENGER LIFTS

The minimum size of lift cars shall be 17 persons (1400 mm wide x 2000 mm deep car platform) for all passenger lifts regardless of travel distance and number of floors served, unless otherwise agreed where in an existing building. Stretcher compliance as required by NCC.

The lifts are to have provision for protective blankets in all lift cars to protect their finishes. Each MUP building is to have minimum of one (1) set of lift protective blankets. Therefore, if only one lift in the building it must have set of blankets supplied with lift.

Lift car finishes shall be as detailed below and in the standard Lift Drawings attached. Equivalent alternatives may be submitted for approval but no alternative to the Lift standards can be implemented without written approval by Associate Director FM Asset Management.

- 6WL Rimex Metals Australia P/L stainless steel patterned wall lining (not lished) on 6mm minimum backing with folds to side walls and lower half of rear wall. Note that the lift car must have an outer shell, backing timber or equivalent of at least 6 mm and then the car finishes applied to the timber. Lift car finishes must not be the metal lift car shell or attached directly to the shell.
- Stainless steel bump rails shall be installed on both sides and rear wall, just above the lift car floor. The stainless steel bump rail shall be a flat plate approximately 150 mm wide x 6 mm thick securely mounted to the lift car wall. See drawing for details (authors note e.g. Building F10 lifts 53 & 54) Aluminium framed half height laminated silver mirror to rear of lift positioned from 200mm above handrail to 200 mm below the ceiling level.





- Fixed “white” coloured laminated lift car ceiling with access panel (to the roof trap door) secured with shot bolts (or similar) on the top side of the ceiling to prevent the panel being opened from within the lift car 38mm dia. continuous s/steel handrail securely attached to side and rear wall, refer drawings.
- Lift car “high power” recessed linear LED lighting to full length to both sides. Lift car lighting levels must comply with AS 1735.2-2001. Emergency lighting must comply with or exceed AS 1735.2 - 2001 Clause 23.25.2.9 except the type of light is to be LED.
- Lift Car door and car front, finished stainless steel.
- The car platform shall be floored with not less than 3 mm thick steel welded to a structural steel frame and provided with steel supporting bearers beneath. Alternatively the platform shall be of approved well-seasoned timber or waterproof marine ply, adequately supported and fitted in a structural steel frame. The underside completely covered with 0.9 mm thick galvanised sheet iron. The upper side of the platform shall be level and made suitable for the fixing of the floor covering.
- Floor covering Amtico vinyl tiles - ceramic black or dark grey.
- Car and landing buttons must be commercially available “third party supplier” items (Dewhurst preferred) fully AS1735.12 compliant with White/Blue Illumination. Generic lift company manufactured items will not be accepted regardless of quality.
- Car and landing indication must be commercially available “third party supplier” items (e.g. DesignCom etc) fully AS1735.12. Generic lift company manufactured items will not be accepted regardless of quality.
- Door frames to be supplied and installed to the full depth of wall structure.
- Hall lanterns, indicators and call buttons are to be installed on the front wall of the lift lobby and in line with the structure to ensure high visibility from every point of the lift lobby.
- To include the supply and installation of the Pixel NBN EM-4GE dual GSM telephone system to accommodate the introduction of NBN to the building.
- All passenger lifts are to have features as required for their particular application including Hazardous Goods Operation.

## GOODS LIFTS

- Goods lifts shall have similar finishes as passenger lifts and with bump rails (bump rails shall be installed on both sides and rear wall, and again the stainless steel bump rails shall be a flat plate approximately 150 mm wide x 6 mm thick securely mounted to the lift car wall. See drawing for details and possible omission of the lift car mirrors.
- Goods lifts are to have appropriate finishes for the intended use, as a minimum they must be highly durable, impact resistant and easily cleaned.
- All goods lifts are to be sized and have features as required for their particular application including Hazardous Goods Operation. Refer below for further details.
- Specialist goods lifts for chemicals, animals, biologicals, etc. may require special finishes that must be co-ordinated with the Project Manager, Designer and End User.
- Fixed “white” coloured laminated lift car ceiling with access panel (to the roof trap door) secured with shot bolts (or similar) on the top side of the ceiling to prevent the panel being opened from within the lift car.
- 38mm dia. continuous s/steel handrail securely attached to side and rear wall, refer drawing.
- Lift car high power recessed linear LED lighting, full length both sides of car. Lift car lighting levels must comply with AS 1735.2-2001. Emergency lighting must comply with or exceed AS 1735.2 - 2001 Clause 23.25.2.9 except that the type of light is to be LED.
- Car door and car front, finished stainless steel.
- Floor covering “Amtico” vinyl tiles - ceramic black or dark grey or aluminium chequer plate.



- The car platform shall be floored with not less than 6 mm thick steel welded to a structural steel frame and provided with steel supporting bearers beneath. Alternatively the platform shall be of approved well-seasoned timber or waterproof marine ply, adequately supported and fitted in a structural steel frame. The underside completely covered with 0.9 mm thick galvanised sheet iron. The upper side of the platform shall be level and made suitable for the fixing of the floor covering.
- Car and landing buttons must be commercially available “third party supplier” items (Dewhurst preferred) fully AS1735.12 compliant with White/Blue Illumination. Generic lift company manufactured items will not be accepted regardless of quality.
- Car and landing indication must be commercially available “third party supplier” items (e.g. Design Com, etc.) fully AS1735.12. Generic lift company manufactured items will not be accepted regardless of quality.
- To include the supply and installation of the Pixel NBN EM-4GE dual GSM telephone system to accommodate the introduction of NBN to the building.
- Door frames to be supplied and installed to the full depth of wall structure.

#### **5.4. COMMISIONING TESTING**

Prior to hand over of the lifts and on satisfactory completion of all tests carried out by an authorized person carry out any tests required by the MUP to establish that the lift complies with the intent of the specification requirements and these design standards.

Before commencing to test, clean the well, machine and equipment using vacuum cleaning equipment and remove rubbish from the site.

Supply all necessary facilities, labour, weights, apparatus and instruments etc., for carrying out the tests. If during the tests the lift fail to comply with the specified requirements, make such alterations and adjustments, as may be necessary to make the lift comply with the specification, at no expense to the Principal

Copies of the test and inspection sheets for the lift equipment shall be furnished to the Principal on request.

Unless otherwise approved by the Principal, the following tests shall be made to the lift at the time of the final inspection:

(a) Full Load Run Test

The lift shall be subjected to a test for a period of one hour continuous running with full contract load in the car. During the test, the car shall be stopped at each floor on the up and down trips, during which the doors shall be fully opened and closed. Stops at the lower terminal landing shall be of one minute duration and at the other floors only sufficient duration to permit the opening and closing of the doors.

(b) Speed Test

The actual speed of the lift car shall be determined in both directions of travel with full contract load and no load in the car. The test shall be made before and after the full load run test and the maximum difference in the speeds obtained shall not exceed 10% of the contract speed.

(c) Balance Test

The lift(s) shall run in both directions of travel with balanced loads in the car and instrument readings taken in order to determine that the percentage of contract load required to counterbalance the counterweight is as stated in the "Schedule of Technical Data".

(d) Levelling Test



The car levelling device shall be tested for accuracy at all floors with no load and full load in the lift car before and after the full load run tests. Levelling accuracy shall be within that stated in the "Schedule of Technical Data".

(e) Overload Test

A test shall be made to ensure that the equipment will safely lower and stop and hold the lift car when loaded up to 25 per cent in excess of the contract load. The lift will not be required to attain rated load performance under this overload condition.

(f) Performance Tests

Overall speed performance of the lift taking into consideration operation of the car and landing doors, shall be the best possible, compatible with the comfort of the passengers during periods of acceleration and deceleration and the limitations of the specified maximum car speeds and door speeds within the limits permitted by the Local Lift Authorities.

For comparison of performance, Tenderers shall state in the "Schedule of Technical Data" the time taken for the car to travel from one floor to the adjacent floor including acceleration from stop and deceleration to creep speed, levelling and closing and opening of the car and landing doors.

Timings on this sequence of operations will be taken with various car loadings up to full load in both directions of travel.

A check on car speeds, line voltage and line current shall be made in both directions of travel with varying loads up to full load, being placed in the lift car.

Comprehensive series of tests will also be applied to the bank of lifts individually and collectively to ensure that the equipment meets all specified requirements in regard to automatic program selection, traffic timing and dispatching etc., under various load and traffic conditions. At the same times, tests shall be conducted on items of equipment, such as door timing and protective devices, load weight, car door protective devices, communication systems.

(g) Temperature Rise Test

At the discretion of the Superintendent, tests shall be made to ensure that the temperature rises of motors, motor generators and magnet coils conform with those submitted in the Schedule of Technical Data.

(h) Insulation Resistance Tests

At the discretion of the Superintendent, tests shall be made to ensure that wiring systems and equipment forming part of the lift installation comply with the Local Lift Authorities' regulations in regard to insulation resistance.

(i) Protective Equipment Tests

Tests shall be made to check the effective operation of circuit breakers, overload devices, reverse phase relays and similar protective equipment.

(j) Safety Device Switches

All switches operated by safety devices shall be tested for effective mechanical and electrical operation.

(k) Door Locks and Contacts

All door contacts, their circuitry and protective fuses, shall be checked and tested for effective operation.

(l) Static Balance Test

The lift car guide shoes shall be removed while the car is at the middle floor landing. The car static balance checked to ensure that the car is standing truly plum with negligible lateral loading of the guide shoes.



(m) Safety Gear Test

The overspeed governors shall be tested for mechanical and electrical tripping speeds and correct operation.

The lift car safety gear shall be engaged at maintenance speed and shall engage equally and hold the lift car stationary was rope slip is demonstrated at the traction sheave.

(n) Other Tests

Any other tests required by the Quality Assurance Manager, the Superintendent, or the Local Lift Inspectorate.

## 5.5. MAINTENANCE

The University has many lifts under maintenance and requires all new lifts to be as compatible and easily integrated with the existing lifts and lift maintenance contractor. To that end consideration must be given, and documentation must be provided, before accepting any new lift system that clearly identifies it as being easily and effectively maintained by the existing lift maintenance contractor.

### 5.4.1. MAINTAINABILITY

#### INDEPENDENT MAINTAINABILITY

All new lift equipment must be able to be fully and effectively repaired, serviced and maintained, in accordance with the requirements and recommendations of each designer, supplier, manufacturer and installer of the lift equipment (including as set out in the Operation and Maintenance Manuals required under the contract), by any qualified and competent lift maintenance contractor without the need to rely on or use devices, spare parts or intellectual property of a proprietary nature such as, but not limited to, tools, instruments, pass words, keys and cards, even if only required on very infrequent occasions. Without limiting the foregoing, the lift equipment will be deemed to be not compliant with this requirement if it is reasonably necessary for the University or its maintenance contractor to, at any time during the life of the lift equipment, to pay and/or to enter into contractual arrangements with, a designer, supplier, manufacturer or installer of the lift equipment, for access to or for the use of anything or any intellectual property in order to effectively repair, service or maintain the lift equipment.

#### SUPPORTED MAINTAINABILITY

The University will consider new lift equipment, which is not compliant with the independent maintainability requirement in Independent Maintainability above if:

All devices, spare parts and intellectual property required for independent maintainability will be provided to or made available to the University at, and as part of the requirements for, practical completion; and

No additional amount will be payable at any time to the contractor or any third party for the University or its contractors to receive or to have access to the relevant devices, spare parts or intellectual property. All Operation and Maintenance manuals are to include instructions on how to use or apply these tools, instruments, pass words, keys, cards, spare parts and intellectual property, etc.

### 5.4.2. INTEGRATION WITH EXISTING MAINTENANCE PROCEDURES

The following procedures shall be included into any new lift construction specification to assist the integration of any new lifts into the existing lift maintenance program.

Campus Services Facilities Section is to be involved in all new lift tender assessments. All documentation must be made available to the Section with at least one week prior notice of the assessment date.

Campus Services Facilities Section shall be involved in the commissioning of all new lift installations. At least 2 weeks prior notice is to be given to the Section of any commissioning of new lifts.

Prior to commissioning of any new lifts (at least 1 week) Campus Services are to be provided with at least one copy of the Operational and Maintenance Manuals for the particular lift.



Any lifts placed into Defects Liability Period must comply with the procedures for recording and reporting of the existing lifts that are in place for the University at the time of tender. It is the contractor's responsibility to ensure that the procedures being applied are current and the latest available.

#### **OPERATIONAL MAINTENANCE DURING THE DEFECTS LIABILITY PERIOD (DLP)**

During the DLP maintenance period the contractor shall provide qualified and experienced personnel to perform the maintenance required for safe and reliable operation, including the following:

Make service visits at intervals as specified for comprehensive maintenance, and at times agreed with the MUP, and carry out regular maintenance procedures, including running adjustments, lubrication and the like.

Promptly attend stoppages or unsatisfactory operation of equipment at any time of the day or night and restore the installation to proper working order. Before the start of the maintenance period, supply the contact telephone numbers of the persons to be called in emergencies.

Make good faults or damage caused by defects in the installation and replace defective parts or parts showing signs of undue wear.

Supply the necessary maintenance materials, including lubricants and cleaning materials;

Leave clean and tidy after each visit the areas and equipment in and on which maintenance work was performed.

Provide a log book with pages set up for operational maintenance records, neatly bound in durable vinyl or similar hard covers, permanently labelled with the project name and date of issue. Record the result of each service visit, including date and time of visit, work carried out, name of service operator and the like.

At the end of the DLP maintenance period, make a service visit attended by the MUP, test the safety and protective devices, demonstrate the satisfactory operation of the lift installation and certify in writing that it is in satisfactory working order and is operating correctly.

### **5.6. PREFERRED SUPPLIERS**

The following manufacturers are the preferred suppliers of VTS :

- Liftronic
- Kone
- Otis
- ThyssenKrupp
- Schindler Lifts Australia

Other alternative equivalent manufacturers can be considered subject to approval by MUP. Providing they can meet the following guidelines.

A competent, well-established, lift contractor with at least 15 years' local lift installation experience shall only install lifts.

The lifts must comply fully with all local rules, regulations, codes and practices as well as gain approval and certification from the local lift inspectorate prior to the lift being placed into service.

All lifts shall be, as a minimum, user friendly to people with disabilities and in compliance with the NCC and Disabilities (Access to Premises – Buildings) Standards 2010. Full compliance to the lift code AS 1735.12 will be applied as detailed in later clauses.

Consideration shall be given to lift power systems that are energy efficient and environmentally friendly. Any lift power system that can be proven to be more efficient or less power consuming and environmentally friendly shall have preference over a less efficient system.

Only non-proprietary lift equipment or lift equipment that has been available locally for at least 5 years in Australia, or lift equipment that has a ready supply of spare parts to local lift companies, other than the original manufacturer, may be used. Lift equipment shall mean all parts of the entire lift installation, in particular the controller and its various parts



A list of how many lifts of the same type and in particular with the same control system that have been installed over the past 5 years is required to be supplied by intended installers in order to be considered at the time of tender. The list is to show the address of the lift installations and if the original manufacturer or installer is now maintaining the lift. Preference shall be given to well established lift systems that have a proven track record of reliability and ease of maintenance.