Government of **Western Australia**
Department of **Housing and Works**

DHW Technical Guideline

TG007 Vertical transport systems

1. Purpose

This technical guide (TG) assists with the selection and specification of a lift service suitable for Department of Housing and Works (DHW) procured non-residential government buildings. These guidelines are intended to assist the project design team, including agency representatives, project managers, architects, and consultants to better understand DHW's requirements.

2. Background

All lifts marketed in Australia are pre-designed products manufactured on assembly lines in various countries, tailored to specific orders e.g. car size, type of control and fit out. These systems meet both International and Australian Standards and are approved by Worksafe. Manufacturers offer a range of products, spanning low usage, standard and heavy-duty options, with costs corresponding to the level of usage and duty.

While each manufacturer provides various products, the characteristics may differ between them in certain aspects. For example, car interior finishes, displays, and buttons etc.

A vertical transportation systems (VTS) consultant determines the characteristics of the required lift service based on traffic studies and user operational requirements for the specific project. Characteristics include number of lifts, rated load, speed, car dimensions, type of traffic control etc. The VTS consultant then documents the design and operational criteria for the required lifts.

3. Methodology

This TG and its associated Appendix are not intended to be used as a project lift specification nor for issue as a request for tender (RFT) document. The VTS consultant is responsible for the provision of the specific RFT lift services documentation, including all required technical criteria and specifications.

The Appendix sets out the minimum performance-based criteria required for a lift specification on DHW procured non-residential projects. The Appendix is to be read in conjunction with this TG, as this document provides guidance for the selection of a suitable lift service.

3.1. Drive Machine Arrangement

Lifts are classified according to the location of the drive machine.

- Machine roomless (MRL) lifts that do not require a separate machine room as the drive machine is placed at the top of the liftwell. They minimise the impact on the building design and are suitable for most projects.
- Machine room (LMR) lift that require a separate room on top of the liftwell for the drive machine. A LMR lift service would only be required where heavy duty lift capacity is required or at high speed, in combination with heavy lift capacity or very large car dimensions.

3.2. Location in the Building

Generally, lift equipment and components, including landing displays and button panels, are designed for use in protected locations that are not open to the weather or corrosive environments. The liftwell temperature must not exceed 40degree Celsius, therefore will require mechanical ventilation.

If the lift is proposed to be open to the weather, this needs to be clearly defined as specifications will differ.

3.3. Car Dimensions

There are minimum NCC requirements. However, DHW requires specific minimum dimensions as detailed below and in the Appendix.

3.3.1. Ceiling heights

While neither the NCC nor AS1735.12 comment on a specific ceiling height, a minimum ceiling height of 2400mm is required for DHW projects. The design team shall consider the intended lift usage, as an increased ceiling height may be required. Depending on the product and excluding lower cost products, most manufacturers offer standard height of 2400mm which can be increased or decreased in 100mm increments within a specified range. Any changes from 2400mm should be approved by DHW.

3.3.2. Car doors

DHW requires a minimum clear opening dimension of 1000mm. The design team should consider the building and accessible usage, as often a wider width of 1100mm may be more appropriate.

3.4. Car Interior Finishes, Displays and Control Devices

Manufacturers make allowance during the design process of their lift products for a maximum weight of car interior finishes. This allowance varies between manufacturers and between each manufacturer’s products. Typical values range from 250kg for lower cost products to 450kg and higher for other products.

The design team shall determine the required weight allowance based on the project’s requirements e.g. car rated load and whether the manufacturer’s standard finishes are acceptable or if custom finishes are required.

To comply with DHW tendering policy and enable fair competition while ensuring desired quality is provided, tenders for lifts must be specified by performance. While each manufacturer provides fixtures (car and landing display and control devices) for their various products, third party fixtures can be utilised where accepted by the manufacturer.

Where it is not possible to specify by performance, fixtures can be specified by example but must be in compliance with Government policy and briefing documents. Selection of fixtures shall be made by the VTS Consultant, in conjunction with the project team and project brief.

3.4.1. Access Control

Access control is often provided to lifts to restrict usage of the lift service to specific users. The following methods are typically employed:

- Restrict calling the lifts to a landing and opening of car doors to authorised users.
- Limit access to any specific building level or combination of levels to authorised users.
- A combination of both scenarios.

Access control can be implemented by an electronic system that uses card readers and swipe cards. Readers are mounted on each landing to restrict calling the lift and/or opening the doors, unless the user presents a valid card. Optionally a card reader can be mounted on the car control panel that can disable programmed floor level buttons. The access control system including card readers and swipe cards and programming of the required functionality shall be coordinated to interface with the lift control system documented.

Alternatively, key switches can be provided on each landing button panel and optionally on the car control panel in lieu of the card readers. Authorised users would be issued with a key rather than a swipe card. Key switches shall be included in the lift specification and provided by the lift contractor.

It is also possible to have a single standalone card reader or keyswitch that disables and enables all land and car control buttons. However, this method has limited capacity to restrict usage as when “turned on” any user on any level can call the lift and enter the car.

Access control is to be provided to lifts and the exact type will be determined by the project team and guided by this technical guideline, the project brief and the customer agency’s brief.

3.4.2. Car Emergency Communication

Each lift car shall have an emergency communication facility which autodials and connects to a 24hour manned station. This is typically the lift sub-contractor and post-Practical Completion, the lift maintenance contractor. The emergency communication device dials to the manned station via a “gateway device” that has two separate

Network Service Carrier inputs. Having two inputs provide redundancy in case one carrier is out of service.

The application to the Network Carriers and associated set up costs and payment of all ongoing monthly costs requires consideration. There are two methods:

- The lift contractor makes the applications and pays all fees and costs up to final completion.
- The client makes the applications and pays all fees and costs prior to placing the lift into service.

Unless otherwise advised, the lift contractor shall make the application and pay all fees and ongoing costs until end of the defect's liability period. After this period, the lift contractor is responsible for changing the name of account holder or alternatively swapping over of SIM cards if the Client chooses a different maintenance provider post-final completion.

3.5. Acceptable VTS Contractors

Lifts are products that consist of a complex arrangement and interconnection of separate electrical, mechanical, and electronic equipment and components. Consequently, the reliable operation of a lift service with minimum breakdowns and fault call backs, is dependent on three factors:

- Appropriate design and engineering of equipment and components by the manufacturer.
- Correct installation of the equipment and components by the lift sub-contractor.
- Appropriate programming and tuning of the completed lift installation by the lift sub-contractor's specialist lift tuner.

The VTS consultant will nominate the basic design and performance characteristics of the various equipment within the lift specification to which a competent manufacturer will have already designed their products. However, the correct installation of the equipment and programming and tuning of the lift will depend on the training and experience of the lift sub-contractor's installers and tuner. It is for this reason and particularly noting the complexity of installations that inclusion of a clause "Acceptable VTS Contractors" should be included in the lift specification with the intent of obtaining a reliable lift service.

Exceptions to this clause will only be considered with DHW approval.

3.6. Platform Lifts

Platform lifts are limited use products and would generally only be considered for installation in buildings where one or more of the following conditions apply:

- Adequate space is not available for installation of a typical EN81.20 goods passenger lift.
- Vertical rise will not exceed the rise specified in the tables.

- Anticipated usage will be low as the rated speed of the products is very low compared to EN81.20 lifts.
- Project budget costs prohibit the use of EN81.20 lifts.

The basic considerations for their usage are described in the following tables:

Table 1 - Low Rise Platform Lift (AS 1735 Part 14)

Applicable Standard	AS 1735 Part 14 low rise platforms for passengers
Maximum rise	Rise ≤ 1 metre
Application	Intended for intermittent passenger use with or without wheelchair.

Table 2 - Vertical Lifting Platform (AS 1735 Part 15)

Applicable Standard	AS 1735 Part 15 special lifts for the transport of persons and goods – vertical lift platforms intended for use by persons with impaired mobility
Maximum rise	In order to comply with the National Construction Code, the rise must not exceed: 4m for an enclosed platform or 2m for unenclosed platform.
Application	Intended for intermittent use by persons with or without wheelchair.

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DHW Technical Guideline

TG007 Vertical transport systems Appendix

Contents

1. VTS generally

1.1. Abbreviations

The following abbreviations may be used in this document:

AS	Australian Standards and incorporated regulations
AS/NZS	Australian & New Zealand standards and incorporated regulations
BMS	Building management system
COP	Car operating panel
DFES	Department of Fire and Emergency Services
DHW	Department of Housing and Works
DLP	Defects liability period
EWIS	Emergency warning and intercommunication speaker
EMC	Electromagnetic compatibility
ESD	Ecological sustainability design
LCD	Liquid crystal display
LMR	Lift machine room
MRL	Machine room less
NCC	National Construction Code
PC	Practical completion
RLMS	Remote lift monitoring system
SR	Superintendent’s Representative
VT	Vertical transportation
VTS	Vertical transport system
VVVF	Variable voltage variable frequency

1.2. Acceptable VTS contractors

The following companies are considered to have demonstrated appropriate experience and resources to undertake the lift services works and maintenance.

- Kone Elevators
- Otis Elevator Company
- Schindler Lifts Australia
- Elevator Australia
- Octagon BKG Lifts

1.3. Approvals and certification contractors

The VTS Contractor shall arrange and provide all approvals and certifications and in particular:

- Arrange and obtain all approvals for VTS equipment that are required by statuary authorities.
- Arrange for sufficient inspections by an independent certifier at various stages and at completion of each VTS equipment installation; the certifier shall not be the person or persons that install or installed the lift equipment.
- Provide a Safe to Operate certificate for each VTS equipment that describes the nominated VTS equipment, states the VTS equipment is safe to operate, and is dated and signed by the certifier.

Original documents evidencing approval by the independent certifier shall be submitted to the Main Contractor and copies included in the operating and maintenance manuals.

1.4. Defects liability

The VTS Contractor shall be responsible for repairs and rectification of defects that occur on the lifts from the date of PC and continuing for the DLP.

1.5. Guarantees

The VTS Contractor shall guarantee all VTS equipment is manufactured in accordance with this specification and is suitable unrestricted use for the specified design lifecycles at the specified characteristics and loads.

1.6. Interpretations

Approved (or similar expressions)	Approved by the SR in writing
To approval	Requires submission of fully descriptive details and/or drawings to the Main Contractor, so that the SR may give approval in writing.
Authority	All local governments, state and federal governing bodies and accepted utility and service providers

Building Owner	The owner of the building but not party to the contract between the Principal and the Main Contractor. Contact with the Building Owner is through the Principal's Representative only.
Compliant	To comply with all code, authority and statutory requirements
Customer Agency	The agency engaging the Department of Housing and Works. May be the Building Owner but not always.
Facility Manager	A person or practice/business that may be engaged by the Building Owner or the Building User to manage the facility. Contact with the Facility Manager is through the Principal's Representative only.
Install	Set out, erect, mount, align, fix, connect, adjust, test and commission and hand over in proper working order and shall also mean, unless stated clearly to the contrary, supply of the item(s).
Lead Consultant	A person or practice/business engaged by the Department of Housing and Works to provide specialist advice or services to a project. Typically performed by an architect. They will engage the VTS Consultant, all communications between the Principal and the VTS Consultant will be through the Lead Consultant.
Lift	A type of vertical transport system.
Lifts	The number of lift installations documented in this specification and any associated documents and shall have a singular meaning where a single lift is specified or documented.
Main Contractor	The person bound to execute the work under the construction contract.
Obtain	To gain and transmit information, approvals, decisions, clarifications and the like to the SR.
Principal	The Minister for Works.
Superintendent's Representative (SR)	The SR administers the construction contract between the Principal and the Main Contractor. Typically, the Lead Consultant / Architect. They will be responsible for reviewing samples, approving shop drawings, providing advice to the Main Contractor during construction and DLP. Any advice from the VTS Consultant will be through the SR and any communications between the Main Contractor and the Principal will be through the SR.
Proprietary	Items identifiable by the naming manufacturer, supplier, installer, trade name, brand name, reference number and catalogue.

Samples	Fixtures, prototypes, panels and like equipment that are required to be submitted for approval by the SR.
Vertical Transportation Systems (VTS) Consultant	VTS Consultant will be engaged by the Lead Consultant as a sub-consultant.
VTS Contractor	A person or practice/business engaged by the Main Contractor to provide specialist advice or services to a project as a sub contractor. all correspondence to the VTS Contractor will be through the Main Contractor.
VTS equipment or equipment	Any single equipment and component or the total of the individual equipment or components that comprise a complete and functional lift and shall have a plural meaning where more than one lift is specified or documented.

1.7. Materials

All materials shall be free from all defects and shall also comply with the relevant rules and regulations laid down by any statutory authority having jurisdiction over such work and shall conform to the requirements of insurance underwriter's codes.

1.8. Permits and fees

The VTS Contractor shall make application for all permits required by each relevant authority or statutory body and pay all associated fees.

1.9. Plant registration

The VTS Contractor is responsible for the registration of each VTS equipment with Worksafe and the payment of associated fees and costs. The application documentation for plant registration shall be submitted to Worksafe at least 30 days prior to the date for PC of the contract.

The VTS Contractor shall Include a critical path timeline in the VTS equipment construction program for the registration process that shows the following milestone dates for each VTS equipment:

- Completion of commissioning process including rectification of any defects.
- Preparation of the Safe to Operate certificate.
- The lodgement date for of the application.

The VTS Contractor shall request the Building Owner details for inclusion on the application from the Main Contractor and provide evidence to the Main Contractor of lodgement of the application with Worksafe and payment of the associated fees and costs.

Following lodgement of the application, the VTS Contractor shall liaise with the Main Contractor and request a copy of each registration certificate. Each certificate shall be enclosed in a rigid, protective frame and be mounted on the wall of the respective

machine room or other location as approved by Worksafe for the type of VTS equipment.

1.10. Practical completion

PC shall not be given until all the following works are completed and approved by the SR:

- VTS equipment is fully installed and fully adjusted.
- Identified defects are corrected.
- Certificates for each VTS equipment have been submitted including independent certification.
- Testing and commissioning have been completed for each VTS equipment and results submitted and approved.
- Operating and Maintenance Manuals and As Constructed drawings have been submitted, approved, and the required number of copies handed to the SR.
- Each VTS equipment is registered with Worksafe and the associated registration certificate is installed at the respective VTS equipment.

1.11. Program

The VTS Contractor shall provide a detailed construction program, showing when all items must be completed in order to meet the required completion dates. The program shall nominate all milestone and critical path dates for each VTS equipment and shall include, but are not limited to, the following:

- Approval of shop drawings.
- Manufacture and delivery periods.
- Completion date for required builder’s works.
- Installation period.
- Testing and commissioning.
- Timeline for registration of VTS equipment with Worksafe.
- PC date.

1.12. Protection and protective coverings

All VTS equipment shall be protected from damage during transport and installation.

Protect decorative metal finishes by coatings or protective wrapping. At PC, the surfaces shall be cleaned and if damaged, replaced or polished.

Stainless steel shall be finished with an approved sealant or polish to diminish finger marking.

The VTS Contractor shall be responsible for any loss or damage which may occur to VTS equipment provided by him for the contract work.

1.13. Quality assurance

The VTS Contractor shall plan and develop a quality assurance program which assures that all the VTS services work including management, design and technical responsibilities for quality are integrated and executed effectively in accordance with AS/NZS ISO 9001, Quality system for design development, production, installation and servicing.

1.14. Samples

Samples shall be submitted to the Main Contractor for approval by the SR. Samples shall be clearly marked with the manufacturer's name and catalogue number. Provide the following samples for each lift installation:

- Each type of key switch and each type of push button.
- Each type of wall, ceiling and floor material.
- Displays for landings and car operating panels.

1.15. Telecommunications service

1.15.1. Requirement

The VTS Contractor shall be responsible for the provision of a fully functional and operating telecommunications service to each required VTS equipment via one or more 'wireless gateway devices'. Each gateway device shall connect to two, separate network service carriers, in order to provide redundancy in the event one Carrier is not accessible for any reason.

The VTS Contractor shall make the applications and pay all fees and costs (including ongoing monthly fees, excess call and data costs) for each required network service carrier for the complete period from lodgement of registration application with Worksafe up to the end of the DLP.

Six weeks prior to end of the defect's liability period, the VTS Contractor shall notify the Main Contractor of the date that the responsibility for the provision of the telecommunication services including payment of associated costs will cease. During this period the Sub-Contractor is responsible for changing the name of account holder or alternatively swapping over of SIM cards if the Client chooses a different maintenance provider post-final completion.

1.15.2. Wireless gateway device

Provide and program a wireless gateway device for each VTS equipment that operates over any commercially available mobile 4G wireless network. The device shall include the following minimum features:

- Battery backup with minimum 4 hours talk time.
- Two independent wireless networks that self-monitor each other with automatic changeover in case of loss of service.

- Compatible with the VTS equipment emergency call device.
- SMS notification of battery faults and failure.
- Standalone operation.
- Compliant to self-test and reporting requirements of EN: 81-28.
- Pixel EM-4GE2 or a similar product equivalent in function, quality, compatibility, etc to the approval of the Superintendent's Representative
- And any other functionality required.

1.15.3. Wiring & socket outlets

Provide the required number of socket outlets installations and all wiring installations between the VTS equipment and each gateway device and determine the required placement of each device in order to achieve adequate wireless network service.

2. Specific requirements

2.1. Lift traffic study

The VTS solution i.e. number of lifts required to service the proposed building, car size, rated capacity, door size, speed and other performance parameters shall be determined by a competent person using a proprietary, simulation type traffic study analysis program such as Elevate (Peters Research) or a similar product equivalent in function, quality, compatibility, etc to the approval of the Superintendent's Representative

The performance criteria including 5-minute handling capacity and waiting time for all office areas of the proposed building shall meet the requirements of the Property Council guidelines appropriate to the agreed classification.

The performance criteria for areas of the building not referenced in the Property Council guidelines shall be taken from CIBSIE Guide D and appropriate to the proposed building use and function.

2.2. General specifications

The following tables provide a summary of the minimum required specifications of the VTS equipment. These tables do not fully describe the VTS equipment and they shall be read in conjunction with the complete document in order to obtain a complete description of the VTS equipment.

2.2.1. Lifts; passenger/goods

Basic description

Lift number	TBA
Class	Class A passenger/goods
Rated load	Min 1275 kg / 17 person
Rated speed	Min 1.0 mps
Car clear internal (W x D x H)	Min 1400 wide x 2000 deep x 2400 ceiling height*
Clear door size	Min 1000 wide x 2100 high, 2-piece centre-opening
Car entries	Appropriate to the building design
Landing entries	Appropriate to the building design
Disability access requirements	Comply with AS1735 Part 12

*For lifts required to accommodate stretchers, please refer to the NCC and the Australian Standards for the appropriate minimum size.

Car and landing finishes

Interior finishes shall be selected from the VTS Contractor's 'standard' range of finishes. Typical selections are listed below; however, these are subject to approval by the Lead Consultant/SR.

Weight allowance	450kg
Lighting design	LED fittings and lighting level to AS 1735.12.
Car floor	Hard wearing vinyl
Car ceiling	Textured stainless steel or laminate
Car front wall	Stainless steel
Car side wall	Textured stainless steel or laminate, with handrail
Car rear wall	Textured stainless steel or laminate
Car protective |blankets	1 set or blankets
Landing/car doors	Stainless steel
Landing door frames	Stainless steel, full depth, wrap around front wall
Top landing controller panel	Stainless steel
Car operating panel	Recessed, stainless steel

Alternatively, car interior finishes will be 'custom' designed and specified by the Lead Consultant.

Control, communication & security

Normal control	Appropriate to number of lifts and levels served.
Auxiliary controls	Fireman's service, independent service, inspection operation
Communication facility	Auto-dial, hands free, call received light
Remote lift monitoring	Appropriate to project requirements
Security	Appropriate to project requirements
Indication of travel direction	Provide to AS 1735 Part 12 to landings
Automatic audible information	Provide to AS 1735 Part 12 to each car

Drive system

Drive machine	Gearless, electric traction drive machine
Machine location	Liftwell or machine room as shown on the lift drawing
Speed control	Variable voltage, variable frequency
Regenerative energy feedback	Appropriate to levels served

Fire service fitout

Designated emergency lift	Appropriate to NCC compliance

WIP telephone	Appropriate to NCC compliance
Automatic fire service recall	Appropriate to fire engineering solution

Fixtures and fittings

Car operation panel displays	select from option listed in Clause D.5 Displays
Landing displays	select from option listed in Clause D.5 Displays
Car operating panels	Main car operating panel – side wall front entry Auxiliary car operating panel – side wall rear entry
Car & landing buttons	Round, illuminated surround (halo) and illuminated legend
Landing pushbutton panels	Recessed
Key switches	Fireman's service, independent service, car light, car fan.

Operational features

Energy saving	Shut down of car lights and fans when cars are idle.
Trapped passenger rescue	UPS back up and controls for automatic rescue of trapped passengers.
Seismic restraints	Required / not required
Liftwell temperature	Operate without loss of performance or reduced life cycle or loss of warranty with 40˚ continuous temperature in the liftwell.
Car guide assembly	Slipper or roller
Counterweight safety	Appropriate to building design

2.2.2. Lifts, additional requirements

Acoustics

The following noise levels shall be determined from the 5 second fast response Leq, except where noted as being maximum levels Lmax. The sound level measurement shall be taken at 1200mm above floor and minimum 1000mm from any wall. If the noise is tonal, adjustments in accordance with AS 2107 shall be made to the figures below.

INSIDE CAR (FAN ON)	
Car running at contract speed	50 dB(A)
During acceleration or Deceleration	60 dB(A)
During levelling with doors opening	60 dB(A)
Car passing adjacent stationary car	55 dB(A)

Car stationary	45 dB(A)
LIFT LANDING (FAN ON)	
Car Passing at contract speed	Leq 50 dB(A), one metre from door
Door opening or closing	L_{max} 60 dB(A)
OTHER	
Inside liftwell cars running	70 dB(A)

Door operation times

Door opening time	adjustable 1-10 sec, set to 1.5 sec
Door closing time	adjustable 1-10 sec, set to 2.5 sec
Door dwell time	adjustable 1.0 to 30.0 sec; set to 6 sec
Door dwell nudging time	adjustable between 20 to 180 sec
Non-interference door dwell time	initial 3 sec with subsequent set 1.0 to 1.5 sec.
Door nudging dwell time	adjustable 1 to 25 sec, set to 25 sec.

Design life

Car super structure	25 years
Landing and car door systems	20 years
Buttons and control devices	20 years
Interior finishes in lift cars	20 years.
Basic mechanical components and motors	25 years.
Starts per hour	240

Quality of ride criteria

The lifts shall be designed to operate without exceeding the incidence of call outs detailed in this specification, based on a usage pattern of 24 hours per day, 7 days per week, throughout the nominated life cycles listed below:

Maximum horizontal vibration front to back and side to side	10 milli-G peak to peak (1-10 Hz frequency range)
Maximum vertical vibration	15 milli-G peak to peak.
Acceleration/deceleration rate	1.0m/s/s adjustable
Jerk rate level	<2.0m/s3
Levelling accuracy	5mm
Running speed	2% of rated speed

2.2.3. Platform lift – low rise

The following tables provide a summary of various specific features of the VTS equipment. These tables do not fully describe the VTS equipment and they shall be read in conjunction with the complete VTS specification in order to obtain a complete description.

General description

Classification	Low rise platform lift
Drive machine type	Hydraulic or screw drive.
Manufacturer	To be completed by the VTS Consultant, and compliant with DHW Specification by Performance and Example policy
Model	To be completed by the VTS Consultant, and compliant with DHW Specification by Performance and Example policy
Rated capacity	340kg
Speed	Maximum 0.15mps, fixed speed
Travel	To be completed by the VTS Consultant

Controls and communication

Control devices	Constant pressure UP/DOWN buttons on platform. Automatic call buttons on landing. Devices on landing or car if travel =< 600. Devices on both landing and car if travel >= 600.
Emergency communication	Auto-dial telephone unit. Permanent mobile/cordless phone and alarm system connected to 24hr service.
Power failure	Battery back-up to lower the platform if not stopped at lower or upper level.

Platform

Clear platform dimensions	1100 wide x 1400 deep
Control station	Mounted on pedestal or fixed panel to non-access side.
Entries	Retractable 150 high ramp to lower entry.
Platform material and finish	Aluminum or stainless steel with non-slip finish.
Side panels (non-access sides)	Typical selections for consideration Polished stainless steel or aluminum frame. Glass or acrylic infill panel. Height of 900mm to max 1100mm
Sill clearance	Maximum 10mm at upper level.
Shear protection underneath platform	Retractable or concertina skirt.
Load notice	Prominent and visible location.

Landings

Upper level	Typical selections for consideration 900mm clear entry gate Manual or auto opening and auto closing. Polished stainless steel or aluminium frame. Glass or clear acrylic infill panel.

Control station locations	Typical selections for designer Gate frame / pedestal / wall mounted.

2.2.4. Platform lift – vertical lifting platform

The following tables provide a summary of various specific features of the VTS equipment. These tables do not fully describe the VTS equipment and they shall be read in conjunction with the complete VTS specification in order to obtain a complete description.

General description

Classification	Vertical lifting platform
Drive machine type	Screw drive
Manufacturer	To be completed by the VTS Consultant, and compliant with DHW Specification by Performance and Example policy
Model	To be completed by the VTS Consultant, and compliant with DHW Specification by Performance and Example policy
Model rated capacity	Designer to specify e.g. 400kg
Speed	Maximum 0.15mps, fixed speed
Travel	To be completed by the VTS Consultant

Controls and communication

Control devices	Momentary operation buttons on platform. Momentary operation buttons on landings.
Emergency communication	Auto-dial telephone unit. Emergency communication facility with battery backup and alarm system connected to 24hr service.
Monitoring, BMS points	To be completed by the VTS Consultant
Power failure	Battery back-up to lower the platform if not stopped at lower or upper level.

Liftwell enclosure

Construction	Typical selections for consideration Self-supporting, steel frame, glass/acrylic/solid panels White powder coat finish to metalwork.
Control stations	Recessed into enclosure door frames - non-hinge side.
Liftwell	Each wall shall be vertical, smooth and continuous. For travel =< 3m enclosure must extend to 1100 above floor to upper landing. For travel > 3m enclosure must extend to 2000 above floor to upper landing.
Landing doors	Typical selections for consideration Provide minimum 2000 high door to each landing. Power or manual operated. Polished stainless steel or anodized aluminum frames. Glass infill panels.

Platform

Clear platform dimensions	1100 wide x 1400 deep
Control station	Mounted on pedestal or fixed panel to non-access side
Platform material and finish	Typical selections for consideration Aluminum or stainless steel with non-slip finish.
Side panels	Polished stainless steel or aluminum frame. Glass or acrylic infill panel. Height of 900mm to max 1100mm powder coat finish.
Handrail	min 900mm – max 1100mm Handrail to at least one side
Protection	Open sides e.g. photocell, light rays etc.

2.3. Design and compliance

2.3.1. Authority compliance

The VTS Contractor shall be fully responsible for developing the design intent and performance outcomes of the VTS equipment to achieve design compliance and registration with the appropriate authority.

2.3.2. Considerations

The design of VTS equipment shall incorporate the following considerations:

- Energy efficiency
- Simplicity of design
- Accessibility of equipment
- Minimal frequency of maintenance.

2.3.3. Design approval

The VTS equipment must have current WorkSafe design approval for the intended duty and vertical travel.

2.3.4. Design; specific procedures

This document is generally a performance-based document and as such it depicts the intent and minimum performance outcomes. The VTS Contractor shall be fully responsible for the performance specification of the VTS equipment, in accordance with the intent of this document. The VTS Contractor is to:

- Attend meetings as required to co-ordinate and resolve building dimensioning for VTS equipment.
- Review the architectural and structural drawings and provide advice to the Main Contractor of any details on those drawings that would potentially affect the VTS equipment designs.

- Co-ordinate the VTS equipment designs with architectural, structural and other trade elements.
- Design and co-ordinate architectural finishes and fixtures with the Main Contractor.

The VTS Contractor shall design and co-ordinate the VTS equipment interface connections with other trades:

- Electrical – power supply and telephone.
- Mechanical – ventilation and BMS status, alarm and power supply operation.
- Security - access control and CCTV.
- Fire Services – fire detection and EWIS telephone and speaker.

2.4. Design particulars compliance

2.4.1. BMS interface

Where appropriate to the project, provide the following minimum status and alarm conditions for each VTS equipment to the mechanical services BMS typically via voltage free contacts.

- Lift running on normal service.
- Lift fault.
- Lift on fire service.
- Lift on exclusive use.

2.4.2. Seismic restraints

Restrain VTS equipment to resist horizontal and vertical seismic (earthquake) forces. Comply with the requirements of AS 1170 Part4 - 2007 and utilise the following coefficients as appropriate:

- Importance level
- Annual probability (ARI)
- Probability factor (kp)
- Hazard factor (Z)
- Design category
- Structural ductility factors
- Structural performance factors
- Sub soil class

2.4.3. Fire services

Where appropriate provide specific facility that will allow the lifts to interface into the building fire detection and alarm system and accept a fire alarm recall signal that automatically homes the lifts to a nominated floor. Where appropriate provide specific facility that will permit installation of a WIP telephone in each lift car and connection into the building EWIS system.

2.4.4. Generator operation

Where a standby generator will be installed in the building, all VTS equipment must be designed to operate correctly on that supply.

2.4.5. Landing door frames

Lift landing door frames shall consist of a box frame designed to achieve the nominated fire rating in conjunction with the landing doors, and a full depth architectural outer frame that overlaps the box frame. The VTS Contractor shall provide all work necessary to integrate the architectural frames with the box frames including, but not limited to, the following:

- Provide dimensioned and fully detailed shop drawings that clearly show the doors and frames, fixing methods and interface with the lift wells and associated wall finishes.
- Review the architectural landing wall finishes drawings and attend meetings and assist to resolve any interface conflicts with the landing wall finishes.

2.4.6. Landing wall finishes

Architectural finishes will be installed by building trades to lift landing walls. The VTS Contractor shall provide all work necessary for installing landing equipment i.e. display and button panels onto the finishes including, but limited to, the following:

- Review the architectural drawings and provide appropriate cable penetrations and access through the wall finishes.
- Provide recessed mounting boxes and arrange with the structural and finishing trades for backing supports, if required, for fixing landing equipment plates
- Coordinate the installation of recessed boxes and landing equipment with the finishing trades.
- Co-ordinate all work with the wall finishing trades.

2.4.7. Lift rated load & car interior finishes

The design of VTS equipment shall include for the rated load, interior finishes and fitout, and any other necessary allowance. The VTS Contractor shall advise the Main Contractor where the weight of car finishes and fitout to any particular lift exceeds the maximum limit, and the interior finishes will be revised to remain within that limit.

2.4.8. Mechanical strength of lift car

Each lift shall have sufficient mechanical strength for the rated carload plus interior fit out weight, proposed usage, and loading method as appropriate to the specified lift class. The design and manufacture of the car sling, frame and floor shall incorporate specific reinforcement to withstand continuous use including, but not limited to the following:

- General goods trolleys.

- Waste and plant trolleys.
- Hand operated electric trolleys – goods lift only.

Car and landing door sills must be heavy duty and specifically designed, manufactured and installed to withstand continuous traffic by trolleys with small diameter, solid or cushioned wheels. In addition, the car shall have sufficient mechanical strength to support 125% rated load without damage to the floor or structure.

2.4.9. Security services

Where appropriate, provide specific facilities that will permit installation of a CCTV camera in each lift and interface and connection of each lift into the building security system. The facilities shall allow installation of card reader in the main and auxiliary car operating panels and access control on car and landing buttons.

2.5. Shop drawings

Shop drawings for goods/passenger lifts shall include, but are not limited to, the parts of the work as listed below for each VTS equipment, and as documented elsewhere in the specification or requested by the SR.

- Lift switchboard, single line diagram showing circuit breaker ratings and details.
- Electrical details; running and starting current per lift and recommended circuit breaker size per lift.
- Heat loads in liftwells, machine rooms, pits and the like.
- Ventilation opening sizes for liftwells.
- Static and dynamic loads and reactions on the building structure.
- Locations and dimension for all ‘cast in’ or ‘built in’ inserts or fixings, or mounting brackets and surface.
- Landing door frames showing integration of box frames and full depth frames.
- Door sill details and fixing.
- Associated work for power supply and telephone services.
- Associated works for security and fire services works.
- Installation details for landing push button panels and displays, including recessed mounting boxes, mounting brackets or surfaces and coordination with wall finishes.
- Main and auxiliary car operating panels, fully dimensioned and showing all fit out including displays, pushbuttons, key switches, door buttons, emergency phone/alarm button, card reader provisions.
- Car interior finishes and fit out details including ceiling plan, floor plan, elevations and sections.

The shop drawing requirements for low rise platform lifts and vertical lifting platforms are included in the respective Sections of this document.

3. General technical

3.1. Acoustic/vibration treatment

VTS equipment installations shall incorporate specific acoustic and vibration treatment to minimise noise and vibration transfer from into adjoining rooms and areas. Machines shall be mounted on proprietary isolation mounts suitably sized to accommodate dead and dynamic loads. Vibration isolation shall be adequate to reduce vibration to adjoining areas to be ‘imperceptible’ on the Reiher Meister Scale of vibration.

3.2. Australian and other standards

VTS equipment design, manufacture, installation and testing shall comply with the latest editions of all relevant Australian or approved alternative Standards including, but not limited to, the following:

- AS/NZ 1939
- AS/NZ 3000:2000
- AS 1735 Lifts, escalators and moving walks – Part 1: General requirements.
- AS 1735 Lifts, escalators and moving walks - Part 12 Facilities for persons with disabilities.
- EN 81.20; Safety Rules for Construction of lifts – Lifts for transport of passengers and goods – Part 20: passenger and goods lifts.
- EN 81.50; Safety Rules for Construction of lifts – Examinations and tests – Part 50: design rules, calculations, examinations and tests of lift components.

3.3. Authorities & Regulations

The VTS equipment installations shall comply with the relevant requirements of all relevant authorities including, but not limited to:

- Office of Energy
- Department of Fire and Emergency Services
- WorkSafe
- Australian Communications Media Authority
- Work Health and Safety Regulations
- NCC

3.4. Controllers

3.4.1. General

Controllers shall be complete with all equipment, controls and fit out for the efficient operation of VTS equipment, and include the following features:

- Totally enclosed cubicle, designed to exclude dust, water and moisture and to prevent accidental contact with live components.

- All bolts and screws shall be fitted with washers, nuts and locknuts or spring washers.
- All items of equipment shall be clearly labelled in an approved manner with reference number or letter.
- Equipment shall be mounted so as to provide clear access to all parts and connections.

3.4.2. Equipment and wiring

- Contain all necessary processor and electronic boards, contactors, relays, transformers and protective devices.
- The main isolator shall be suitable for termination of the supply submains cables.
- Surge protection installed on incoming power supply circuit.
- Components shall be rated for the required duty with provision for short term overload situations.
- All wiring neatly run and changes of direction with due regard to cable bending radius.
- Adequate ventilation.
- Thermal operated protective devices not subject to heat emitted from other components.

3.5. Distortion and harmonics

Incorporate passive or active harmonic filters where equipment produces harmonic distortion in excess of the AS61000- 3-2.3-4,3-6 limits. Specifically include filter systems for harmonic distortion, flicker, line notching and noise.

Eliminate inductive coupling between lift control and power wiring by use of screened power cables, separation and enclosures.

Total harmonic distortion at the point of common coupling, i.e. VTS equipment switchboards, shall not exceed 3%. Provide written guarantee to the Main Contractor that the lift equipment will not interfere with any building equipment that is connected to the buildings electrical distribution system.

3.6. EMC/radio frequency interference

VTS equipment installed must comply with EMC limits set by Australian Standards and other regulatory authorities for electromagnetic compatibility.

The equipment including inverters and power drive shall not interfere with the other electrical facilities installed in the building, including, but not limited to, data and communications, audio-visual systems, television and laboratory equipment.

3.7. Keys mechanical

The VTS Contractor shall handover to the Main Contractor three complete sets of operation and other keys for each VTS equipment at PC. Each set of keys shall be secured to a binder, and each key individually identified for function.

The key combination for each specific function on the VTS equipment shall be different. However, where more than one similar VTS equipment is installed, the combination shall be the same for corresponding functions in each VTS equipment.

3.8. Maintainability

VTS equipment shall be manufactured and installed so that routine maintenance and replacement of all components can be carried out safely and minimum disruption to the VTS equipment operations or building operations.

3.9. Noise & vibration

The acceptable limits for motors, machines, converters and the like shall be as follows:

- Noise: to AS 2107 Table 1.
- Vibration: to AS 2670.2 Fatigue-decreased proficiency boundary.

3.10. Power supply

Each VTS equipment shall function correctly on the site power supply, nominally 400V/230V 50 Hz to the supply authority tolerances of +10%/-6%, and all equipment supplied shall be suitable for this supply.

3.11. Switchboards

3.11.1. General

Switchboards and switchgear shall be capable of withstanding the power supply fault levels at the switchboard location, including overloads caused by lift equipment, without causing any resultant mechanical or electrical damage to busbars, wiring or equipment associated with the switchboard.

Main switches shall be provided with suitable terminations to accept the incoming submains conductor size.

Circuit breakers shall be fitted with over current protection in all phases and shall be designed and rated to protect the associated cabling and equipment motor. Provide combined over current/RCD circuit breakers to car and liftwell lighting circuits and socket outlet circuits.

All switchboard equipment shall be labelled, and labels shall be engraved black lettering on white background, fixed with chrome-headed escutcheon pins or screws.

3.11.2. Circuit breakers

Circuit breakers shall be provided for lift equipment including:

- Controller/ power drive.

- Liftwell lighting and socket outlet circuits (separate circuit for each).
- Car lighting and socket outlet circuits (separate circuit for each).
- Car exhaust fan circuit.
- Air conditioning equipment and over temperature alarm systems.
- Other circuits as required.

3.12. Wiring generally

All wiring shall be carried out in a neat and tidy manner, appropriate to the type of VTS equipment. Generally, enclose wiring in ducts or fixed to cable tray and protected from damage, and comply with the following:

- Separate enclosure/tray for power and other wiring.
- Enclosures and tray run in horizontal and vertical planes only.
- Rigid construction and securely fixed and supported over their entire length.
- Cleaned, free of all dirt and debris and sealed.

4. Lifts; passenger and goods

4.1. Car fitout and equipment

4.1.1. Car operating panels

General

Car operating panels (COP) panels shall be stainless steel complete with concealed fixings and hinged supports and manufactured to suit the nominated fit out including displays.

The lift car capacity, identification number and other statutory notices shall be engraved and colour filled to approval in the upper section of the main car operating panel.

Equipment and cover plates shall be engraved and colour filled to approval. All fit out, including buttons, key switches, displays shall be of the flush panel type.

Main car operating panel

Provide the following fit out on the main car operating panel:

- Lift information display.
- Alarm/emergency communication push button.
- Destination push buttons for landings served.
- Door open and door close buttons.
- Independent service key switch, ventilation fan key switch, fireman’s service key switch, car light key switch.
- Socket outlet.
- Space and mounting provision for installation of a card reader for access control.

Auxiliary operating panel

Provide the following fit out on the auxiliary car operating panel:

- Lift information display.
- Alarm/emergency communication push button.
- Destination push buttons for landings served.
- Door open and door close buttons.
- Space and mounting provision for installation of a card reader for access control.
- Where required, incorporate a cabinet for WIP phone.

4.1.2. Emergency communications facility

Combined alarm/emergency communication facility connected to a permanently manned monitoring station with the following features.

- Single button, auto-dial call operation.
- Hands free once call button is pressed.
- Call back from monitoring station.
- Light to signal that the call has been received.
- Recessed mounting.

4.1.3. Exhaust fan

Provide a car exhaust fan on the car enclosure complete with sound isolated supports. Provide controls to automatically switch ‘off’ the car fan, after an adjustable timed period, 0 - 90 minutes, when the last registered car destination call has been served and no further landing car calls have been registered. The fan shall automatically switch ‘on’ when a further landing car call is registered.

4.1.4. Lighting

Car lighting to all dedicated hospital patient lifts or other lifts that may be used intermittently for patient transfer shall have colour corrected lamps appropriate for cyanosis observation.

Provide controls to automatically switch ‘off’ the car lights, after an adjustable timed period, 0 – 90 minutes, when the last registered car destination has been served and no further landing car calls have been registered. The lights shall automatically switch ‘on’ when a further landing car call is registered.

Provide single point, emergency lighting light fittings, to the lift car interior and to the car top. The emergency lighting fittings shall comply with requirement of AS 2293 and shall have automatic test circuits and controls.

4.1.5. Socket outlet

Provide a single phase 10A socket outlet complete with integral 30mA RCD device and test button in the main car operating panel of each lift. The outlet shall have a stainless-steel fascia plate and concealed fixing screws.

4.2. Car interior finishes

Interior fitout and finishes to the lift cars may be specified in the technical schedules or VTS drawings or selected from the VTS Contractor’s schedule of standard fitout and finishes.

Prior to ordering the lifts or preparation of shop drawings, the VTS Contractor shall liaise with the Main Contractor and confirm the extent of fitout and finishes. The VTS Contractor shall include for the following:

- Where provided, review the architectural interior car fitout drawings for compliance with AS 1735 Parts 2 & 12.

- Co-ordination and attendance at meetings to assist with the design and achieve design compliance.
- All required backing materials and fitout.
- Ceiling including lighting and access panels.
- Walls including handrails and wall protection.
- Flooring including sub floor and final covering.
- Final clean and polish prior to handover.

Provide support hooks for each lift car and the nominated set of protective blankets for protection of lift car wall finishes when the cars are being used to transport goods; allow a separate blanket for each wall.

Use qualified, competent fitout trades, with previous experience in the design, production of shop drawings and installation of interior finishes to lift cars, for the performance of this work.

4.3. Control gallery

4.3.1. Traffic control system

Each lift shall be provided with a fully electronic solid- state controller incorporating computer/microprocessor-based traffic control system, inclusive of motion controls, door controls floor finding and levelling and other specified controls and operate on the nominated traffic control and other auxiliary control.

In a bank of two or more lifts, any controller shall have capacity to function as the master controller, and in the event the nominated master controller fails, then an alternative controller shall take over without loss of service to the building. The controller (or designated master controller) shall register and store all calls from the cars and landings immediately that they are made and respond to the calls in the correct sequence according to the traffic control system.

The controller, including motion controls, door controls floor finding and levelling and other specified controls shall be of a tried and proven type, capable of being demonstrated on an existing lift installation. Controllers shall have facilities for on- site testing for system analysis.

4.3.2. Floor finding & levelling

Floor finding and levelling shall be achieved by means of high- resolution measurement systems that positively and correctly communicate the car position at all times to the controller. The measurement system shall correct for both under-travel and over-travel and include re-levelling to compensate for rope stretch and contraction.

4.3.3. Load weighting

Load weighting shall be provided to each lift and shall be used for car overload indication and in conjunction with the lift traffic control system algorithms such as:

- Starting torque.
- Car overload indication.
- Peak traffic determination.
- Car dispatching.
- Landing call by-pass.

Load weighting shall be fitted to the car platform or hoist ropes and shall be accurate to 25kg. If the actual measured car load exceeds the rated car load by 10%, the hoist system shall not start, doors shall remain open, a continuous buzzer shall sound and the display shall indicate ‘CAR OVERLOADED’.

4.3.4. Parking

When the lifts are on ‘normal’ control, they shall park with the doors closed at a nominated floor.

4.4. Control, operation

Each lift shall be arranged to operate under the various functional controls included in this document, and clarified hereunder, exclusive of any other statutory or AS 1735 control requirements.

4.4.1. Access control

Electronic security system

Interface landing car call buttons to the building electronic security system to permit controlled calling of the lift and access to any particular or all levels of the building. The access control system shall provide the following functionality:

- Disables the landing car call buttons on any or each building level, unless a valid swipe card is presented to a landing card reader on a particular level and makes the associated buttons active for a preset time period.
- Allows unrestricted travel to any building level via the car destination buttons in the lift car.

Additionally, and if specified, the electronic security system disables any or all car destination buttons in the lift car unless a valid swipe card is presented to a card reader in the lift car and makes the button/s active for a preset time period.

Interface between the lift controller and security system shall generally be low level voltage free contacts. Final system program settings shall be verified on site prior to commissioning the lift/s.

Landing keyswitch

Provide a keyswitch on the landing button panel on each building level. The keyswitch shall be two position ON / OFF with the key withdrawable only in the OFF position.

- In the ON position, the lift call buttons shall be made active and allow calling the lift to the floor level.
- In the OFF position, the lift call buttons shall be made inactive and prevent calling the lift and/or opening the landing/car doors.

4.4.2. Automatic control

Provide automatic control on single lift installations that serve two stops.

- Microprocessor based control system.
- Single lift call button on each landing.
- Car destination button for each floor.

4.4.3. Directional collective control

Provide directional, collective control on single lift installations with three or more stops.

- Microprocessor based control system.
- Single button on terminal floors, and UP and DOWN buttons on intermediate floors.
- Car destination button for each floor

The car shall respond only to ‘car’ and ‘up’ calls when ascending and only to ‘car’ and ‘down’ calls when descending, except where such ‘up’ and ‘down’ call is the highest or lowest call registered in which case the lift shall ascend in response to a ‘down’ call and descend in response to an ‘up’ call.

When the car is idle and landing calls are registered both above and below its position, the car shall proceed towards the landing corresponding to the first call registered. Calls registered for the landings for the opposite direction of travel shall not be answered until the car has answered the furthest call (landing or car) in the direction in which it has started by the first call registered.

4.4.4. Fireman’s service

Key switch in the landing button plate on the nominated exit level, and key switch in the main car operating panel, to each lift installation in accordance with the National Construction Code (NCC).

4.4.5. Fire service recall

Where required by the fire engineering solution for the building, upon receipt of a fire alarm signal from the building fire panel, the lifts will automatically return to the nominated floor, fully open the car and landing doors and allow passengers to exit the

lift. The lift shall not return to normal service until the fire alarm is cancelled at the fire panel. Fire service controls shall remain active.

4.4.6. Group traffic control

General

Software based, group traffic control system of the run to demand, real time type, that evaluates traffic demand at any one instant and to allocate a car at the earliest possible moment. The system shall guarantee that the best call allocation is established to ensure the minimum waiting time at the lift landings. The system shall provide efficient flight profiles that can be altered by reprogramming after handover of the installation to suit the building operation. The traffic control system shall incorporate the following sub-systems:

4.4.7. Independent service

Independent service control shall be initiated via key-switch operation in the car which shall provide the following outcome:

- Remove the lift from the normal control, whereby it does not respond to further landing calls and cancels current car button registrations.
- Allow car button registration to be made in the normal manner, and with respect to further travel of the lift, shall set the direction of travel.
- Park the lift with doors open at the destination landing.
- Illuminate the words ‘exclusive service use’ on each landing display.
- Upon completion of the independent service operation, the lift shall return to normal service via a further key- switch operation.

4.4.8. Inspection service

UP/DOWN operating buttons on the top of the lift car; lift speed on inspection service shall be rated speed of the lift or limited to 1.0mps to whichever is the lesser. The operating buttons shall be locked off by keyswitch also installed on the car top.

4.4.9. Power supply operation

Each individual lift and bank of lifts must operate correctly on both ‘normal’ power supply obtained from the Supply Authority network and the building ‘generator’ power supply, and also return to service following interruptions to Supply Authority supply.

The lift control systems must operate without loss of performance or control functionality under each of these two power supply modes and must operate under all transient supply conditions that occur during switching between power supply modes. Lift controllers and control systems must retain all operating data during transition between

power supply modes and under all transient supply conditions that occur during transition.

During a ‘homing’ process each lift shall show a message on the car landing displays to advise passengers that the lifts are returning to ground or the nominated floor. Once the lift has ‘homed’ at the nominated floor, the car and landing displays shall show the following message ‘lift is out of services due to loss of supply’. When all lifts have ‘homed’ then the nominated lift/lifts shall return to service.

In the case that the lift or lifts must make a re-calibration run after a power supply interruption, then during such run, each lift shall display a message on the car and landing displays to that effect. Once the lift is re -calibrated, the car and landing displays shall advise by display message that the lift or lifts are back in service.

4.5. Displays

4.5.1. Displays generally

Provide displays to each lift in the car and on landings. The displays shall provide full lift information and additional information as described in the following sub-sections.

Recess displays into landing walls, centred above the lift doors and recessed into car operating panels.

Where appropriate, protect all displays with vandal resistant, clear, non-clouding, and easily replaceable overlay. The complete installation of display plus overlay shall present a flush finish to the mounting surface.

Design and manufacture all recessed mounting boxes or other mounting fixtures or provisions for installation of displays on landing walls and incorporate facilities for adjustment to suit landing wall finishes at each lift location.

4.5.2. Type 1 displays

- Portrait or landscape orientation, 24 Bit colour.
- Low power consumption and ‘auto sleep’ function.
- Up/down direction arrow with floor position indication.
- User defined background image, font and colour options.
- Fully customizable, lift status and control mode text messages; minimum 10 messages.
- Date and time – digital display.
- Tenant logo and information
- Image slideshow, scheduled event updates and LAN connection.
- Windows based software.

- PIXEL – OPAL 15inch., or a similar product equivalent in function, quality, compatibility, etc to the approval of the Superintendent's Representative

4.5.3. Type 2 displays

- 112.5mm x 84.5mm screen, Portrait or Landscape orientation, 16 Bit colour.
- Low power consumption and 'auto sleep' function.
- Up/Down direction arrow with floor position indication.
- User defined background image, font and colour options.
- Fully customizable, lift status and control mode text messages; minimum 10 messages.
- Date and time synchronisation – digital display.
- Tenant logo and information.
- Windows based software.
- PIXEL PI-56s or a similar product equivalent in function, quality, compatibility, etc to the approval of the Superintendent's Representative

4.5.4. Type 3 displays

- 55mm x 97mm screen Portrait or Landscape orientation, 16 Bit colour.
- Low power consumption and 'auto sleep' function.
- Up/Down direction arrow with floor position indication.
- User defined background image, font and colour options.
- Fully customizable, lift status and control mode text messages; minimum 10 messages.
- Windows based software
- PIXEL PI-43s or a similar product equivalent in function, quality, compatibility, etc to the approval of the Superintendent's Representative.

4.5.5. Type 4 displays

- 50mm block height.
- Lift position and scrolling direction arrows.
- Chimes on landings and oral message annunciation in cars, to AS 1735.12.
- Scrolling text messages - lift status and service mode.
- Digital dot matrix

4.5.6. Lift information

Car information

- The displays shall show the operational control of the lift and include the following:

- The direction in which the car will leave a floor, provided it stops at that floor, via illuminated arrow.
- The direction the car is travelling when it is not stopped at a floor via illuminated arrow.
- The floor at which the car is currently loading/unloading via illuminated number.
- The floor the car is passing or at which it is stopping, via illuminated number.

Control mode

The displays shall show the control mode of the lift in full text messages; the words ‘lift out of service’ or OOS are not acceptable. Typical messages shall include:

- Lift on normal service.
- Lift on exclusive service.
- Lift on fireman Service.
- Lift out of service for maintenance.
- Lift shutdown on fault.

4.5.7. Networking, local

Car and landing displays for each lift on the site shall be networked so that all displays can be simultaneously addressed and updated.

4.6. Doors

4.6.1. Control and operation

Opening & closing

The door control system shall be automatic and incorporate pre-opening. It shall open the doors automatically as the lift is levelling to a landing, and close again automatically after a predetermined period of time. The door control system shall allow for pre-opening to be disabled or turned off.

Car door button operation

Operation of a door close button in the lift car shall cause the doors to close, provided the door passenger protection devices indicate the entrance is clear.

Operation of a door open button in the lift car while the lift is standing at the landing shall cause the doors to re-open if closed or closing, and remain open until the button is released or until nudging operation commences.

Passenger protection device

Provide 3D infra-red sources between the car and lobby doors to control door closing. The doors shall not close whilst the entrance is obstructed and shall retract if obstructed after closing has commenced. The doors shall then re-close after a pre-set delay.

Should the doors be delayed in closing and locking for a preset period of time due to operation of passenger protection device, then the scanning device shall become inoperative, and the doors shall close at a greatly reduced speed with the buzzer sounding to nudge the passenger out of the doorway. The door open button in the car control panel(s) shall remain operative to re-open the doors.

Door open alarm

If the door open button has exceeded the pre-set time, then the door open button shall become inoperative, and the doors shall close at a greatly reduced speed with the available buzzer sounding. The passenger protective device shall remain operative to re-open the doors.

Door timing definitions

Door dwell time – car call means the amount of time the car/landing doors remain stationary in the fully open position after responding to a car call.

Door dwell time – landing call means the amount of time the car/landing doors remain stationary in the fully open position after responding to a landing call.

Non-interference door dwell time means the amount of time the car/landing doors remain stationary in the fully open position after the protection beams are interrupted and restored by transferring passengers. When the beams are restored, and if again interrupted after the initial time period, subsequent open times shall have a reduced value.

Door nudging dwell time means the amount of time that elapses before car/landing doors begin to close at reduced speed and torque after the protection beams have been obstructed.

4.6.2. Hardware

Each landing doorway assembly shall have a one- hour fire rating; provide a copy of a certificate from a recognised testing authority certifying this rating.

Surfaces shall be perfectly flat and free from scratches or dents. All door frames shall be machined, bent and folded and joints shall be welded, ground smooth and re-linished. The VTS Contractor shall be responsible for protecting door surfaces against damage until PC.

Sill clearance between car and landing doors shall be less than the width or diameter of a walking stick and in any case shall not exceed 20mm.

Provide permanent floor number to the rear of each set of landing doors.

4.6.3. Operators

Door operators shall have adjustable speed and torque. The drive system shall be variable voltage, variable frequency which shall match speed and torque to the load imposed by the operation cycles.

4.7. Facilities for persons with disabilities

4.7.1. Requirement

Each lift installation shall be designed to comply with AS1735 Part 12, and shall include, but not be limited to, the following minimum facilities:

- Where specified, an auxiliary car operating panel.
- Full length hand rail on each car side wall
- Passenger doorway protection.
- Design of car and landing buttons.
- Braille descriptions on car buttons.
- Automatic audible announcements in lift car in the English language.
- Audible chimes and direction of travel on each landing

4.7.2. Automatic audible information

Provide automatic audible information in each lift car, irrespective of the number of floors served by the lift, in accordance with AS 1735 Part 12.

4.7.3. Indication of travel direction

Provide visual and audible indication of travel direction to each lift landing, irrespective of the number of lifts in the bank, in accordance with AS 1735 Part 12.

4.8. Hoist drive system

4.8.1. General

The hoist drive shall be a gearless, permanent magnet, synchronous A.C. electric motor coupled to the drive sheave and speed control inverter that provide variable voltage/variable frequency control of acceleration, deceleration, and full speed running to pre-set patterns.

The electrical power drive system shall incorporate the following design performance and operating features:

- High power factor, minimum of 0.95, under all load conditions.
- Minimise power consumption when the car is ‘idle’ or parked at a level.
- Self-diagnostics built into the system.
- Speed monitored by a speed measuring and correcting pulse generator in a closed loop configuration.

- Control circuits designed to provide for automatic restarting of the lift on resumption of power supply after power failure and power supply change over sequences.
- Safely lower, stop and hold 125% of rated load.

4.8.2. Hoist drive inverter

The inverter shall be a minimum 6 pulse design and shall be electrically coupled to the mains power supply by a suitable filter network and/or isolation transformer that will prevent feedback from harmonics, noise and other disturbances into the power supply network, to the satisfaction of the Superintendent and in accordance with Australian Standards and local regulations.

The inverter shall incorporate regeneration and feedback of energy into the power supply during conditions of overhauling and stopping.

A ripple filter shall be provided on the inverter output to eliminate harmonic distortion to the motor and to ensure long life of the motor.

4.8.3. Motion control

The hoist drive and braking control systems shall incorporate the following performance and operating features:

- Close speed control and accurate floor stops shall be maintained under all conditions of car loading.
- Maintain ± 2% of contract speed under all load conditions.
- Smooth automatic step-less acceleration, deceleration, and levelling of the lift in both directions of travel.
- Cars shall be brought to smooth and accurate stop at the desired floor level under power from the hoisting machine.
- Match starting torque to load in order to prevent roll-back on energising the bake.
- Under normal stopping reduce the speed to zero before applying the mechanical brake.
- Under emergency conditions stop the lift without undue harshness.
- Prevent abrupt starting sequences.
- Running speed monitored by a speed measuring and correcting pulse generator in a closed loop configuration.

4.8.4. Protection

Provide protection devices and circuits for detection of abnormal circuit conditions including overloads and short circuits, over and under voltage, phase failure and reversal.

4.9. Liftwell equipment generally

4.9.1. Counterweight

Balance the counterweight-car combination to achieve the most efficient travel characteristics.

4.9.2. Flushing and screening

Provide all required flushing and screening to every liftwell including in pits, at landings and other locations. Include screening between adjacent lifts in common liftwells. All flushing and screening shall be permanently installed and remain in place at completion of the work.

4.9.3. Guide rails

Guide rails shall be Tee shaped steel sections, with tongue and groove flush joints, and fixed with connecting splice plates; all joints shall be without gaps. Install guide rails plumb and align vertically with a tolerance of 0.5mm in 20m.

All irregularities shall be filed to a smooth surface. Particular attention shall be made to alignment accuracy of fixing and trueness of the guide rails.

4.9.4. Lighting & power

Provide general purpose lighting and power in accordance with AS 1735.

4.9.5. Pit access ladder & sump cover

Supply and install a pit access ladder and removable cover for the sump in each lift pit. All metalworks shall be aluminium or galvanised steel.

4.9.6. Static balancing

Static balance each lift car so that equal pressure is applied to both guide rails.

4.9.7. Trailing cables

- Provide trailing cables of adequate design and number to meet all lift requirements. Provide additional trailing cables to each lift car for the following associated services as required:
- CCTV camera.
- Access control to car buttons.
- Card reader in each car operating panel.
- WIP telephone.

4.10. Pushbuttons

4.10.1. General requirements

Landing and car push buttons shall be identical across all lift installations and comply with the following requirements:

- Touch type operation with momentary audible tone acknowledgement.
- Illuminate when operated and remain so until car stops at associated floor level.
- 15mm high tactile legend with Braille dots below the legend.
- Vandal resistant, opal polycarbonate or optional stainless steel pressels.
- Legend and halo illumination.
- Single or dual colour LED illumination, optional illumination colours – red, white and blue.
- Round or optional square pressel.
- Positive contrast to the surrounding surface and the legend shall contrast with the button pressel.
- Dewhurst or a similar product equivalent in function, quality, compatibility, etc to the approval of the Superintendent's Representative

4.10.2. Landing push button panels

Push button panels shall be stainless steel flush plate with concealed screw fixings and smooth levelled edges; mount flush plates over recessed metal boxes in the lift well wall. Flush plates shall be engraved with a warning against the use of lifts in a fire in accordance with the NCC.

4.11. Trapped passenger rescue

Provide a specific control system to each lift, inclusive of UPS backup, arranged such that upon loss of normal power supply and without attendance by a service person:

- If the lift is stopped level at any landing, and the doors are closing or closed, then the doors shall automatically e-open and allow passengers to exit the lift.
- If the car is not stopped level at a landing, the lift shall automatically descend to the next lowest landing, fully open the car and landing doors and allow passengers to exit the lift.

The car and landing doors shall automatically re-close after the exit of passengers and the door open button remain active. The lifts shall automatically return to normal service upon re-connection of normal power supply.

5. Platform lift – low rise

5.1. Arrangement

The platform lift shall be a low-rise platform to AS 1735 Part 14, pre-engineered and manufactured and as further described in the technical schedules. The lift shall generally comprise but is not limited to the major component items listed below:

- Base frame and anti-slip platform.
- Side panels with handrails.
- Power unit for raising and lowering the platform.
- Structural components treated with anti-rust undercoat and finish as specified.

5.2. Associated works details

The following clauses detail the works that will be performed by other trades that are associated with the platform lift installations. The VTS Contractor shall liaise with the various trades performing the associated works and provide details of the specific works that are necessary for the platform lift that is to be installed.

5.2.1. Electrical services works

- Provide a power supply cable and terminate on the socket outlet adjacent the platform lift.
- Provide a 25mm circular conduit complete with draw wire from each landing call station to the platform lift controller.
- Test and commission the power supply to the platform lift.

5.2.2. Communications cabling services

- Supply and install a site communications cable to the platform for the emergency communication system.
- Allow 10 metres spare cable for connection to the platform controller.

5.2.3. Hydraulic services works

- Provide a pipe connection from a sump in the pit floor to a suitable location to facilitate removal of water from the pit.

5.2.4. Structural services works

- Where specified, construct a pit for drainage to the VTS Contractors required tolerances.

5.3. Australian and other standards

All design, manufacture, installation and maintenance and materials for the work shall be carried out in compliance with the latest editions of all relevant Australian or approved alternative standards including but not limited to the following:

- AS/NZ 3000.
- AS 1735 Lifts, escalators and moving walks - Part 12 Facilities for persons with disabilities.
- AS 1735 Part 14 Low rise platforms for passengers

5.4. Shop drawings details

Shop drawings shall fully detail the installation requirements for the platform lift and include but not be limited to the following details:

- Plan and elevations that are fully dimensioned and that clearly show physical spatial requirements.
- Structural fixing details and locations.
- Static and dynamic loads and reactions on the building structure
- Electrical load and power supply and cabling requirements.
- Finishes and fitout details.
- Control station details e.g. manufacturer, finishes, button type etc.
- Electrical details; running and starting current and recommended circuit breaker size.

5.5. Testing and commissioning

Provide all testing and commissioning to prove that the platform lift is correctly installed and safe to operate including but not be limited to the following.

- Control devices operate correctly for raising, lowering and calling the platform.
- Emergency communication system operates correctly.
- Cabling tested and safe to energise.
- Verify the rating and operation of the circuit protective devices.
- The platform supports the maximum rated load without deformation.

6. Platform lift – vertical lifting platform

6.1. Arrangement

The platform lift shall be a vertical lifting platform to AS 1735 Part 15, pre-engineered and manufactured and as further described in the technical schedules. The lift shall generally comprise but is not limited to the major component items listed below.

- Base frame and platform.
- Platform unenclosed or enclosed in accordance with As1735 Part 15.
- Enclosed liftwell with landing doors.
- Power unit for raising and lowering the platform.
- Structural components treated with anti-rust undercoat and finish as specified.

6.2. Associated works details

The following Clauses detail the works that will be performed by other trades that are associated with the platform lift installations. The VTS Contractor shall liaise with the various trades performing the associated works and provide details of the specific works that are necessary for the platform lift that is to be installed.

6.2.1. Electrical services works

- Provide a power supply cable and terminate on an isolator adjacent the liftwell.
- Test and commission the power supply.

6.2.2. Communications cabling services

- Supply and install a site communications cable to the liftwell for the platform emergency communication system.
- Allow 10 metres spare cable for connection to the platform controller.

6.2.3. Hydraulic Services works

- Provide a pipe connection from a sump in the pit floor to a suitable location to facilitate removal of water from the pit.

6.2.4. Structural Services works

Where specified, construct a pit with for drainage to the VTS Contractors required tolerances.

6.3. Australian and other standards

All design, manufacture, installation and maintenance and materials for the Work shall be carried out in compliance with the latest editions of all relevant Australian or approved alternative standards including but not limited to the following:

- AS/NZ 3000.

- AS 1735 Lifts, escalators and moving walks - Part 12 Facilities for persons with disabilities.
- AS 1735 Part 15 Vertical lifting platforms.

6.4. Shop drawings details

Shop drawings shall fully detail the installation requirements for the platform lift and include but not be limited to the following details:

- Plan and elevations that are fully dimensioned and that clearly show physical spatial requirements.
- Liftwell enclosure arrangements.
- Structural fixing details and locations.
- Static and dynamic loads and reactions on the building structure
- Electrical load and power supply and cabling requirements.
- Finishes and fitout details.
- Control station details e.g. manufacturer, finishes, button type etc.
- Electrical details; running and starting current and recommended circuit breaker size.

6.5. Testing and commissioning

Provide all testing and commissioning to prove that the vertical lifting platform is correctly installed and safe to operate including but not be limited to the following.

- Control devices operate correctly for raising, lowering and calling the platform.
- Emergency communication system operates correctly.
- Cabling tested and safe to energise.
- Verify the rating and operation of the circuit protective devices.
- The platform supports the maximum rated load without deformation.

7. Testing and commissioning

7.1. General

7.1.1. General requirement

The VTS Contractor shall provide competent persons together with all proper equipment, instruments and weights required to perform testing and commissioning of the VTS equipment. The VTS Contractor shall be fully responsible for the programming, performance and reporting of testing and commissioning activities for the VTS equipment to verify and prove the following:

- The VTS equipment is correctly installed and comply with the requirements of the respective design Standards and Authorities.
- The performance and operation requirements stated in this specification are achieved for each VTS equipment.
- Each VTS equipment is safe to operate and put into service.
- All interfaces with other building services e.g. mechanical, electrical, fire protection, security etc. are functional and operate correctly.

7.1.2. Performance guarantees

If testing and commissioning reveal defects, poor workmanship, variance or non-compliance with requirements of specified standards and authority codes, or variance or non-compliance with the requirements of this VTS specification, the VTS Contractor shall complete corrective work to satisfaction of the SR at no cost. Such corrective works shall include but are not limited to the following:

- Replace such defective or non-compliant VTS equipment.
- Perform work and provide VTS materials and equipment that are necessary for the lifts to meet specified operation and performance.
- Perform re-testing and re-commissioning to verify specified compliance, operation and/or performance.

7.1.3. Reports

Testing and commissioning activities shall be reported on A4 size sheets which shall clearly identify the particular activities. Each report shall be legibly written or typed, signed and dated, and contain the following information:

- The date, time and place of the activity.
- The testing and commissioning activity and results.
- The name, role and signature of each person present.

Reporting will include the VTS Contractor’s in-house template testing and commissioning documents as appropriate. The VTS Contractor shall prepare additional

template reporting sheets for the project specific activities where these are not included in their template documents.

7.1.4. Specific activities

- Testing and commissioning of VTS equipment shall comprise the following areas:
- Statutory: The examinations or inspections and testing specified by the design standard applicable to the VTS equipment, i.e. AS 1735 Part 10, BS EN 81 and regulatory authorities.
- Self-regulatory: The VTS Contractor's 'in-house' or self-regulated examinations, inspections, testing and commissioning works.
- Project specific: The additional testing and commissioning stated in this document.

The VTS Contractor shall perform all testing and commissioning activities, except that duplication of testing is not required, i.e. where an activity is included in one area it need not be repeated.

All testing and commissioning procedures and results shall be recorded and reported in hard copy and electronic format, and copies of all reports shall be submitted to the SR for review and acceptance.

7.2. Controls, communications & interfaces

7.2.1. Access control

- Enable and disable operation of each car destination push button via security system.
- Operation of each car destination push button via card reader operation.

7.2.2. BMS

- Operation of alarms and keyswitch operations.

7.2.3. Closed circuit television

- Verify the operation of the CCTV camera in each lift car.

7.2.4. Lift equipment

Verify the correct operation of the following:

- Emergency communication device i.e. car phone.
- Car emergency lighting
- Passenger doorway protection device
- Landing displays and car call buttons.
- Car displays, destination buttons and key-switches.

7.2.5. Power supply

- Verify that the lifts return to normal operation when normal or generator supply is available.

- Verify that the landing and car displays show correct message when lift is shut down.
- Verify that the correct mode operation is maintained during transition between modes.
- Prove compliance with the harmonics and power supply limits.

7.3. Operation and performance

7.3.1. Full load run

Each lift shall be subjected to a test run of 48 hours 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 shall be of sufficient duration to permit the opening and closing of the doors.

At the beginning and end of the full load run test, carry out a rated speed test and the maximum difference in the speeds obtained shall not exceed ±2% of the contract speed.

Reporting for the full load run shall include the date and time, duration, number of stops and floors number, failures, and reasons for failures.

7.3.2. Flight time

Flight time of each lift shall be measured taking into consideration acceleration and deceleration, and car speed. Carry out the following with 100% rated load in the car:

- Flight time from sheave start to sheave stop for one floor run.
- Flight time from sheave start to sheave stop for lowest level to highest level, and highest level to lowest level.

7.3.3. Quality of ride

Quality of ride measurements for each lift:

- Horizontal acceleration, front to back and side to side.
- Vertical vibration.
- Acceleration/deceleration rates.
- Jerk rate.
- Levelling accuracy on each floor served.

7.3.4. Acoustics

All measurements shall be taken with the car ventilation fan running and 1m off the ground and as per below:

- Inside car, car stationary, measured centre of car.
- Inside car, car running at contract speed, measured centre of car.

- Inside car, during acceleration and deceleration, measured centre of car.
- Each lift landing, car passing at rated speed, measured 1m horizontally from landing doors.
- At each lift lobby, car/landing doors opening or closing, measured 1m horizontally from landing doors.

7.3.5. Door performance

Door performance measurements for each lift:

- Door closing time – from fully open to fully closed.
- Door opening time - from fully closed to fully open.
- Door dwell time: car call
- Door dwell time: landing call
- Non-interference door dwell time.
- Door nudging dwell time
- Door closing pressure.

7.4. Safe to operate

Alarms, displays, controls: verify correct operation of all equipment.

Balance: run the lift in both directions of travel with balance loads in the car and verify the percentage of contract load required to balance the counterweight.

Braking: verify stopping and holding of the car.

Buffer: test oil buffers under rated load and speed conditions and verify that they return to their normal position after operation.

Door locks and contacts: all door locks and door contacts, their circuitry, and protective fuses, shall be checked and tested for effective operation.

Dynamic braking: test that the effect of dynamic braking will not permit the car speed to exceed contract speed while the lift is lowering 125% of the contract load.

Earth loop impedance: carry out to all 230V/400V cables and wiring.

Electrical supply: measure power factor, line voltage and line current, for both directions of travel with varying loads up to full load placed in the lift car.

Levelling: check that car levelling device accuracy at all floors, with no load and full load in the lift car, is within the tolerance specified in the technical schedule.

Overload: a test shall be made to ensure that the equipment will safely lower and stop and hold the lift car when loaded up to 125% in excess of the rated load. Also, test the load weighting performance along with the warning displays/audible alarms.

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

Safety device and switches: test all switches and devices for effective mechanical and electrical operation.

Safety gear: overspeed tests shall be carried out with no load and full load in the car to confirm that the lift equipment complies with the relevant codes and regulations.

Speed: verify the contract speed of the lift car in both directions of travel both with full load and no load in the car.

Speed governor: determine the tripping speed of the governor, the relationship between the pull through pressure required to slip the governor rope through the clamping device on the governor stand and the pressure required to initiate the operation of the safety gear.

8. Operation & maintenance

8.1. Maintenance

8.1.1. Maintenance generally

The VTS Contractor shall provide corrective and preventative maintenance to all VTS equipment and systems, including repair to defective VTS equipment, from the date of PC up to the end of the defects' liability period, including the making good of any resulting damage.

Defective is defined to include, but not limited to, operation or control system failures, performance below specified and required minimum, excessive wear, unusual deterioration or ageing of materials or finishes, unsafe conditions, the need for excessive maintenance, abnormal noise or vibration, and similar unsatisfactory conditions.

Prepare and retain copies of all logbook entries, maintenance schedules and service reports, including details of all preventative and corrective maintenance work carried out. A copy of all such documentation shall be submitted each month to the Main Contractor for the duration of the defects' liability period.

8.1.2. Log book

The VTS Contractor shall provide a logbook and shall enter in the logbook all site attendances and details of work carried out. The VTS Contractor shall record the following details in the log:

- Time of arrival and departure
- Reason for attendance; breakdown, routine maintenance, or other reason.
- Details of nature of faults and repairs or replacements carried out
- Details of all tests and adjustments carried out.

8.1.3. Maintenance procedures

All routine maintenance items are to be initialled and dated in the appropriate column in the maintenance schedule by the service person carrying out the work.

The VTS Contractor shall on every visit report to the Facilities Manager or, in their absence, such other persons nominated from time to time by the Facilities Manager, before commencing work and on completion of work.

If a fault or malfunction notice has been issued to the VTS Contractor by the Superintendents Representative, this shall be initialled by the attending employee of the VTS Contractor and filed in the log.

The VTS Contractor shall attend to call-outs in the event of breakdown or stoppages to the equipment during the whole twenty-four-hour period of every day of each year for

the duration of this Contract. If a passenger is trapped, the time to attend shall not exceed time period nominated in the performance schedules. The Facilities Manager shall not be responsible for any further payment for the service other than the contract price.

If attendance is required outside normal working hours, only such adjustments and minor temporary repairs will be effected as then can be carried out by the attending service person, and other work will be carried out during normal working hours.

The total number of call-outs during this period, excluding nuisance calls, shall not exceed the number stated in the performance schedule. Should the call-outs exceed the number specified pro rata on a monthly basis, the VTS Contractor shall carry out a full investigation and report at no cost.

The VTS Contractor shall program in the replacement of parts or components showing signs of wear or potential failure. Such repairs or replacements shall be scheduled during normal hours of work. When such repairs or replacements necessitate the placing of the equipment out of service, the VTS Contractor shall notify the Facilities Manager of the anticipated duration of the stoppage and arrange to complete the work at a time which in the opinion of the Facilities Manager will cause a minimum of inconvenience to the site and users of the vertical transportation equipment.

8.1.4. Maintenance scope of work

Experienced and qualified service person shall attend on site at regular intervals as required for comprehensive maintenance. Carry out all service, routine adjustments, replacements, cleaning and lubrication needed to keep the vertical transportation equipment operating in a first-class condition. Comprehensive maintenance shall include regular maintenance servicing and attendance to callouts in accordance with the requirements of this specification:

- Carry out scheduled preventative maintenance work and regular servicing in accordance with the manufacturer’s recommendations, the requirements of AS 1735 and any WA statutory requirements.
- Provide a 24-hour call-out service with all call-outs being attended to within the guaranteed maximum response time declared in the performance schedule.
- Maintain the vertical transportation installations to achieve the specified performance.
- Supply and replace all failed lamps in lift wells.
- Replace all failed lamps in lift cars.
- Removal of rubbish and keep clear lift wells, pits and machine rooms.
- Keeping of records (logbook) relating to service visits, call outs, faults rectified and repairs carried out.
- Maintain and update maintenance manuals.

- Equipment which fails as a result of incorrect servicing, faulty workmanship, materials or design shall be immediately replaced free of charge and replacement equipment manufactured overseas shall be air-freighted.

8.1.5. Comprehensive maintenance indicators

1.	INSPECTIONS & REPORTS	
a)	Minimum routine maintenance visits per individual VTS installation	One per month/VT equipment
b)	Annual survey and condition report	12 monthly
c)	Frequency of performance and breakdown reports	Six monthly
d)	Lift group control performance reports	Six monthly
e)	Date for submission of maintenance program from commencement of contract.	21 days
2.	RESPONSE TIMES TO CALLOUTS	
a)	The response time to callouts for entrapments, stoppages and malfunctions considered to require urgent attention, shall not exceed: During normal site working hours Outside normal site working hours	Project specific typically; : 30 minutes : 50 minutes
b)	The response time to call outs for stoppages and malfunctions, considered to not require urgent attention, shall not exceed: During normal site working hours Outside normal site working hours	Project specific typically; : 40 minutes : 50 minutes
3.	INCIDENCE OF CALL OUTS	
a)	Maximum number of call outs averaged over a period of 12 months	: 8 per lift per year
4.	PERFORMANCE VARIATIONS	
	The following variations shall be applicable to the measured initial performance evaluation.	
a)	Variation of lift speed, up or down direction	: 2%
b)	Variation of lift acceleration/ deceleration in up or down direction	: 5%
c)	Variation in lift flight time, sheave start to sheave stop, between typical floors.	: 5%
d)	Levelling accuracy	: 5 mm
5.	RIDE QUALITY	: maintain initial measured values

6.	NOISE	: maintain initial measured values

8.2. Training

The VTS Contractor shall provide training for the correct use and operation of the VTS equipment. Training shall be carried out on site and shall comprise practical ‘hands on’ experience by attendees. Each training session shall be structured to suit the duties and activity of attendees. Each training session shall be structured to suit the duties and activity of attendees. Training shall include the following subjects:

- General presentation on the VTS equipment.
- Basic operation; normal control, independent service, fireman’s service, emergency call system.
- Access control system.
- BMS alarms and monitoring.

8.3. Operating and maintenance manuals

8.3.1. General equipment

The VTS Contractor shall provide one (1) hard copy operation and maintenance manual for each type of the VTS equipment.

Submit a complete draft set of manuals for review and comment by the SR two months prior to PC. The VTS Contractor shall make all corrections and incorporate/insert all additional information specified by the SR.

The manuals must include as a minimum the information and technical details specified in the following subsections, and comply with the following general criteria:

- Consist of one or more binders as required to accommodate all the information on the VT services.
- Each binder shall comprise a three ringed binder, selected colour and A4 in size and contain section dividers.
- Each binder shall contain a table of contents that includes the contents of all binders.
- Identify the building name on the binding and front cover and identify the VTS Contractor.
- Identify the date of PC.

In addition to the hard copy manual the VTS Contractor shall provide electronic (soft) copies of the manuals. The number and method of storge and transmission of each electronic copy will be confirmed by the SR but as a minimum be three (3) copies each separately stored on a USB or DVD.

8.3.2. As constructed records

Provide all As Constructed records for each VTS equipment including, but not limited to the following:

- List of drawings showing drawing number, title, and final revision suffix.
- Shop drawings amended to suit the final installations at PC.

8.3.3. Certificates

Provide the following certificates for each VTS equipment:

- Certificate for each VTS equipment that the respective VTS equipment is safe to operate and put into service.
- Certificate of Testing and Commissioning with copies of all testing and commissioning reports
- Certificate of practical completion for each VTS equipment

8.3.4. Cleaning regimes

Provide project specific cleaning regime for the following:

- All type of finishes and materials for lift car wall, floor and ceiling.
- Car operating panels and buttons.
- Landing push button panels.
- Balustrade panels, decking and skirting materials.

8.3.5. Contact information

Name and contact details i.e. fixed and mobile phone number, of the lift company including the 24-hour response centre.

8.3.6. Description of VTS equipment & systems

Provide fully detailed descriptions of each VTS installation that fully describes the associated VTS equipment, controls, and interfaces.

- Schedule of VTS equipment including overall description, reference number or designation, location, type of VTS equipment, description, and performance data.
- Manufacturer's technical specifications for all equipment, components and assemblies including reference numbers and part descriptions.
- Technical specifications shall include controllers, drive machines and brakes, overspeed governors and tension sheaves, roping, buffers, safety gear, guide rail assemblies, floor finding and levelling components, door operators, landing and car displays and buttons and key switches, limit switches, door locks and all other components.
- Wiring diagrams, program instructions, access codes, diagnostic instructions, and similar information.

- Installation procedures, alignment diagrams and figures, fit tolerances, and future removal and replacement procedures for equipment.
- Access codes, adjustment and set-up manuals for adjustment, diagnosis and troubleshooting of VTS equipment systems and performance of routine safely tests.

8.3.7. Maintenance procedures

Provide a set of fully detailed set of maintenance schedules, procedures, and instructions for VTS equipment. Each maintenance schedule shall include all routine maintenance service activities together with the following:

- Frequency of maintenance visits
- Individual maintenance activities
- Maintenance procedures
- Duration of each maintenance activity

8.3.8. Manufacturers recommendations

The VTS Contractor shall obtain and provide the manufacturer's recommended maintenance instructions for VTS equipment. The VTS Contractor shall advise the Facilities Manager of any changes to the manufacturer's recommended maintenance instructions during the defect liability period and update the manuals.

8.3.9. Testing and commissioning data

Provide copies of all testing and commissioning reports carried out in accordance with the project specification for each VTS equipment and include the VTS Contractor’s self-certification testing and commissioning results.

8.4. Special tools and software

The VTS Contractor shall hand over to the Main Contractor all tools, diagnostic equipment and software programs that are required for maintaining and fault finding the VTS equipment at the end of the defects’ liability period.

Diagnostic equipment shall be complete with access codes, adjustment and set-up manuals for adjustment, diagnosis and troubleshooting of VTS equipment systems, and performance of routine safely tests.

Where the VTS equipment controller/s incorporate an event log for diagnostic and fault-finding functions, all associated codes and passwords shall be also handed over in both hardcopy and electronic formats.

9. Tender schedules

9.1. Statement of compliance with specification

The tenderer shall comply with all requirements of the VTS specification and associated drawings. The following table summarises aspects of design criteria on which the efficient use of VTS equipment will be dependent.

The tenderer shall verify by a Yes response that each design criteria has been read, understood, any ambiguities clarified, and the work is included in the tender offer. Where a No response is stated, the tenderer must submit written documentation that clearly state the technical or other reasons for non-compliance.

This Statement of Compliance must be submitted with the tender offer/submission.

Item	Response	Signature
Acoustic Requirements		
Comprehensive Maintenance Indicators		
Distortion/Noise/Harmonics		
Life Cycle		
Power Drive Systems		
Quality of ride		
Schedules of Technical Requirements		

9.2. Description of offers and features

Provide a fully detailed description of offer for each VTS equipment type.

The description must provide technical specifications that will assist in assessing compliance of the offered equipment to the specification and include details of additional features that are inherent in the equipment or design.

The Description of Offer and Features must be submitted with the tender offer/submission and include the following minimum details:

- ESD Initiatives incorporated into design of each VTS equipment
- Design standards
- Specific acoustic and vibration treatment
- Distortion, harmonic mitigation and power supply filter
- Drive motor and inverter units
- Method of floor finding and final stopping transducers
- Method of load weighing and sensor location
- Car landing floor passenger protection type

- Traffic control features and options

9.3. Technical schedules

The Schedules listed in this Section 9.3 Technical Schedules must be fully completed and must be submitted with the tender offer/submission.

9.3.1. Lifts – performance guarantees

Acoustic

Item	Unit	Tenderer's Guarantee
Inside car (fan off)		
Car running at contract speed	dB(A)	
Car during acceleration or deceleration	dB(A)	
Car during levelling with doors opening	dB(A)	
Adjacent car passing stationary car	dB(A)	
Car stationary (fan on)	dB(A)	
In lift lobby		
Car passing at contract speed	dB(A)	
Door opening or closing	dB(A)	
Other		
Inside liftwell	dB(A)	

Life cycle

Item	Unit	Tenderer's Guarantee
Landing and Car Door Systems	years	
Buttons	years	
Car and Landing Displays	years	
Motor and Drive System	years	
Controller	years	
Maximum starts per hour	number	

Miscellaneous

Item	Unit	Tenderer's Guarantee
Load weighing accuracy	kg	
Fire rating of Landing door	hours	
Call out response time	minutes	

Person trapped in car		
Call out response time Lift shutdown on fault	minutes	

Power supply

Item	Unit	Tenderer's Guarantee
Power supply tolerance reference to 400V	+/- %	
Total harmonic distortion at lift switchboard	%	
Power factor full load up/down		
Power factor empty up/down		
Main drive inverter efficiency	%	

Quality of ride

Item	Unit	Tenderer's Guarantee
Maximum horizontal vibration Front to back	milli-G	
Maximum horizontal vibration Side to side	milli-G	
Jerk	m/S^{-3}	
Levelling tolerance - full load	mm	
Levelling tolerance - no load	mm	

Standby energy consumption

Item	Unit	Tenderer's Guarantee
Controller	watts	
Drive system Inverter	watts	
Landing displays	watts	
Car displays	watts	
Car buttons	watts	
Landing buttons	watts	
Car fan	watts	

9.3.2. Lifts – technical compliance

Controller

Item	Unit	Tenderer's Guarantee
Product Model Code	nil	
Traffic control features	nil	

Displays

Item	Unit	Tenderer's Guarantee
Manufacturers Product model code	nil	
Size car/landing	mm	

Door system

Item	Unit	Tenderer's Guarantee
Manufacturers product model code	nil	
Door operator motor voltage	volts	
AC Motor design Synchronous/Asynchronous	nil	
Vector speed control - Yes/No	nil	
Drive e.g. Belt, chain, other	nil	

Floor finding/levelling

Item	Unit	Tenderer's Guarantee
Car position system	nil	
Resolution	mm	
Levelling and Final Stop	nil	

Hoist drive

Item	Unit	Tenderer's Guarantee
Manufacturers product model code	nil	
Motor rated output	Kilowatts	
Permanent magnet synchronous design	nil	
Motor losses full load	watts	
Drive system	nil	

Hoist drive inverter

Item	Unit	Tenderer's Guarantee
Manufacturers product model code	nil	
6 Pulse PWM, IGBT	nil	
Power factor full load	nil	
Full load/No load losses	watts	
Regenerative feedback	nil	
Levelling accuracy	mm	
Inverter efficiency full load	%	

Pushbuttons

Item	Unit	Tenderer's Guarantee
Manufacturers Product model code	nil	
Diameter	mm	

9.3.3. Platform lift – low rise

General description

Item	Tenderer's Guarantee
Classification	
Drive Machine Type	
Manufacturer and model	
Rated Capacity	
Speed	
Travel	

Controls and communication

Item	Tenderer's Guarantee
Pushbuttons	
Emergency Communication Type	

Landings

Item	Tenderer's Guarantee
Control station arrangement	
Upper level gate arrangement	

Liftwell enclosure

Item	Tenderer's Guarantee
Construction	
Doors	

Control Stations	
Electrical Compartment	

Platform

Item	Tenderer's Guarantee
Clear platform dimensions	
Control station	
Entry ramp	
Platform material and finish	
Side panels (non-access sides)	
Sill clearance	
Shear protection underneath platform	

Performance guarantees

Item	Unit	Tenderer's Guarantee
Landing Door Systems	years	
Push Buttons	years	
Drive System	years	
Maximum starts per hour	number	

9.3.4. Platform lift – vertical lifting platform

General description

Item	Tenderer's Guarantee
Classification	
Drive Machine Type	
Manufacturer and model	
Rated Capacity	
Speed	
Travel	

Controls and communication

Item	Tenderer's Guarantee
Pushbuttons	
Emergency Communication Type	

Landings

Item	Tenderer's Guarantee
Control station arrangement	
Upper level gate arrangement	

Liftwell enclosure

Item	Tenderer's Guarantee
Construction	

Doors	
Control Stations	
Electrical Compartment	

Platform

Item	Tenderer's Guarantee
Clear platform dimensions	
Control station	
Entry ramp	
Platform material and finish	
Side panels (non-access sides)	
Sill clearance	
Shear protection underneath platform	

Performance guarantees

Item	Unit	Tenderer's Guarantee
Landing Door Systems	years	
Push Buttons	years	
Drive System	years	
Maximum starts per hour	number	

9.4. Resourcing and capability

The tenderer shall submit details of resources and capability to undertake the Works. The submission shall include, but is not limited, to the following:

- Current workload and projected future workload.
- Proposed personal and management staff for the project.
- Company history inclusive of management and staff levels and company organisation chart.
- Full details of national and international technical support services and resources.

The tender submission shall clearly show the numbers of management and technical staff including:

- Number of Management Staff
- Number of Project Managers
- Number of New Installation Technicians
- Number. of Upgrade Installation Technicians
- Number of Maintenance Services Technicians

9.5. Past installation experience

The tenderer shall submit details of past lift installation experience over the last 5 years. The submission shall include, but is not limited to, the following details:

- The total number of projects and for each project the number of lifts/lift banks.
- For lift or lift bank provide details including rated load, speed, car size, levels served, group or simplex operation.
- Specific reference to projects of similar size and complexity to the proposed project.

9.6. Relationships and obligations

The tenderer shall submit full details of the tenderer’s relationships and obligations with other entities including, but not limited to, the following details:

- Legal relationship of tenderer to the VTS equipment manufacturers proposed for the project.
- Responsibilities to VTS equipment manufacturers in relation to warranties and maintenance.

9.7. Maintenance and service

The tenderer shall include details of the warrant period for any individual VTS equipment where such warranty extends beyond the defects’ liability period including the agent for the warranty.

The tenderer shall provide details of their specific responsibilities in relation to warranty service and repair of VTS equipment.

The tenderer shall provide details of specific back up support arrangements or agreements that are in place with equipment suppliers that will assist the tenderer to fulfil maintenance obligations, e.g. access to specialist service technicians and testing equipment for VTS equipment.

The tenderer shall provide guaranteed response times to callouts for stoppages and malfunctions considered to require urgent attention:

- During normal site working hours,
- Outside normal site working hours.

The tenderer shall provide guaranteed response times to call outs for stoppages and malfunctions, considered to not require urgent attention:

- During normal site working hours,
- Outside normal site working hours.