

Lifts for Public Transport Infrastructure




Engineering Specification

Rail Commissioner

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TABLE OF CONTENTS

1. Introduction	7
2. Purpose	7
3. Scope	7
4. Related Documents	7
5. References	7
6. Acronyms	8
7. General	8
7.1. Design Requirements	8
7.1.1. Lift Doors	9
7.1.2. Entry Area	9
7.1.3. Circulation Space	10
7.1.4. Customer Information	10
7.1.5. Luminance Contrast	10
7.2. Construction	10
7.2.1. Fixings and Fastenings	10
7.2.2. Welding	10
7.2.3. Flame Cutting	11
7.2.4. Painting and Finishing	11
7.2.5. Stainless Steel Materials and Finishes	11
7.2.6. Labels and Notices	11
7.2.7. Associated Works	12
7.3. Shop Drawings	12
8. Lift Shaft	12
8.1. Equipment	12
8.1.1. Guide Rails and Fixings	12
8.1.2. Lift Guide	13
8.1.3. Travelling Cables	13
8.1.4. Buffers and Supports	14
8.1.5. Lift Overrun Pit Ladder	14
8.1.6. Lifting Facilities	14
8.1.7. Finishing/Flushing	14
8.1.8. Fire Detection/Protection	15
8.1.9. Lift Shaft Ventilation	15
8.2. Lift Machinery	15
8.2.1. General	15
8.2.2. Controller	16

8.2.3.	Wiring	16
8.2.4.	Equipment Protection	16
8.2.5.	Auxiliary Power Supply	17
8.2.6.	Hoist Machine.....	17
8.2.7.	Hoist Machine Ropes / Belts	17
8.2.8.	Counterweight	17
9.	Lift Landing	18
9.1.	Doors and Frames	18
9.1.1.	Frames	18
9.1.2.	Frame Sills.....	18
9.1.3.	Doors.....	18
9.1.4.	Door Locks, Hangers, and Tracks.....	19
9.2.	Call Panels and Indicators	20
9.2.1.	Call Panel	20
9.2.2.	Car Position Landing Indicator	20
9.2.3.	Audible Indicator	20
9.2.4.	Accessible Lift Sign.....	20
9.2.5.	Highlighted Door Architrave Trims	21
9.3.	Lift Maintenance and Services Cabinet.....	21
10.	Lift Car	21
10.1.	Details	21
10.1.1.	Car Platform	21
10.1.2.	Exterior Lighting.....	21
10.1.3.	Exterior Power	21
10.1.4.	Interior	22
10.1.5.	Workshop/Construction Drawings.....	22
10.1.6.	Floor and Skirting.....	22
10.1.7.	Wall Panels.....	22
10.1.8.	End Walls	22
10.1.9.	Ceiling	23
10.1.10.	Handrails	23
10.1.11.	Interior Lighting	23
10.1.12.	General Purpose Outlet	23
10.1.13.	Ventilation.....	23
10.1.14.	Load Notice Panel	24
10.1.15.	Security Camera Sign.....	24
10.1.16.	Operating Panels.....	24
10.1.17.	Indicator.....	24

10.1.18. Voice Enunciator System.....	25
10.2. Doors.....	25
10.2.1. Locks, Hangers and Tracks	26
10.2.2. Operator and Controller	26
10.2.3. Protection Devices.....	27
10.2.4. Light Curtain	27
10.2.5. Delayed Door Closing Facility	27
10.2.6. Door Open Dwell Time.....	28
10.2.7. Lift Landing Access Devices	28
11. Electrical Services	28
11.1. Communications and CCTV.....	28
11.1.1. Conduit and Ducting	28
11.1.2. Communications Cabling Marshalling Box (CCMB)	28
11.1.3. Emergency Help Phone	29
11.1.4. CCTV Camera Provisions.....	30
11.1.5. Lift Failed Alarm.....	30
11.1.6. Public Address System.....	31
11.2. Control Equipment	31
11.2.1. Supervisory Control System	31
11.2.2. Mode of Operation	31
11.2.3. Levelling	31
11.2.4. Automatic Travel on Power Failure	32
11.2.5. Exclusive or Independent Use Service.....	32
11.2.6. Lift Operation Control.....	32
11.3. Electrical Installation	33
11.3.1. General.....	33
11.3.2. Earthing System	33
11.3.3. Electrical Ducting and Conduit.....	33
11.3.4. Wiring	34
11.3.5. Lift Shaft Lighting.....	34
11.3.6. Wiring Diagrams	34
11.3.7. Lift Main Isolator	35
11.3.8. Circuit Breakers	35
11.3.9. Electrical Supply	35
12. Commissioning and Maintenance.....	35
12.1. As Constructed Drawings	35
12.2. Lift Operations Maintenance Manuals.....	36
12.3. Testing and Commissioning.....	36

12.4. Registration of Plant	37
12.5. Verification.....	37
12.6. Defects Liability Period	38
12.7. Maintenance and Servicing.....	38
12.8. Records	38
13. Programming, Staging and Payments	38
APPENDIX 1	40

1. Introduction

The Department of Planning, Transport and Infrastructure (DPTI) operates and maintains the Adelaide Metropolitan Passenger Rail Network (AMPRN) under the Rail Accreditation assigned to the Rail Commissioner. There are approximately 89 train stations and 33 tram stops serving the AMPRN.

This document supersedes Appendix 129004.1 previously contained within AR-PW-PM-SPE-00129004 Overpasses (D063).

2. Purpose

The purpose of this specification is to outline requirements for the design, supply, delivery, installation, testing, commissioning and 12 months fully comprehensive maintenance and servicing of an electric traction passenger lifts at the station precinct. This specification should be read in conjunction with the remainder of the DPTI Station Standards for the Train System, as listed in DPTI Master Specification Part RW-STS-D1 Stations.

3. Scope

This specification applies to all new and upgraded lifts for public transport infrastructure. Existing lifts may be rated against this standard.

4. Related Documents

DOCUMENT NAME	DOCUMENT NUMBER
Vertical Transportation Services: Lift No. 1 Plans, Section & Elevations (For Information Only)	T-01
Vertical Transportation Services: Lift No. 1 Elevations & Details (For Information Only)	T-02

5. References

- AS 1170 Structural Design Actions
- AS 1288 Glass in Buildings
- AS 1428 Design for Access and Mobility
- AS 1477 PVC Pipes and Fittings for Pressure Applications
- AS 1554 Structural Steel Welding
- AS 1735 Lifts, Escalators and Moving Walks
- AS 2053 Conduits and Fittings for Electrical Installations
- AS 2208 Safety Glazing Materials in Buildings
- AS 2293 Emergency Evacuation Lighting for Buildings
- AS 2700 Colour Standards for General Purposes
- AS 2899 Public Information Symbol Signs (withdrawn)
- AS 3000 Electrical Installations (Wiring Rules)
- AS 3008 Electrical Installations – Selection of Cables
- AS 3085 Telecommunications Installations
- AS 4506 Metal Finishing – Thermoset Coatings
- AS/ACIF S 009 Telecommunications Wiring Rules

- BS EN 81-1 Safety Rules for the Construction and Installation of Lifts, varied by AS 1735.1 Appendix A; Lifts, Escalators and Moving Walks
- BS EN81-71 Safety Rules for the Construction and Installation of Lifts – Particular – Applications to Passenger Lifts and Goods Passenger Lifts- Part 71: Vandal Resistant Lifts
- National Construction Code - Building Code of Australia (BCA)

Legislative Requirements

- *Disability Standards for Accessible Public Transport (DSAPT)*
- *Disability Discrimination Act (DDA)*

6. Acronyms

ACRONYM	FULL NAME
AC	Alternating Current
ACMA	Australian Communications and Media Authority
AMPRN	Adelaide Metropolitan Passenger Rail Network
APS	Auxiliary Power Supply
BCA	Building Code of Australia
CCMB	Communications Cabling Marshalling Box
CCL	Certified Components List
CCTV	Closed Circuit TV
DDA	Disability Discrimination Act
DIN	German Institute for Standardisation (Deutsches Institut für Normung)
DPTI	Department of Planning, Transport and Infrastructure
DSAPT	Disability Standards for Accessible Public Transport
ELV	Extra Low Voltage
GPO	General Purpose Outlet
IP	Ingress Protection
MCB	Miniature Circuit Breaker
MRL	Machine Room-Less
POE	Power Over Ethernet
RCCB	Residual Current Circuit Breaker
SWL	Safe Working Load

7. General

7.1. Design Requirements

Lifts shall be provided to access the railway station platform or for traversing between platforms via an overpass.

Lifts shall be provided where specified at Enhanced Amenity Stations and Standard Amenity Stations.

The lift car shall be a standard size capable of carrying 21 people, minimum size of 1600mm wide x 2100mm deep to carry a stretcher and provide a 180 degree wheelchair turning space.

The rated vertical travel speed of a lift shall be 1 m/s and the maximum speed shall not exceed 1 m/s. This shall be calibrated and tested at intervals recommended by the manufacturer to maintain this speed. This calibration and test information shall be

supplied to DPTI as part of the Maintenance Manual, in accordance with clause 13 Records.

The rated duty shall be continuous operation at full load. All lifts shall be traction lifts - alternative lifts shall not be used.

Lift shafts and control buttons shall be weatherproof as lifts shall be installed in an outdoor environment with components exposed to the elements including ingress of water into the lift over-run pit. Water from surrounding areas shall be prevented from entering the lift shaft. Dust and rubbish entering the lift shaft shall be minimised. Services, other than electrical services for the lift, shall not be located within the lift shaft. All components likely to be exposed to sunlight shall be designed to withstand UV radiation and to suit South Australian climatic conditions.

The design of the lift/s shall be suitable for use by the public including persons with disabilities and those using manual and motorized wheel chairs. The lift/s installation shall comply with the applicable provisions of the Commonwealth Disability Discrimination Act; this standard, the relevant Australian Standards and the Building Code of Australia.

Lifts shall be installed in public areas that in general are unsupervised. Lifts are likely to be subjected to vandalism and therefore the design shall provide a facility which will be difficult to willfully damage. The requirements of EN81-71 Safety Rules for the Construction and Installation of Lifts - Particular Applications to Passenger Lifts and Goods Passenger Lifts - Part 71: Vandal Resistant Lifts shall be complied with for Class 1 lifts.

Certification that the lift complies with the specification, relevant legislation and all applicable codes shall be provided prior to an order being placed for lifts.

Lifts shall be registered with SafeworkSA before operation.

7.1.1. Lift Doors

Lift cars shall only have one set of doors. The minimum clear width of a lift car door opening shall be not less than 1000 mm.

Lift doors shall be observable by customers on both platforms.

The position of the lift doors shall be designed to ensure customers:

1. enter and exit the lift car parallel to the rail tracks;
2. do not have to exit away from the platform; and
3. do not have to pass between the lift shaft and the platform edge.

Under no circumstances shall a lift car door open facing the platform edge and tracks (perpendicular to the tracks).

The path from the lift car door to the core circulation area shall be as short and as direct as practicable.

7.1.2. Entry Area

The entry area, i.e. surface from the threshold level of the lift car door to the waiting space, shall have a maximum grade of 1:40. This surface shall have a longitudinal fall away from the lift shaft.

If the lift entry area is positioned under adjacent stairs/ramps the following shall be maintained:

1. minimum circulation space, in accordance with Clause 7.1.3 Circulation Space; and
2. a minimum head height of 2400 mm.

7.1.3. Circulation Space

A circulation space to allow for a 360° wheelchair turn shall be provided in front of the lift. The circulation space shall be not less than 2450 mm by 2450 mm.

7.1.4. Customer Information

Lifts installed for public use shall have audio, visual and tactile information that meets DSAPT requirements. PA speakers shall be installed; refer to AR-PW-PM-SPE-00129016 Passenger Information System

The lift LCD screen shall be protected from vandalism with a thick polycarbonate coating

7.1.5. Luminance Contrast

The internal handrail shall meet the 30% contrast requirements.

A 50 mm wide edging strip shall be provided to ensure 30% luminance contrast to differentiate the lift entrance from the doors. This edging strip shall be provided by an adhesive PVC strip.

7.2. Construction

7.2.1. Fixings and Fastenings

The Contractor shall supply and install all fixings and fastenings required to support mechanical and electrical equipment covered by this section.

Fixings set into walls as inserts, such as steel sections, shall be hot dipped galvanized. Uni struts shall be galvanised steel.

Where fastenings are into concrete and/or masonry, they shall be chemical or mechanical anchors set into neatly formed holes drilled with tipped, rotary tools to the correct size as nominated by the manufacturer.

Where fixing of ducts and/or conduit is to steel work, self-tapping plated screws; minimum 20 mm long shall be used.

Explosive powered fixing devices shall not be used.

7.2.2. Welding

All site and factory welding shall be carried out by a competent, qualified tradesperson holding current certificates of competency to carry out structural welding in accordance with AS 1554.1, Clause 4.12.

All surfaces to be welded shall be clean and free from scale, grease and grime.

All welds shall be uniform, predominantly smooth, free of spatter and shall conform to the requirements of AS 1554.1.

Suitable fire extinguishers shall be provided whenever welding is carried out on site.

7.2.3. Flame Cutting

Hand flame cutting for any purpose will not be allowed unless prior approval has been received from DPTI. Flame cutting shall not be permitted in members carrying stress at the time of cutting or members that will later be subject to stress.

Where flame cutting is approved, all such cut edges and holes will be cleaned and ground to give a smooth finish ready for the applicable protective coating.

Suitable fire extinguishers shall be provided whenever flame cutting is carried out on site.

7.2.4. Painting and Finishing

All steelwork used in installation which is not zinc plated, hot dipped galvanised or stainless steel, shall be cleaned, prepared and properly painted with one coat of an approved rust inhibiting primer, followed by two coats of a high quality equipment enamel. Over coating of the primer shall be carried out within 48 hours of the application of the primer.

Shaft equipment painted prior to delivery to site shall be thoroughly cleaned of grease and grime. All such equipment damaged during delivery, storage or installation shall be touched up, to the approval of DPTI, in a matching colour, prior to the date of commissioning of the lift/s.

7.2.5. Stainless Steel Materials and Finishes

The contractor shall provide stainless steel to the surface finish and grade as described in the appropriate sections of this Specification. Any blemishes in the surface finish shall be repaired to provide an evenly finished surface over the whole area of any panel. The finish of all surfaces shall be identical and shall be run vertically. All panels shall be flat and smooth and where panels have been welded, no weld marks shall be visible.

All stainless steel shall be adequately protected with tape or plastic film, from the time of manufacture to the time of handover of the complete lift installation. Any stainless steel not protected and being damaged shall be repaired to the satisfaction of DPTI.

7.2.6. Labels and Notices

All labels and notices shall be of machine engraved laminated plastic, with machine engraved legends. Each notice shall be fixed using plated steel screws fixed to the particular surfaces. Adhesive fixed labels shall not be used.

7.2.7. Associated Works

Where ducts and penetrations are not shown on the Drawings, details showing locations, sizes and all relevant information shall be submitted to DPTI for review.

All ducts and penetrations shall be backfilled and sealed.

7.3. Shop Drawings

Within 28 days of the Date of Acceptance of Tender the Contractor shall submit drawings showing details of the arrangement of all parts of the plant and equipment for DPTI to review. The drawings shall make provisions in the building structure to accommodate the equipment, the lift car including its fittings and control panels, electrical wiring and switchboard diagrams, and CCTV, Emergency Help Phone and alarm interfacing and wiring diagrams. Two copies of all drawings shall be provided with the title of the project and Drawing number on bottom right hand corner of each sheet.

Drawings shall be certified by a suitably qualified engineer.

The Contractor shall allow 14 days for the review of the drawings by DPTI. Where drawings are returned for amendment, the amended drawings shall be resubmitted within sufficient time to prevent delay to the completion of the Works. The review of the drawings will not in any way provide relief from responsibility for errors or omissions and interferences or from the necessity of furnishing such workmanship or materials as may be required for the completion of the Works in accordance with this Specification.

8. Lift Shaft

The Contractor shall determine:

1. the positions and dimensions of all openings and inserts required for the lift/s installation;
2. the finished positions of frames and face plates on the wall finishes of the shaft including in landing areas; and
3. the positions and structural requirements for the load reaction points for the shaft walls and over run pit.

The lift pit shall be water and oil proof with a floor graded to the sump. The sump shall be provided with a flush steel non-slip grate similar to a pedestrian grate with approved abrasive finish. The concrete floor shall be given a light broom finish, broomed toward the sump.

Permanent Lifting Facilities in accordance with Clause 8.1.6 Lifting Facilities shall be provided.

No ledges shall be left within the lift shaft wall surface on which items may be left that may interfere with the movement of the lift car and/or travelling cables.

8.1. Equipment

8.1.1. Guide Rails and Fixings

Guide rails, fixing brackets and fixings shall be designed, positioned and installed to ensure they are sufficiently rigid to withstand the maximum loads imposed on them by the lift equipment and its operation. The design of the guide rails and fixings shall be certified by a suitably qualified engineer

The guide rails for the lift car shall:

1. be of standard “T” steel section, either T89 or T127;
2. be installed over the full length of the lift shaft, in such a manner to accommodate building expansion and contraction. Where slotted holes are used to facilitate adjustment, a keeper plate shall be provided to prevent independent movement of rail clips;
3. be plumbed within the lift shaft using suitable steel packers and/or be fixed to the shaft by means of steel beams and mild steel brackets; and
4. have all faces accurately machined, including joints, to produce a smooth surface over the full length of rails.

The guide rail brackets shall:

1. be bolted to approved surface mountings and/or steel beams fixed to the lift shaft structure;
2. be secured using steel bolts and washers long enough to accommodate a full threaded nut;
3. be spaced at not more than 2.4 m centres; and
4. be provided with approved rail clips that are designed to allow vertical rail movement due to shaft compression.

All spacers/shims, bolts, nuts and washers shall be zinc plated or hot dipped galvanised.

The “T” guide rails, except for the running surface, shall be painted in accordance with this Specification.

8.1.2. Lift Guide

Lifts shall be provided with slipper guide sets. Slipper guides shall incorporate automatic oiling system to ensure smooth and silent operation.

8.1.3. Travelling Cables

Travelling cables shall comply with AS 1735 and be suitable for use as lift trailing cables and comply with all relevant standards for electrical and communication purposes.

Cables shall be multi-core flexible cables with a minimum of 10% spare cores; at least two spare cores shall be shielded.

Cables shall be connected through junction boxes or plugs. All terminals shall be clearly labelled and all wiring shall be laced together in a neat and regular fashion.

In addition to the required number of control and power cables, plus spares, the following shall be provided:

1. Emergency Help Phone System;
2. CCTV Camera Video Signal and 12 V DC or 24 V AC/DC Power Supply Cables of at least 1.0 mm² conductor cross section;
3. Lift car Internet Protocol device cable; and
4. Public Address (PA) wiring to accommodate 100V line speaker cable.

The Internet Protocol cable shall be initially used for camera tamper alarm connection and CCTV camera and shall be suitable for future lift phone upgrade. It shall include four sets of travelling cable meeting AS 3080 Cat 5E or higher performance (Dätwyler Part number 191032).

8.1.4. Buffers and Supports

Buffers shall be placed symmetrically in the lift pit, in relation to the centre of gravity of the lift car and counter weight shall be designed to meet the required load.

The buffers shall be bolted to a mild steel base plate fixed to the lift pit floor between the guide rails.

8.1.5. Lift Overrun Pit Ladder

A welded steel or aluminium access ladder shall be provided within the lift overrun pit to allow access from the level of the lowest floor served by the lift to the bottom of the lift pit.

Emergency stop switches shall be provided adjacent to the pit access ladder in a readily accessible position and located on the lift shaft wall to prevent operation via the gap between open car and landing doors.

These switches shall be labelled “EMERGENCY STOP SWITCH” - RUN/STOP in red letters on a white background.

8.1.6. Lifting Facilities

Lifting anchors/beams required for the installation or maintenance of the shaft equipment shall be provided. The lifting anchors/beams shall be provided at the top of the lift shaft to take point loadings in accordance with the relevant regulations. The design of such anchors/beams is to be certified by a suitably qualified engineer and submitted for review by DPTI

The lifting anchors/beams shall be positioned in accordance with the lift supplier's requirements and shall be designed to support the load nominated by the lift supplier.

The Safe Working Load (SWL) of the lifting anchors/beams installed shall be permanently marked on or adjacent to the item such that it is clear which load refers to each item.

8.1.7. Finishing/Flushing

All excess lift shaft brackets such as switch brackets, conduit or duct fixing brackets, etc. shall be cut off.

If flame cutting is employed, metalwork shall be ground / filed clean and smooth. All painting and galvanising shall be finished to a high quality after brackets are modified, in accordance with this specification.

In concrete lift shafts galvanised steel sheet well flushing shall be provided, suitably stiffened to prevent vibration and excessive deflection. The sheet shall be 1.2 mm minimum thickness, installed in the path of travel of the lift car door openings and painted in accordance with this specification. This flushing is intended as a barrier to prevent entry into the lift shaft from the lift if the doors are forced open following the failure of the lift mid-floor.

In glazed lift shafts clear polycarbonate sheet well flushing shall be provided, suitably stiffened to prevent vibration and excessive deflection. The sheet shall be 6.0 mm minimum thickness, installed in the path of travel of the lift car door openings. This flushing is intended as a barrier to prevent entry into the lift shaft from the lift if the doors are forced open following the failure of the lift mid-floor

8.1.8. Fire Detection/Protection

Smoke detectors or heat sensors shall be provided at the top of the lift shaft. The smoke detection shall be powered from the lift mains electricity supply and in case of loss of mains power, the Auxiliary Power Supply. The smoke detector shall be located at the top of the lift shaft in proximity to the hoist machine and lift control equipment

The external output signal from the Lift Shaft Smoke Detection shall be connected to terminals at the Communications Cabling Marshalling Box (CCMB).

In the absence of normal mains power, operation of the smoke detection systems shall be maintained for a minimum period of two hours.

8.1.9. Lift Shaft Ventilation

The lift shaft ventilation system shall have a separate power supply. Lift shafts shall be designed so that the maximum temperature in the shaft is always limited to a safe work environment for personnel and the lift computer equipment. The shaft ventilation system shall be designed to maintain a temperature no higher than ambient at the top of the shaft at all times.

Refrigerated air conditioners shall not be used. Evaporative coolers shall be protected from vandalism. A lift shaft over temperature alarm shall be provided.

8.2. Lift Machinery

8.2.1. General

The lift systems shall be designed to be single button collective. The system shall be designed to provide the user with maximum efficiency of service. The supervisory control shall be of microprocessor design and shall be designed using new materials of first quality. All components shall be in current production, incorporate latest technologies, be robust in construction and be designed with longevity in mind.

Lift well wiring, landing button stations and controller wiring shall be provided with a single button collective control system with a single button at each floor.

8.2.2. Controller

A control cabinet incorporating variable voltage, variable frequency Alternating Current (AC) motor control system shall be provided. The cabinet shall be installed in the shaft head against the wall where possible and housed to prevent build-up of dust. The cabinet shall be of modular design. All terminals shall be clearly labelled and marked in a permanent fashion. The control cabinet shall house the microprocessor, supervisory lift monitors, door monitoring and drive controls, and data communication, all designed using components of the latest technologies. The components shall be robust construction and be designed with longevity in mind.

A control panel incorporating lift controls, an emergency release, and maintenance platform controls allowing diagnostic checks of the control panel shall be installed on the top level adjacent to the lift cabinet inside the shaft head. Any specialised equipment required for maintenance or adjustment of the equipment shall be provided as part of the installation. Where such equipment forms part of the controls, then that equipment shall remain in the panel. Manuals, fault codes, service notes and other documentation shall be included in a metal compartment securely fixed to the inside of the panel door. Chokes and filters shall be provided where necessary, and shall be designed to be efficient and reasonably quiet.

8.2.3. Wiring

Panel wiring shall be terminated in tunnel style terminals where the fixing screw does not bear directly on the conductor, or by use of correctly sized crimp lugs held under threaded bolts or machine screws. Generally the wiring format shall follow the principle of one conductor per terminal. Under no circumstance will conductors of differing cross sectional area or construction be terminated in the same terminal. Wiring shall be run in bundles wherever practicable, and with changes of direction of wiring runs being accomplished with right angle bends.

Bundles shall be supported from the controller frames and shall be bound with PVC ties. All switchgear control and protection equipment shall be permanently marked with symbols consistent with those detailed on the wiring diagrams.

All control wiring shall have permanent cable identification that is cross-referenced to the wiring diagram.

Labels for all communications and CCTV cabling shall comply with the requirements of AS 3085.1.

8.2.4. Equipment Protection

Protection devices shall be built into the equipment to prevent damage to components caused by phase failure, phase reversal and extreme voltage surges. Control circuits shall be protected by fuses. Terminal points shall be permanently marked.

8.2.5. Auxiliary Power Supply

A battery powered Auxiliary Power Supply (APS) shall be provided and installed to provide 240 V AC power during failure of mains power supply. It shall be of sufficient capacity to maintain operation for 30 minutes of the lift car air conditioning system under full cooling load (summer worst case); and lift car lights, car alarm bell and lift shaft smoke detection for an additional 90 minutes.

After 30 minutes of operation on the APS the lift car air conditioner shall cut out and the lift car ventilation fan will start up. The APS shall continue to maintain supply for lift car lights, lift car ventilation fan, lift car alarm bell and lift shaft smoke detection for an additional 90 minutes.

The minimum recovery rate of the APS shall be eight hours after restoration of mains power. The battery capacity shall then be sufficient to provide a further two hours of auxiliary power supply, should a further mains failure occur.

The APS shall comply with the requirements of AS 3000, AS 1735 and AS 2293. The APS shall be fitted with all necessary controls to monitor battery status, state of charge and a means to conduct discharge testing during scheduled maintenance without affecting normal operation of the lift.

A prominent visual and audible alarm shall be fitted to either the lift controller or APS. This alarm is to operate when the auxiliary power supply is under discharge testing or when the APS is isolated from the main lift controller during maintenance or repair.

8.2.6. Hoist Machine

The hoist machine brake and control components shall be protected from solids and liquids to not less than Ingress Protection (IP) 54 or shall have additional protection added such that the combined affect is not less than IP 54.

The hoist machine shall be a gearless type specifically for use in Machine Room-Less (MRL) type traction lifts. Hoist machines that use an electric motor driving a sheave through a gearbox shall not be acceptable.

The hoist machine shall use variable voltage, variable frequency control fully adjustable in both speed and torque curves.

8.2.7. Hoist Machine Ropes / Belts

The hoist machine shall use steel wire ropes or steel cables encased in a polyurethane skin. Steel wire ropes and traction / diverting sheaves shall comply with AS 1735. Traction methods using steel wire ropes encased in a polyurethane sheath shall be required to comply with the minimum requirements of AS 1735 and in addition be certified by the manufacturer as suitable for passenger lift use. Such certification shall be provided at the time of tender.

8.2.8. Counterweight

The counterweight shall comply with AS 1735. Counterweight guide shoes shall comply with this specification as described under clause 8.1.2 Lift Guide Rollers.

9. Lift Landing

9.1. Doors and Frames

9.1.1. Frames

Landing door frames at each level shall:

1. be manufactured from Grade 304 stainless steel, 1.55 mm minimum thickness, satin finish, square section in profile to cover the full depth of the lift shaft wall structure and having the required projection past the lift shaft wall to accept the finishes applied to the wall;
2. be designed, including structural side frame angles and constructed to ensure that distortion, warping or twisting does not occur;
3. have all joints finished accurately to provide a smooth finish; and
4. be provided with grout guards when installed in concrete or masonry structures and grouted in place.

9.1.2. Frame Sills

Door frame sills shall be provided at each landing door opening and be manufactured from a wear resistant grade extruded aluminium alloy in natural anodised finish. Sills shall be designed to allow easy removal without damage to surrounding floor surfaces. Sill support angles shall be provided at each lift landing and be manufactured from mild steel.

Suitable separators shall be used between any interface of aluminium and steel.

9.1.3. Doors

The landing doors shall be of the horizontal sliding type designed for use with power operating devices. Landing doors shall:

1. be power operated two-piece, centre (preferred) or side opening, horizontal sliding type;
2. provide a minimum clear opening of 1 000 mm wide by a clear opening height of 2 100 mm;
3. be manufactured with clear laminated toughened safety glass in accordance with AS 2208, 10 mm thickness, mounted in door frames with a minimum width of 50 mm measured in the plane of the door, of Grade 304 stainless steel 1.55 mm minimum thickness, with satin finish;
4. have fixed glass fitted such that it is able to be readily removed and replaced when damaged;
5. have each door fitted with removable and anti-rattle guides to slide in a groove in the sill;
6. be provided with clearances not less than 4 mm from any structure and shall overlay door frames at the top and side by not less than 12 mm;

7. be fitted at the extremities of each panel with not less than two rubber bumpers designed to absorb the shock of the opening door striking the door frame angle;
8. have white colour opaque film (3M Scotchcal Series 50 or approved equivalent) adhered to the unexposed side of the lower fixed glass panels;
9. have a 50 mm wide strip of reflective graphic film colour blue (3M Scotchlite Series 680 or approved equivalent) applied to the leading edge both doors, and a 100 mm wide strip applied horizontally to the outside face of the glass between a height of 1000mm and 1100 mm above finished floor level; and
10. have an approved anti-graffiti film fitted to the outside face of the glass.

9.1.4. Door Locks, Hangers, and Tracks

All locks and mechanisms shall be provided together with necessary door suspension equipment as may be required.

All door mounting, suspension, locking and operating equipment shall be heavy duty suitable for operation in an environment where it will be subject to abuse, including complying with all requirements of EN81-71 Vandal Resistant Lifts. Details of the proposed door equipment shall be provided in the tender, including details of features that make it resistant to vandalism.

Electro-mechanical interlocks shall:

1. be provided for each landing door opening;
2. be provided with silver tipped contacts with positive wiping action; and
3. be located so that they are readily accessible for maintenance and to facilitate replacement.

Door tracks shall:

1. be for the lower track, manufactured from aluminium and for the upper track manufactured from steel. Each shall be capable of easy replacement due to wear and/or damage;
2. be fitted so as to ensure positive alignment in both the horizontal and vertical planes;
3. be fixed to the head plate of each landing door frame; and
4. be shaped to match the sectional contour of the rollers used.

The lower door tracks shall be provided with slots so that the closing doors will be able to expel rubbish caught in the channel. Two slots, 50 mm long and 8 mm wide, situated not more than 50 mm from both sides of the centre of the door opening shall be provided.

Track rollers shall:

1. be provided on each door panel a minimum of two rollers per door of minimum diameter 60 mm; and
2. be of the sealed ball or roller type bearings, factory lubricated.

Roller suspension brackets shall:

1. incorporate a ball bearing mounted steel tyre on a lockable eccentric steel pin designed to allow for adjustment and arranged to eliminate movement due to the upthrust of the door panel; and
2. be mounted so as to ensure correct alignment of the door panel.

Means shall be provided to gain access to the lift shaft as required by AS 1735. Access shall be gained by the insertion of a key to an unlocking mechanism.

Key apertures shall not be located in door panels but shall be contained in the vertical door frame jambs or the door head.

9.2. Call Panels and Indicators

9.2.1. Call Panel

At each level served by the lift, a landing call panel shall be provided mounted on the front face of the lift shaft.

The button panel shall include a graphic face plate, Visualise™ manufactured by Pitt & Co. Australia Pty Ltd of Maryborough, Qld. or equivalent approved by DPTI. The face plate shall be fixed to the wall via tamperproof stainless steel “mushroom” head type fasteners. The face plate shall incorporate tactile text and grade 1 Braille. The call button shall be a jumbo button with dual illumination white halo light when no call is registered and blue light halo when a call has been registered (Dewhurst US91-30 or approved equivalent).

9.2.2. Car Position Landing Indicator

At each landing a DesignCom LD-33 or approved equivalent LED/LCD position indicator shall be installed displaying the lift position and direction of travel. The indicator shall also display a “LIFT OUT OF SERVICE” message for the duration of the daily off period and in the event of lift breakdown, or when under maintenance.

The indicator shall be mounted on a stainless steel face plate fixed to the wall via tamperproof stainless steel “mushroom” head type fasteners and protected by a polycarbonate lens to prevent damage from vandalism.

9.2.3. Audible Indicator

An audible gong shall be provided to announce the arrival of the lift car at each landing. The audible indication shall be of electronic chime set type, with different two tone sound for each landing and shall be of the directional type for lifts required to comply with AS 1735.12. The chime shall be mounted in the landing position indicator faceplate which shall be perforated to improve the performance of the chime and be designed to prevent water entry to IP 32. The sound level output between 35 dB(A) and 55 dB(A) of the chime sets shall be designed for easy adjustment by maintenance personnel.

9.2.4. Accessible Lift Sign

A sign for the lift and access for the disabled shall be provided in accordance with AS 2899.1, with tactile text to read “Lift” and Braille to read “Accessible Lift”.

9.2.5. Highlighted Door Architrave Trims

Lift door frames to each landing shall be fitted with Reflective Graphic Film colour blue (3M Scotchlite Series 680 or approved equivalent) 100 mm wide all around the exposed face of the frame. The film shall be wrapped so that 50 mm of the film is visible when viewed from any angle.

9.3. Lift Maintenance and Services Cabinet

The lift maintenance control panel at the top landing shall be enclosed in a robust vandal resistant enclosure fabricated from Grade 304 stainless steel. This enclosure will be located on the appropriate side of the lift entrance at the top floor and shall feature a robust door with concealed hinges and a 3 point locking system with flush handle and latch, fitted with a standard groove, six pin barrel suitable for DPTI’s master keying system. The cabinet shall be weatherproof to at least IP54 standards and shall integrate into the lift shaft design.

In addition to the lift maintenance controls this cabinet will also include terminations described in the CCMB section and the time clock.

An additional cabinet of similar construction shall be provided either at the top floor on the opposite side of the landing entrance or on the bottom floor, to house the auxiliary power unit.

10. Lift Car

10.1. Details

10.1.1. Car Platform

The lift car platform shall:

1. be constructed of structural steel or structural aluminium, channel and angle sections, to an approved design to ensure ample strength without distortion under all desired design loads; and
2. be designed to accept a rigid lift car floor.

Timber floors are not acceptable.

10.1.2. Exterior Lighting

The lift car shall be provided with one 240 V fixed luminaire on top of and under the car.

The luminaires and controls under and on top of the car shall be located in protected positions to minimise damage from maintenance personnel. The fixed luminaires shall consist of industrial bulkhead fittings to AS 1735 requirements, fitted with 18 W fluorescent lamps, strong wire guards and separately controlled by a switch on top of the car for the upper light and by a switch adjacent to the overrun pit ladder for the light under the lift car.

10.1.3. Exterior Power

A double 10 A GPO shall be provided on top of the lift car.

The supply for the lift car normal light and power shall be taken from a separate two pole Residual Current Circuit Breaker (RCCB) / Miniature Circuit Breaker (MCB) on the lift control panel.

10.1.4. Interior

All materials used in the lift car interior lining shall comply with the requirements of the National Construction Code - Building Code of Australia and AS 1735, particularly with reference to combustibility characteristics and smoke indexes.

10.1.5. Workshop/Construction Drawings

Before fabrication of the lift car commences, the Contractor shall provide for review by DPTI, fully detailed and dimensioned workshop/ construction drawings of the lift car and all materials to be used.

10.1.6. Floor and Skirting

Floor finish shall be slip resistant to R10 or R11 in accordance with AS 4586. The floor shall have minimum 30% luminance contrast to any surrounding materials. Skirting to side and rear walls shall comply with the requirements of AS 1735.

10.1.7. Wall Panels

Side and rear wall (rear wall applicable to cars with only one entrance) panels shall comply with the following requirements.

Where lift car walls are glazed, clear laminated glass panels shall be used in accordance with AS 1735, AS 1288 and AS 2208, 10 mm thickness, mounted in substantial glazing channels with anti-tamper trim, able to be readily removed and replaced when damaged, with an anti-graffiti film applied to the glass.

Where lift cars walls are not fully glazed, wall panels shall be 12 mm structural plywood finished with satin charcoal pinstripe stainless steel lining ("Rimex Satin Charcoal Pinstripe" or approved equivalent), adhesive fixed with contact adhesive. Wall panels shall be secured to the car shell via concealed brackets in a horizontal format. Brackets shall be continuous at 400 mm maximum centres to provide rigid and firm panel support. Panels shall be mounted at 15 mm offset from the car shell to allow ventilation behind. Panelling joints shall be neatly folded and butted to form a smooth interior finish. A recessed clear silicone bead seal shall be installed between the panel ends and the door return to provide a moisture proof barrier at corner junctions.

Car lighting pelmets shall extend along both side walls and shall be constructed from folded satin finish stainless steel with polycarbonate diffusers and clear acrylic prismatic diffusers inside the polycarbonate sheets.

10.1.8. End Walls

The end walls and return panels of the lift car shall be in Grade 304 vertical finished stainless steel, 1.55 mm thick, satin finish.

The return shall be an integral part of the door jamb, door head and panel above the door. The internal corner joints, side to end walls, shall be square.

10.1.9. Ceiling

The ceiling finish shall be Grade 304 brushed satin finish stainless steel reinforced with marine ply or equivalent to prevent denting or distortion.

The ceiling shall have a trap door which is to be fitted with a secure key lock cylinder operable from within the car and by a handle from above to provide access to the lift car or lift roof in an emergency.

10.1.10. Handrails

Handrails shall be 42 mm OD 1.6 mm thick, Grade 304 stainless steel tube with solid non removable end caps. The finish shall be powder coat in accordance with AS 4506 Category 3, colour "Golden Yellow" in accordance with AS 2700 – Y14. The fixing method shall be tamperproof and capable of withstanding forces in accordance with AS 1170.1.

10.1.11. Interior Lighting

Lighting is to be provided such that a minimum of 200 lux illumination (horizontal at floor level) is provided in the car at all times. It should take the form of two batten fittings fitted with 'cool white' LEDs. Light fittings shall be accessible from within the lift car and shall be protected by vandal proof diffusers.

The light fittings shall be located in surface mounted Grade 304 stainless steel bulk head fittings on each side of the car. Each bulk head fitting shall extend the full length of the car and be designed so that the diffuser can be removed and the light fittings accessed, without removing more than four tamper resistant screws.

The bulk head enclosures shall have concealed ventilation openings for air circulation. These openings shall be designed to restrict insect entry

10.1.12. General Purpose Outlet

A GPO shall not be provided in the lift car.

10.1.13. Ventilation

The lift car shall be adequately ventilated with both mechanical and natural ventilation to AS 1735. An air conditioning unit shall be located on the lift car roof, ducted into the lift car to prevent the car interior temperature from rising above a comfortable level at all times. The system shall be designed to ensure that the air is uniformly distributed throughout the car without excessive noise. The air conditioner should provide cooling only.

The air conditioning unit shall be arranged to run on the auxiliary power unit for a period of up to 30 minutes in the event of mains power supply failure.

A suitably sized air extraction fan of all metal construction shall be mounted on top of the car capable of extracting not less than 8.5 m³ of air per minute. In the event that the mains power supply fails for a period greater than 30 minutes, the air conditioning unit on the car shall be arranged to shut off and

the extraction fan shall start and be maintained running by the auxiliary power unit for a further period of up to one hour. The extraction fan shall not run otherwise unless the air conditioner is detected to have failed.

10.1.14. Load Notice Panel

A Load Notice Panel shall be provided, fabricated from stainless steel, Grade 304, 2.5 mm thick, satin finish with rounded corners. The panel shall contain engraved text information including the load capacity of the lift.

The following key switches shall be located in the Load Notice Panel. The key switches shall use standard groove, six pin barrel locks suitable for DPTI's master keying system:

1. a two position Exclusive or Independent Service Key switch with label identified positions;
2. lift car ventilation fan key switch; and
3. lift car light key switch.

10.1.15. Security Camera Sign

A Security Camera Sign shall be provided by the CCTV contractor, for fixing to a wall with tamper resistant screws.

10.1.16. Operating Panels

The lift car shall have at least one car operating panel located in accordance with AS 1735, Part 12 requirements.

The button panel shall include a graphic face plate, "Visualise" sign by Pitt & Co. Australia Pty Ltd or approved equivalent. The panel shall be fixed to the wall via tamperproof stainless steel "mushroom" head type fasteners and shall incorporate the following buttons as listed below:

A single jumbo button with dual illumination (white halo light when no call is registered and blue halo light when a call has been registered - Dewhurst US91-30 or approved equivalent) shall be used as the call button. Pressing this button shall cause the lift to close its doors and travel to the opposite floor.

The open door and alarm buttons shall be LED dual illuminating using white halo light when no call is registered and blue halo light when the button is pressed (Dewhurst US 91-15 or approved equivalent). Operation of the alarm button shall be acknowledged as required by AS1735.12.

10.1.17. Indicator

LCD lift indicators shall be provided. The indicators shall be DesignCom LD33 or approved equivalent indicators programmed to displaying the current lift position. The indicator shall display the message "Call Answered" when the emergency telephone is operated and it detects that the call has been answered.

The car position indicator shall also display a "LIFT OUT OF SERVICE" in the event of lift breakdown, or when under maintenance.

The indicator shall be mounted on a face plate of stainless steel, Grade 304, 2.5 mm thick, satin finished with rounded corners and shall have a substantial polycarbonate lens to prevent damage from vandalism.

10.1.18. Voice Enunciator System

A programmable, multi-function speech enunciator unit shall be provided in each lift car, complete with loud speaker with a volume control in accordance with AS 1735.12, Section 9. Encoders and power supply shall be interfaced to lift controller, cabling and connection.

All equipment shall be mounted and located to system manufacturer's recommendations to ensure full audio coverage of the lift car passenger occupation space. The voice enunciator system shall be provided with pre-recorded speech messages using a clear voice to make suitably worded and phrased announcements.

The wording for the messages will be provided by DPTI.

The sound level output from the voice enunciator shall be between 35 and 55 dB(A).

10.2. Doors

The car doors shall be of the horizontal sliding type designed for use with power operating devices. Lift car doors shall:

1. be power operated horizontal sliding type, two-piece, centre (preferred) or side opening;
2. provide a minimum clear opening of 1 000 mm wide by a clear opening height of 2 100 mm;
3. be manufactured in single panel form, with a minimum width of 50 mm measured in the plane of the door, of Grade 304 stainless steel, 1.55 mm minimum thickness, with satin finish;
4. contain clear laminated glass panels in accordance with AS 1288 and AS 2208, 10 mm thickness, mounted in door frames and able to be readily removed and replaced when damaged, within one hour;
5. have the bottom edge of each door fitted with removable and anti-rattle guides to slide in a groove (track) in the sill;
6. have a retaining plate fitted to the bottom of the door between the door guides that projects into the door sill;
7. be of proven design with maximised glazed area matching that of the landing doors, with framing suitably reinforced as required to provide a rigid assembly, finished flush and free from distortion;
8. be provided with clearances not less than 4 mm from any structure and shall overlay door frames at the top and side by not less than 12 mm;
9. be fitted with shields to prevent unauthorised access to control equipment and electrical wiring in the door cavity;
10. be fitted at the extremities of each panel with not less than two rubber bumpers designed to absorb the shock of the opening door striking the door frame angle;

11. have white colour opaque film (3M Scotchcal Series 50 or approved equivalent) adhered to the unexposed side of the fixed glass panels below a height of 1100 mm;
12. have a 50 mm wide strip of Reflective Graphic Film colour royal blue (3M Scotchlite Series 680 or approved equivalent) applied to the leading edge of both doors; and
13. have an approved anti-graffiti film applied to the glass.

10.2.1. Locks, Hangers and Tracks

All locks and mechanisms shall be provided together with necessary door suspension equipment as may be required. All door mounting, suspension, locking and operating equipment shall be heavy duty and suitable for operation in an environment where it will be subject to abuse including complying with all requirements of EN81-71 Vandal Resistant Lifts.

Electro-mechanical interlocks shall:

1. be provided for each car door opening;
2. be provided with silver tipped contacts with positive wiping action; and
3. be located so that they are readily accessible for maintenance and to facilitate replacement.

Door tracks shall:

1. be for the lower track, manufactured from aluminium and for the upper track manufactured from steel. Each shall be capable of easy replacement due to wear and/or damage;
2. be fitted so as to ensure positive alignment in both the horizontal and vertical planes, to each header plate of car door frame; and
3. be shaped to match the sectional contour of the rollers used.

The lower door tracks shall be provided with slots so that the closing doors will be able to expel rubbish caught in the channel. Two slots, 50 mm long and 8 mm wide, situated not more than 50 mm from both sides of the centre of the door opening shall be provided.

Door hangers shall:

1. be fitted with two door hanger rollers to each door panel; rollers shall be rubber tyred steel or nylon and shall rotate on lifetime lubricated, sealed ball or roller type bearings; and
2. have roller suspension brackets incorporating a ball bearing mounted steel type on a lockable eccentric steel pin, designed to allow for later adjustment, arranged to eliminate movement due to the upthrust of door panels; suspension brackets and hanger tracks shall be adjustable to provide correct alignment of car door panels.

10.2.2. Operator and Controller

Car door operator types shall be heavy duty and suitable for operation in a public environment where it will be subject to abuse. Mechanical linkages are preferred to toothed belts for vandal resistance. If belts are used to drive doors they shall be guarded and arranged so that they cannot be interfered with from the doorway.

Full documentation shall be provided for car door operators, landing and car door assemblies to allow assessment of suitability. Equipment deemed unsuitable will be rejected. The various time elements of the door operating cycle, pre-opening, opening/closing and dwell times shall be individually and precisely adjustable. The door passenger protection system shall seamlessly interface with door operation control.

The car door operator shall have self-resetting stall protection, operating in both directions of travel to prevent damage to either the door operator or associated control circuits. A suitable arrangement shall be similar to 15 seconds door motor operation followed by a 45 second shut down/cooling down period. After the 45 second shut down period, the door shall attempt to open or close as appropriate. This 60 second cycle shall be capable of continuous operation.

Car door operators using fuse or circuit breakers that require manual reset for stall protection shall not be used.

The door operator control system shall ensure consistent door velocity, acceleration and deceleration rates, irrespective of the air pressure that may be exerted on the door sets from time to time and at the maximum torque and velocity allowed in accordance with AS 1735.

The door operator shall be capable of arresting and reversing the movement of closing doors within 50 mm without obvious reaction to the car superstructure.

The method of coupling car and landing door sets shall be firm and positive and not allow any "float" between them. The coupling design shall prevent damage to equipment should the doors be opened manually during travel.

Car doors shall be fitted with a mechanical locking device which only permits the car doors to be opened when the car is in the unlocking zone regardless of the horizontal distance between the car sill and the inner surface of the lift well.

10.2.3. Protection Devices

The lift car doors shall be provided with an approved passenger protection system consisting of the following major items together with all necessary controls and associated equipment.

10.2.4. Light Curtain

Passenger protection during door operation shall be by an approved electronic door area scanning device operating in accordance with the requirements of AS 1735.12, Clause 4.2. In the event of an object being within the door scan area, the door operator shall prevent the door from contacting the object during normal operation. Such devices shall only be located between the landing doors and the car doors and shall be mounted in a manner that prevents interference with the device.

10.2.5. Delayed Door Closing Facility

All equipment and controls necessary for delayed power closing of the doors (nudging) shall be provided in accordance with AS 1735. The control system shall be fitted with an override feature that when operated, prevents operation of the delayed door closing facility so that the doors remain open with the warning buzzer sounding after 20 seconds until the cause of the circuit failure or defect is rectified.

At the commissioning of the lift, the operation of the delayed door closing facility shall be satisfactorily demonstrated to DPTI. The delayed door closing facility will then be deactivated so that in the event of the door light curtain being obstructed the door will remain open.

10.2.6. Door Open Dwell Time

When the lift arrives at a landing, the doors shall automatically open and remain fully open for a minimum of seven seconds and adjusted to ten seconds as determined by passenger traffic, before closing and if a light beam is interrupted when the door is closing, the door shall re-open and remain open for a minimum of 7 seconds or until the light beam is re-established.

10.2.7. Lift Landing Access Devices

Lift landing access devices shall be located at every level in the door jamb. Access devices located in doors will not be accepted.

11. Electrical Services

11.1. Communications and CCTV

11.1.1. Conduit and Ducting

Wherever practicable, all communications and CCTV wiring shall be run in a duct and/or conduit which meets the requirements of AS 1477, AS 1735, AS 2053, AS 3080, AS 3084 and AS/ACIF S009. Care shall be taken to ensure that ducts and conduits do not interfere with free access to any equipment or appliance installed as part of this installation.

PVC conduit and fittings for communications and CCTV cabling shall be ACMA CCL listed Communications Conduit – White. All underground conduit and all conduit provided for draw-in cable access shall comprise rigid straight sections and rigid sweeping bends, with a maximum conduit occupancy of 25% (as a proportion of sum of cable cross section areas to the inner cross section of the conduit) after the completion of specified works.

All ducting and conduits which are exposed, accessible to the public and within 2.4 m of ground or platform level, shall be provided in steel, or where PVC is used, covered with an appropriate steel cover to prevent vandalism.

11.1.2. Communications Cabling Marshalling Box (CCMB)

A CCMB shall be provided in the lower section of the lift control panel enclosure.

The internal clear dimensions of the CCMB enclosure shall be suitable for the required equipment.

The CCMB shall be fitted with suitable terminals to interconnect the lift side wiring with the external wiring for:-

1. lift telephone;
2. lift car CCTV;
3. lift status signals;
4. lift car Internet Protocol device cabling;
5. public Address System speaker;
6. lift shaft smoke detector;
7. time clock over ride signal;
8. CCTV alarm contact signal;
9. air conditioner failed (car over temperature); and
10. lift shaft over temperature.

All cables entering and leaving the CCMB shall be suitably tagged and marked for identification to DPTI's approval. All terminals shall be segregated as required and clearly marked with identification. Miniature screw terminals of the DIN-rail mounting style or suitable telecommunications 'disconnect module' terminations shall be used as appropriate.

The CCMB shall contain only ELV voltage levels (excluding the PI Speaker).

As an alternative to hard wired signalling and communications an interface unit designed to communicate using the mobile phone network may be installed in place of the CCMB, subject to DPTI's approval.

11.1.3. Emergency Help Phone

A hands-free, autodialling emergency help phone shall be provided in the lift car ceiling. The unit shall consist of a speaker and microphone concealed behind a cover panel. The telephone shall automatically operate via the alarm button. The communication system shall operate in accordance with the requirements of AS 1735, Part 12, Section 9. The communication system shall be a "Design Com Technologies EM-C83" or approved equivalent. All work shall conform to ACMA requirements and relevant AS/ACIF standards, Codes and Regulations.

Phones shall be fitted with an adaptor to allow operation on the 4G network. The adaptor shall have a battery fitted that will power the adaptor for a minimum of 3 hours in the event of a power failure.

Unless specified otherwise each lift shall be equipped with a lift telephone (DesignCom Technologies EM-C83-QRT or approved equivalent). It shall be capable of ringing a minimum of 2 numbers in sequence. The following parameters shall be configured:

Max talk time:	3 minutes
Auto-Answer:	ON
Number to be dialled:	1. 1300 171 521 (shift manager) 2. Lift Maintenance contractor's emergency line

The telephone shall be connected so that one of the relay outputs provides a CCTV synchronising signal when the telephone is activated. The other alarm

relay output will be used to cause a “call answered” message to display in the car position display. The LED screen inside the lift car should display ‘alarm received and help on way’.

DPTI shall be given seven days written notice of the required date for commissioning the Emergency Help Phone.

11.1.4. CCTV Camera Provisions

An Indigo Vision 9000 series fixed IP dome camera complete with processor cooling fan and housing tamper switch shall be fitted to each lift car (with supply and installation of the camera, and connection from the CCMB to the CCTV equipment rack being part of the CCTV system scope of work). The cameras shall be connected to a POE port on the site CCTV Local Area Network, recorded on the CCTV system Network Video Recorder and monitored by the DPTI Security Hub and CCTV Monitoring Control Centre.

The camera 24 V DC power shall be extended from marshalling screw terminals at the CCMB to the camera through a dedicated CCTV 2-core ELV travelling cable with at least 1 mm² cross section conductors. A 2 m 2-core tail shall be provided above the lift car ceiling for termination to the CCTV camera terminals by the CCTV installer.

The Cat5 travelling cable shall be run from the CCMB to the lift car roof (with 2 m service loop above the lift car), and left for termination to a Cat6 outlet inside the camera housing by the CCTV installer.

The CCTV scope of work shall include:

- a) provision of a Cat6 cable from the CCTV Local Area Network node to the CCMB and testing of the end to end circuit to the camera to AS 3080 Cat5 performance, and
- b) provision of 1.0 mm² or greater 24 V DC fuse protected supply from the CCTV LAN Node 24 V DC power distribution to the CCMB ELV connection terminals for the CCTV camera.

DPTI shall be given 21 working day’s written notice of the actual date for the coordination and commissioning of the CCTV camera system.

The CCTV cameras are provided with integral housings suitable for surface mounting. The provision of cable feed through holes and a secure mounting surface at the camera fixing points shall be coordinated with the CCTV scope of work.

The camera signal cabling shall be installed, leaving 2 m tails at the camera housing, and terminated at the CCMB as indicated above. Sealing grommets shall be used where cabling passes through walls, housings and marshalling boxes.

11.1.5. Lift Failed Alarm

Relay contacts shall be provided with terminals in the CCMB enclosure to monitor all functions that would normally cause the lift to cease operation. The monitored functions shall include

1. safety circuits;
2. fail to start circuits;

3. motion controller faults;
4. door system faults, including entrance protection failure; and
5. power supply phase/s failure.

The alarms shall be extended by the CCTV Scope of Work to the CCTV system alarm interface unit and configured for extension to DPTI's alarm monitoring provider

11.1.6. Public Address System

Public Address Systems are only applicable where the lift is immediately adjacent to a platform.

A speaker shall be provided suitably mounted on top of the lift car and adjusted so that announcements are clearly audible in the lift car. The speaker shall be a TOA CS-64 or approved equivalent. This is a 100V line speaker and all wiring to the speaker shall be carried out in accordance the requirements of AR-PW-PM-SPE-00129016 Passenger Information Systems and comply with AS/ACIF S009. A dedicated 2-core LV travelling cable shall be used for the speaker. The speaker wiring shall terminate at the CCMB for connection to the station wiring, shall be doubled insulated and shall have a brown sheath where practicable.

11.2. Control Equipment

11.2.1. Supervisory Control System

The operation of the lift shall be of the single button "simplex" system arranged for "without attendant" operation. The system shall be operated by a single button within the lift car and call buttons on each landing served by the lift. A single call station shall be provided at each landing.

11.2.2. Mode of Operation

The system shall be arranged to enable the car to answer a car call and a Landing Call registered for the direction in which the car is travelling as it approaches the landing at which a call has been made.

On arrival at a landing, in response to a landing call, the car shall hold for a predetermined period to allow sufficient time for registration of a car call. Upon expiration of such time and providing that car and landing doors are not held open, the car shall proceed in response to previously registered car call or other Landing Call.

Pressure on the door open button or operation of a landing button at the floor at which the lift is parked, shall stop and re-open the doors during the closing operation or shall cause the closed doors to open.

11.2.3. Levelling

Levelling shall be accomplished in a straight, step-less manner from lift car floor to landing floor, to achieve accuracy, under all load and direction conditions, of plus or minus 3 mm. Equipment shall re-level the car to within the stated accuracy should the car run past a floor during loading or unloading of the car. Re-level speed shall not be in excess of 0.025 m/second and shall be smooth and free from noticeable jerk. Changes in speed and final stop shall be accomplished smoothly.

11.2.4. Automatic Travel on Power Failure

Upon loss of mains power supply to the lift system, all equipment, interfacing and controls shall be provided to cause automatic operation of the lift at a controlled speed to a floor level, followed by one Door Open + Door Close cycle before withdrawal of the lifts from service with doors closed.

11.2.5. Exclusive or Independent Use Service

An exclusive service key switch shall be provided to enable the lift to be removed from automatic passenger service. The key switch shall be standard groove, six pin barrel locks suitable for the Principal's master keying system.

The key switch shall be an "OFF" - "ON" switch with the key removable in the "OFF" position only. Selection of the "ON" mode shall cause the lift to park at any floor, with doors open and landing call buttons out of service. When the lift is switched to exclusive or independent service, the Car Position Landing Indicator shall display on each landing a "LIFT OUT OF SERVICE" message for the duration of the time that the lift is switched to exclusive or independent service.

The switch escutcheon shall be identified by the functional label "EXCLUSIVE", with all switch positions also clearly labelled and shall finish flush with the mounting plate.

11.2.6. Lift Operation Control

Each lift shall be fitted with time clock control to enable the lift operation times to be set.

The time clocks shall be Theban TR 642 top2 RC article number 6420300 with Theban Top2-GPS antenna article number 9070610 (or equivalents approved by DPTI). The time clock shall be housed in the Lift Control Panel Cabinet on the top landing. The antenna shall be mounted at the top of the lift shaft where it has a clear view of the sky.

A temporary override function shall be provided for each lift which can be activated by a remote ELV contact closure. On application of this signal the time clock shall revert to lift normal operation for a pre-programmed period.

The time clock/lift controller interface shall be configured to provide the following:

1. throughout the daily "ON" period, normal lift service shall be available;
2. throughout the daily "OFF" period, the lift controller shall respond to all car operating panel commands, but not respond to Landing Call button operation;
3. at the commencement of a daily "OFF" period, the lift shall complete its current travel to the last destination level selected, and if no further Car Operation Panel calls are initiated within a suitable time (field adjustable), close doors, travel to the upper Level, and Park, with doors closed; and
4. "LIFT OUT OF SERVICE" message shall be displayed in the landing car position indicator.

Station specific time clock on/off settings and exception days shall be obtained from DPTI.

A time clock over ride switch shall be provided in the lift control panel to override the time clock for maintenance operations and shall be labelled for function.

11.3. Electrical Installation

11.3.1. General

All electrical works shall be carried out by electrical tradespersons who are licensed and experienced in this class of work.

The completed electrical installation shall be certified by a licensed Electrical Contractor, who shall complete an 'Electrical Certificate of Compliance'.

The completed telecommunications installation shall be certified by a licensed Cabler, who shall complete a 'Certificate of Compliance', form TCA1.

The 'Certificates of Compliance' shall be lodged as part of the Quality Records for this work. The installation shall be in accordance with the requirements of Regulations, AS 3000 and AS 1735 including the colour coding of both three and single phase wiring.

11.3.2. Earthing System

Arrangements for the interfacing of earthing requirements in overhead wiring areas require individual designs validated by suitable persons as designated by DPTI.

11.3.3. Electrical Ducting and Conduit

Wherever practicable, all wiring including Extra Low Voltage (ELV) shall be run in electrical duct and/or conduit which meet the requirements of AS 1477, AS 1735; AS 2053 and AS 3000. Care shall be taken to ensure that ducts and conduits do not interfere with free access to any equipment or appliance installed as part of the works.

PVC conduit and fittings for electrical cabling shall be Heavy Duty – Colour orange.

PVC conduit and fittings for electrical cabling exposed to sunlight shall be Light Duty – Colour grey.

All ducting and conduits which are exposed and, accessible to the public and within 2.4 m of ground or platform level, shall be provided in steel, or where PVC is used, covered with an appropriate steel cover to prevent vandalism.

Conduits and ducts shall be securely attached where they enter equipment boxes and casings.

Flexible conduit shall be installed where switchgear or operating devices may be subject to vibration or require adjustment to their position after installation. Flexible piping or conduit shall not be kinked and shall be protected in position where it is likely to be damaged.

Where double insulated flexible cable is used to make difficult connections or where there is a need for adjustment, this mechanically unprotected cable shall be kept to a minimum and shall not exceed 500 mm in length.

11.3.4. Wiring

Except where otherwise specified, power, control and other fixed wiring shall be PVC insulated cables.

Wiring shall terminate in lugs, ferrules or terminal clips. All cables shall be of such size as to prevent excess voltage drop. Connections to resistors that are subject to appreciable temperature rise shall be made with flame resistant cables brought out to clearly marked terminal blocks, all in accordance with AS 3008.

In accordance with AS 1735, conduit ducts and other equipment not associated with the lift installation shall not be installed in the lift pit or the lift shaft.

11.3.5. Lift Shaft Lighting

Adequate lift well lighting shall be provided in accordance with AS 1735.

Light fittings shall be minimum single 36 W fluorescent fittings, suitably guarded, located clear of lift shaft rails, and like items of equipment. The fittings shall be fixed with plated steel screws.

Each light fitting shall be provided with a three core PVC flex and plug top. The flex shall not exceed 600 mm in length.

Three-Pin plug sockets shall be provided for each lift shaft light fitting and shall be controlled by two-way switching located at the top and bottom of the shaft.

The lift shaft lighting shall be supplied from a two-pole RCD circuit breaker. The circuit breaker shall be labelled "Lift Shaft Lighting".

11.3.6. Wiring Diagrams

One complete set of bound schematic As Constructed wiring diagrams for the lift installation shall be provided. All control wiring shall be labelled and referenced to the labelling diagram.

All equipment shown on the diagrams shall be named or represented by a symbol, and a schedule of symbols, indicating the name of each part so represented, shall be included on the diagrams.

Switch and relay operating times and other relevant information such as priorities and similar items shall be set out in an appropriate schedule in a manner which will permit easy checking of the functioning of the equipment against the original setting.

All diagrams shall be new and unmarked at the time of practical completion of the installation and shall be placed, unfolded in individual protective clear

polythene envelopes. Only one diagram will be placed on each sheet with one sheet per envelope. The set shall be provided with an index sheet.

11.3.7. Lift Main Isolator

A four-pole lockable isolating switch shall be provided in the Lift Control Panel. The lift sub-mains shall be terminated directly at this isolation switch.

The sub-mains to the lift main isolator and final connection to the lift main isolator will be made by other trades.

This isolation switch, neutral and earth links shall be treated as the electrical point of connection between the lift installation and the building electrical installation. This isolation switch may be a circuit breaker rated at a minimum of 6 KA and shall comply with AS 1735.

Operation of this isolating switch shall isolate the lift and prevent operation and discharge of the emergency power supplies as described in Clause 11.2.4 Automatic Travel on Power Failure.

11.3.8. Circuit Breakers

Circuit breakers used to protect circuits for car light and power, shaft lights, emergency power supplies and the like, where the connection is to the lift sub mains and not through an isolating transformer, shall be protected by individual circuit breakers incorporating RCD protection that operate in all circuit active and neutral conductors simultaneously.

General lighting and power circuits shall be protected by RCD's with 30 mA earth leakage protection.

All circuit breakers shall have a minimum fault level of 6 KA.

11.3.9. Electrical Supply

The electrical supply will be 400/230 volts, +10%, -6%, 3 phase, 4 wire, 50 Hz in accordance with SA Power Networks Service Rules and Conditions of Supply. Design and utilise only systems and equipment to be capable of guaranteed rated performance on both present and future supply voltages.

12. Commissioning and Maintenance

12.1. As Constructed Drawings

A complete set of "As Constructed" drawings including electrical and communication schematics shall be provided within 14 days from the Date of Practical Completion.

All changes to equipment and services layouts, wiring, and any other items which may have been incorporated into the works, which will assist DPTI in carrying out future maintenance and/or additions to the installation shall be recorded during the progress of work.

One print of each drawing shall be submitted for review by DPTI. Following review and any necessary amendments required by DPTI, the original transparency of each drawing shall be provided to DPTI. The title block on each drawing will refer to the station/location in which the lift/s have been installed.

One full set of prints shall be inserted into each of the Maintenance Manuals.

12.2. Lift Operations Maintenance Manuals

Two bound copies of the Lift Operation Maintenance Manuals for the complete lift installation shall be provided within 14 days of the Date of Practical Completion. A draft copy shall be submitted to DPTI for approval prior to printing and issue.

The manuals shall contain the minimum information, as set out below, plus any other information that DPTI determines would be of assistance.

1. one set of the full size copies, minimum size A3, of Works as Executed drawings for the lifts, electrical, mechanical and communications;
2. maintenance procedures – details on cleaning surfaces and recommended cleaning products;
3. maintenance procedures – detailed maintenance plan for the Defects Liability Period describing components and service intervals;
4. maintenance procedures – detailed on going maintenance plan after the Defects Liability Period describing components and service intervals;
5. signed copies of all commissioning/acceptance test results as well as final defects clearance;
6. name, address and telephone number of manufacturers of non propriety equipment (manufactured by other than this lift manufacturer), i.e. lift controllers, hoist machines, door operators and assemblies, smoke detectors, lift key switches, etc;
7. telephone number for routine and breakdown service; and
8. any other information that may be felt necessary during the course of this contract.

The manuals shall be neatly bound in a White Vinyl hardback folder, with inserted page on the front, in the following format:

OPERATION & MAINTENANCE MANUAL
FOR LIFT INSTALLATION AT insert station name and location

12.3. Testing and Commissioning

The Lift Contractor shall test the installation in accordance with the requirements of AS 1735 and to the requirements of DPTI. Written notice shall be given to DPTI of all tests at least seven days prior, to enable a representative to be present. If the lift fails to comply with the above requirements the Contractor shall make all alterations, adjustments and replacements etc., as may be required to make the lift comply. Practical completion shall not be given until satisfactory results are obtained, and the Specification details have been complied with. The Contractor shall provide to Safe Work SA all the necessary documentation and pay all fees required for the registration of the installation. If registration is not granted, the Contractor shall take whatever action is required to ensure the registration of the installation at their own expense. The Contractor shall further provide DPTI with copies of all documentation as required and provided to the Authority. In addition the Contractor shall consult with DPTI to ensure the registration details, including, Owner, Owner Address, Equipment Identification, etc., are correct, prior to lodgement. The Contractor shall provide all facilities, labour, weights, apparatus, instruments, recording devices etc, which may be required for the testing of the lift.

In addition the Contractor shall ensure that:

1. the entire lift installation is cleaned and free of all rubbish etc., prior to testing;
2. adequate protection for the area adjacent to the lift is provided in case of malfunction during testing;
3. all communication systems are working prior to the commencement of testing;
4. all landing fittings and appointments are operating correctly;
5. all doors are operating smoothly and correctly;
6. all noises are eliminated, a smooth ride has been obtained and levelling is accurate; and
7. all interface services with other trades have been fully tested and commissioned.

All measuring devices used shall be calibrated and certified by a NATA registered organisation.

The results of all tests and performances shall be documented, copies supplied to DPTI and also incorporated into the Maintenance Manuals.

Such tests shall include:

1. contract speed test in both UP and DOWN travel directions, at full contract load;
2. full load safety gear test;
3. balance load test and full load tests;
4. levelling test;
5. control system performance test which shall include continuous operation of the lift at full load for a minimum of one hour;
6. temperature rise test;
7. demonstration of Starts per Hour, duty cycle, rating, compliance, Round Trip protective equipment test;
8. demonstration of correct operation of all alarms; and
9. any other tests to approval.

The timing of these tests shall be satisfactory to DPTI.

Prior to acceptance, DPTI will inspect all equipment and finishes for appearance and quality of finish. Any work not in accordance with the intent of this Specification shall be rectified without delay.

12.4. Registration of Plant

Six weeks prior to the expected testing and commissioning of the lift/s, the Contractor shall lodge with DPTI any required registration forms.

The form/s shall be completed and shall show the Serial Number of each lift, matched with the site Lift Number. DPTI will arrange for the completion of the form/s and return for lodgement by the lift contractor with Safe Work SA.

12.5. Verification

Certification that the lift complies with the Specification, relevant legislation and all applicable codes shall be provided.

A copy of all completed test and commissioning documents shall be provided to DPTI. These documents shall identify all non-conformances / defects and the name/s of person/s carrying out the certification process.

The lift shall not be permitted to be used by the general public or customers until full compliance with all relevant Legislation, the plant has been registered and the CCTV cameras and Emergency Help Phone/s have been activated.

12.6. Defects Liability Period

Defects in lift operation and equipment shall be corrected during the Defects Liability Period.

12.7. Maintenance and Servicing

Regular and systematic inspections, minimum frequency monthly, shall be provided, together with a 24 hour call out service for all items of equipment provided as part of these works for the duration of the Defects Liability Period.

The 24 hour call out response time between receipt of breakdown advice and the arrival by the technician on site shall not exceed:

1. Non Urgent Breakdown – 60 minutes;
2. Urgent Breakdown (e.g. passenger trapped) 30 minutes between 0700 hours and 1800 hours weekdays; and
3. Urgent Breakdown (e.g. passenger trapped) 60 minutes other than between 0700 hours and 1800 hours weekdays.

All costs of maintenance, adjustments, testing and servicing during the Defects Liability Period, including the provision of 24 hour call out service for breakdowns, shall be included in the tendered price for “Maintenance and Servicing of Lift/s”.

Repair works considered necessary as a result of vandalism will be paid for by the Principal, at cost price plus 10% for overheads and profit, providing:

1. DPTI is notified of the details of the alleged vandalism within 48 hours of the callout so that the Station/Lift CCTV video footage can be inspected to verify or otherwise the claim;
2. The details of the problem and the repair work carried out are recorded in the Lift Record book; and
3. The account for such maintenance is forwarded direct to DPTI.

12.8. Records

A bound duplicate lift record book shall be provided in the door pocket of lift control cabinet. All maintenance and breakdown visits, call out records, including vandalism and defect rectifications shall be recorded in this record book. The records shall detail the date, time, fault reported and corrective action made.

The record books are the property of DPTI and shall be maintained in good order for future use by lift maintenance personnel.

13. Programming, Staging and Payments

Within 21 days of the Date of Acceptance of Tender, the Contractor shall submit a detailed installation program to DPTI for review. The program shall show critical lead times for delivery, installation of equipment and provision of power supply.

The Contractor shall advise DPTI, within 21 days after the Date of Acceptance of Tender, of the requirements for power supply for the starting and running of the lift/s. DPTI will place an order with the Electricity Supplier to carry out any necessary alterations to the electrical service to the facility, DPTI shall then have no further involvement in ensuring that the power supply is available to meet lift/s installation and commissioning program.

If alterations to the installation program are required through necessity, copies of the new program shall be submitted to DPTI for review. All notices to, or requests for advice/assistance from DPTI in this specification shall be in writing and unless stated otherwise, DPTI shall require seven working days advance notice before actioning that notice or request.

The tendered price for Design, Supply and Installation of Lift/s shall include the cost of all labour, materials and plant to provide a fully tested and commissioned lift/s in accordance with this Specification. Payment for the Design, Supply and Installation of Lift/s will be made on the following basis:

- a) 10% on receipt of the detailed program;
- b) 50% on commencement of lift installation on site;
- c) 30% on commissioning of lift; and
- d) 10% on receipt of approved lift Manuals including “As Constructed” drawings, the results of lift testing, rectification of minor defects and/or omissions.

Payments will be made in the course of normal Progress Payments for the Contract. Payment for the Maintenance and Servicing of Lift/s during the Defects Liability Period and up to the time the lift/s have been finally accepted by DPTI will be in equal monthly amounts, paid in arrears at monthly intervals of the tendered amount for Maintenance and Servicing of Lifts.

APPENDIX 1

The attached schedules shall be completed and submitted to DPTI with the Tender:

SCHEDULE 24.12.2 Technical Particulars of Lifts

SCHEDULE 24.12.3 Performance of Lift Subcontractor

SCHEDULE 24.12.2 - TECHNICAL PARTICULARS OF LIFTS

Where more than one lift, photocopy pages for additional lifts

ITEM	LIFT NO.
Lift Manufacturer	.....
Certificate of Quality Assurance Attached	
Confirm that Lift Design Complies with EN81-71	Yes / No
Hoist Machine Type and Manufacturer	.....
Hoist Machine Drive (Ropes or Belts)	.....
Lift Controller Type and Manufacturer	.....
Lift Contract Load (kg)	.....
Car Interior Dimensions (L x D x H)	..... X X
Lift Contract Speed (Metres/Sec)	.....
Plant Duty Rating – Starts per Hour	.....
Minimum Size of Lift Sub Mains Electricity Supply	.....amps
Full load Starting Current Lift Motor – up. (guaranteed max.)	.....amps
Full load Running Current Lift motor – up. (guaranteed max.)	.....amps
Guaranteed levelling accuracy, - maximum	Full Load..... No Load.....
Door Operator Type and Manufacturer	.....
Car Door Operation - Make and Model No.	.....
- Method of speed and torque control	.....
Passenger Door Protection - Make and Model No.	.....
Landing Door Assembly - Make and Model No.	.....
Make and Part No. Trailing Cables - CCTV	.....

ITEM	LIFT NO.
Help Phone - Emergency
Circuits - Control
Car Fixed Ventilation Openings	..... % of inside car floor area
Car Ventilation Fan - Make and Model No.
- Capacity	..... m3/hr
Car Air Conditioner - Make and Model No.
- Capacity
Car guides - Rollers	Dia.mm..... Number.....
Counterweight guides - Rollers	Dia.mm..... Number.....
Car Control Buttons - Make and Model No.
Car Position Indicators - Make and Model No.
Landing Call Buttons - Make and Model No.
Landing Indicators - Make and Model No.
Voice Annunciator System - Make and Model No.
Lift Shaft Smoke Detection System - Make and Model No.
Lift Pit Sump Alarm System - Make and Model No.
Auxiliary Power Supply System - Make and Model No.
- battery capacity or amp hour rating
- max continuous current delivery for 2 hours
- anticipated current demand averaged over 2 hours
Automatic Travel on Power Failure System - Make and Model No.
- battery capacity or amp hour rating

- operating duration after power failure	.....
- reserve capacity in door open and close cycles	.....

QUALITY REQUIREMENTS**TABLE 1 PROCESS REQUIREMENTS FOR DOCUMENTED CONSTRUCTION PROCEDURES,
LOT IDENTIFICATION AND TRACEABILITY**

CONSTRUCTION PROCEDURE	LOT IDENTIFICATION	TRACEABILITY
Required 14 days prior to start of construction	Each lift = 1 Lot	Each lift numbered per as drawings

TABLE 2: AUTHORITY AND RESPONSIBILITY FOR SPECIFIED INSPECTION/APPROVAL POINTS

ACTIVITY	INSPECTION POINT	CLAUSE REF.	LEVEL OF INSPECTION	INSPECTION RESPONSIBILITY
Program	21 days from the date of acceptance of tender		Hold Point	DPTI
Electrical Power Requirements	21 days from the date of acceptance of tender		Hold Point	DPTI
Shop Drawing	28 days from the date of acceptance of the tender		Hold Point	DPTI
Voice Annunciator System	Prior to lifts going into service		Hold Point	DPTI
Wiring Diagram	Prior to lifts going into service		Hold Point	DPTI
Lift Manual	Within 14 days from Date of Practical Completion		Hold Point	DPTI
Notification of Lift Testing	One week prior to testing taking place		Hold Point	DPTI
Testing and Commissioning	At time of testing		Hold Point	DPTI
Registration of Plant	Six weeks prior to expected testing		Hold Point	DPTI
Certification	Prior to lift being used by the general public or customers		Hold Point	DPTI

TABLE 3: MINIMUM INSPECTION AND TEST REQUIREMENTS

ACTIVITY	QUALITY VERIFICATION REQUIREMENT	CLAUSE REF.	MIN. TEST FREQUENCY	MIN. REQUIREMENT
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Lift Installation	AS 1735, Parts 1, 2 & 12, AS 1428		Each Lift	Each Lift
Lift Testing	AS 1735, Parts 1, 2 & 12, AS 1428		Each Lift	Each Lift