

1. Description of the works

1.1. Supply, installation and support and maintenance of lifts at the following buildings:

1.1.1. Braamfontein Centre;

1.1.2. Medical School- Animal Unit;

1.2. The lifts will be supplied, installed and maintained in accordance with the timelines set out in this scope of work.

2. University's Objectives

2.1. The aim of this project is to:

2.1.1. replace the passenger lifts at Braamfontein residence and Medical school- Animal unit. These lifts have come to their end of life cycle and the cost of corrective maintenance has increased drastically. The current technology of these lifts is outdated and it is difficult to find spares;

2.1.2. comply with the lifts regulation requirements according to the Occupational Health and Safety Act 85 of 1993;

2.1.3. ensure that the minimum COVID-19 requirements are met- highly minimised probability of lifts stuck with passengers;

2.1.4. provide value adding improvements on the buildings.

3. Overview

3.1. The work included in this specification comprises the design, supply, delivery installation, testing, commissioning and maintenance of the vertical transportation systems.

3.2. This specification is designed to ensure that the University obtains a consistent product and that the product installed must:

3.2.1. be designed for its intended usage;

3.2.2. be fit for purpose for its intended purpose and within budget;

3.2.3. be reliable;

3.2.4. comply with the codes of the day and requirements of any authority having jurisdiction over the work;

3.2.5. be readily maintainable by a third party;

3.2.6. be supported by the manufacturer for its intended life cycle.

3.3. The work in this specification includes the following to be performed by the successful service provider:

3.3.1. confirmation of structure dimensions prior to compilation of detail drawings.

3.3.2. provide driving machines, controllers and associated equipment;

- 3.3.3. provide lift cars complete with platform, frames, superstructure, ventilation, lighting, and all normally supplied accessories including complete interior fit out to architect and consultant approval;
- 3.3.4. provide car and landing doors, sills and frames complete with operating mechanisms;
- 3.3.5. provide landing doorframes and sills;
- 3.3.6. provide guides and supports, ropes, counterweight, buffers, travelling cables etc. Travelling cables are to include cores for communications, CCTV and security equipment plus 10% spare capacity;
- 3.3.7. provide interfaces and cabling infrastructure for access control, fire service;
- 3.3.8. provide shaft and landing equipment including shaft flushing, sill support angles and sills, shaft trimmer beams, pit ladders and screens to openings as required;
- 3.3.9. provide, maintain and remove (when no longer required) temporary hinged screen cages to lift shaft door openings during construction;
- 3.3.10. provide fire-rating behind controller cabinets, call button and hall lantern boxes in accordance with the relevant regulation
- 3.3.11. provide all mechanical and electrical safety devices;
- 3.3.12. provide circuit breaker protection to all light and power circuits within car and lift shaft;
- 3.3.13. provide emergency five-way voice (including VOIP) communication system as prescribed;
- 3.3.14. provide for painting of all lift equipment in the lift shaft;
- 3.3.15. provide all statutory signage;
- 3.3.16. provide lift shaft lighting and general power outlets where required;
- 3.3.17. provide scaffolding for the lift installation;
- 3.3.18. provide (and clean out after installation) all concrete inserts/shaft bracket attachments;
- 3.3.19. provide pit sump covers where required;
- 3.3.20. provide protective blankets if required;
- 3.3.21. Provide any ESD options, i.e. Power saving options/devices etc.;
- 3.3.22. obtain all necessary statutory authority approvals;
- 3.3.23. provide all as-built drawings and operating manuals. Manuals and drawings are to be provided in hardcopy and CD-ROM format;
- 3.3.24. provide on-site training to client representatives on correct operation of vertical transport equipment prior to handover; and

Note: The successful service provider must provide all machines, labour, cartage, tools, plant and appliances

necessary for the installation together with all minor and incidental work necessary to complete the works, but which may not be specifically mentioned above to ensure a compliant installation.

4. Equipment included

4.1. The detail lift requirements are detailed in this scope of work, the bill of quantities (see Annexure C.1 ; C2 and C3), and the specifications listed below:

Building	Braamfontein Centre		Wits Medical Centre
Lift ID	A (01L3098)	B (01L3493)	M
Grouping	Simplex	Simplex	Simplex
Capacity (kg)	1000	800	1600
Car entrances	1	1	1
Fireman's level	Ground	Ground	Ground
Speed m/s	1.75	1.75	1.75
Landing openings	21	21	8

4.2. Fire requirements

4.2.1. The lift doors shall be fire rated with a stability and integrity rating of not less than 120 min and shall be sealed against the ingress of smoke for a minimum of 30 min.

4.2.2. The successful service provider should supply a break glass unit per lift in the absence of a fire control panel. The evacuation floor (homing) is situated on ground floor

4.3. Support and maintenance of lifts

4.3.1. The successful service provider is required to provide support and maintenance which should include but is not limited to

4.3.1.1. a 24-hour emergency contact for logging calls or the contact number of the service technician within the locality of the University to attend to calls.

4.3.1.2. as per Government Regulations, adhering to a response time for occupied stops, which is between 45 (forty-five) and 60 (sixty) minutes and a resolve time should be 30 (thirty) minutes max. For general call outs, the maximum response time is 120 (one hundred and twenty) minutes and resolve time for repairs is 2 (two) hours. If spares are required for the repairs, the resolve time may be 24 (twenty-four) hours.

4.3.1.3. scheduled and preventative maintenance of the lifts;

4.3.1.4. provide maintenance and labour as per the Original Equipment Manufacturers (OEM)

specifications;

- 4.3.1.5. attend call-outs due to malfunctions and provide a response and resolution timeously not to hamper or impede on the operations of the University;
- 4.3.1.6. inspect, repair and configure the lifts as may be necessary to keep the lifts in good working order for the duration of the contract (i.e. 36 months);
- 4.3.1.7. must at all times ensure warranty and asset management throughout the lifecycle of the contract;
- 4.3.1.8. ensuring that any OEM products or services for the University are registered with the OEM and the successful service provider must pass-through or assign to the University and/or the University's service providers/vendors (if applicable) the rights the successful service provider obtains from the OEM and/or any other vendors of such products and services (including support and maintenance, warranty and indemnification rights);
- 4.3.1.9. must at all times ensure that it honours OEM warranty in relation, irrespective of the date of termination of the awarded contract for whatsoever reason;
- 4.3.1.10. guarantees that any parts associated with the lifts will be replaced or repaired if found to be defective by the University without any additional cost for the University.

4.4. Associated work by others

- 4.4.1. The lift replacements are a single construction project. Provision must be made within the priced sum for any builders or minor electrical works required to ensure compliance.

4.5. Tests

- 4.5.1. The following definitions shall bear the meanings below:
 - 4.5.1.1. **Type Tests:** Tests carried out on an item of equipment not previously approved for use by the Statutory Authority.
 - 4.5.1.2. **Final Tests:** Acceptance tests carried out during the defects liability period to assess compliance with stated performance criteria.

4.6. Registration of items of plant

- 4.6.1. If required by local authorities, provide registration in compliance with all relevant codes, regulations and practices to the governing body and pay all fees (if applicable).

4.7. Design

- 4.7.1. Space requirements: The space requirements are included in section 4.1
- 4.7.2. The layout of equipment and services to be accessible for operation, maintenance and replacement and comply with the requirements of the governing body.

4.8. Coordination

- 4.8.1. Due to the nature of the installation, a fixed sequence of operation is required to properly install the complete lift system. The work shall be closely scheduled in order not to delay the entire project.
- 4.8.2. The successful service provider shall familiarise themselves with the requirements of the other trades and shall examine the plans and specifications covering each of these sections.
- 4.8.3. The lift space requirements shall be carefully checked with other trades to ensure that the equipment can be installed in the proper sequence in the space allotted.

4.9. Electrical supply system

- 4.9.1. 400 V, 3-phase, 4-wire, 50 Hz.

4.10. Electrical cable sizing

- 4.10.1. Cable selection to be based on current carrying capacity and voltage drops based upon actual cable lengths and selected make of cables. Allow for standby plant and future demand where required and allow cable sizes and installation to suit.

4.11. Inspection - Notice

- 4.11.1. Witness points: If notice of inspection is to be given in respect of parts of the works, advise when those parts are to be concealed
- 4.11.2. Hold points: If notice of inspection is to be given in respect of parts of the works, do not conceal those parts without approval
- 4.11.3. Minimum notice for inspections: Two (2) working days for on-site inspections, and five (5) business days for local pre-delivery inspections
- 4.11.4. Concealed services: Give notice so that inspection may be made of services to be concealed.

4.12. Tests

- 4.12.1. All tests and examinations relevant to the lift installation shall comply with the requirements of SANS1545.
- 4.12.2. Test program: Submit a testing program, which is consistent with the construction program. Include test dates and procedures.

4.13. Notice

- 4.13.1. General: Give sufficient notice so that designated tests may be witnessed
- 4.13.2. Hold Points: Do not carry out designated tests without approval
- 4.13.3. Minimum Notice for tests to be witnessed: Five (5) working days for site tests

4.14. Reports

- 4.14.1. Submit copies of all relevant test reports, including certificates for Type Tests, showing the

observations and results of tests and compliance or non-compliance with requirements.

4.15. Manufacturer's name plates

- 4.15.1. For lifts, provide permanently fixed plates indicating manufacturer, model, serial number, capacity and electrical data for all equipment.
- 4.15.2. Lettering height: 4 mm maximum, 1.5 mm minimum

4.16. Corrosion protection

- 4.16.1. Protect metallic components from corrosion by application of factory or site finishes and by electrical separation of dissimilar metals.

4.17. Metalwork

- 4.17.1. Use metalwork capable of transmitting the loads imposed, and sufficient to ensure the rigidity of the assembly without causing deflection or distortion of finished surfaces. Construct to prevent rattle and resonance
- 4.17.2. Metal separation: Prevent contact between electrolytically dissimilar metals, by using concealed insertion layers

4.18. Painting - General

- 4.18.1. If exposed to view, paint new services and equipment including in machine rooms and lift shafts, except chromium, anodised aluminium, GRP, UPVC, stainless steel, non-metallic flexible materials and normally lubricated-machined surfaces.
- 4.18.2. Experienced tradesmen shall perform all painting.

4.19. Combinations

- 4.19.1. Do not combine paints from different manufacturers in a paint system.

4.20. Protection

- 4.20.1. Remove fixtures before starting to paint, and refit in position undamaged on completion. All damaged paintwork shall be repaired after installation.

4.21. Paint application

- 4.21.1. Apply the first coat immediately after substrate preparation and before contamination of the substrate can occur. Ensure each coat of paint or clear finish is uniform in colour, gloss, thickness and texture, and free of runs, sags, blisters, or other inconsistencies.
- 4.21.2. Colours and finishes are detailed in the respective sections of the specification.

5. Warranty- Minimum 3 (three) years

- 5.1. **General:** Name the University as warrantee. Register with the manufacturers if necessary. Retain

copies delivered with components and equipment

5.2. **Commencement and duration:** Commence warranty periods at practical completion or at acceptance of installation, if acceptance is not concurrent with practical completion. Warranty periods to end at expiry of defects liability period unless specified otherwise.

5.3. **Approval of Installer:** If the lift manufacturer does not perform the lift installation, and product warranty is conditional upon the lift manufacturer's approval of the lift installer, submit the lift manufacturer's written approval of the lift installing company.

6. Detailed Scope of Work

Hoisting machine

6.1.1. Traction drive

6.1.1.1. The brake shall be spring applied and electrically released by direct current. There shall be two shoes actuated by compression springs. The brake shall have sufficient power to hold the car at any landing with the normal amount of counter balancing and with at least 150% of rated load. The brake shall operate in the event of a power failure or any other safety device designed to stop the lift.

6.1.1.2. An effective sound reducing material shall be installed between the bed-plate of an overhead or basement driving machine and the beams, the structural concrete slab, shaft structure or the up-stands.

6.1.1.3. The driving machine and motor shall have sufficient capacity to operate the lift continuously at 100% of rated speed in both directions without overheating or hunting during levelling.

6.1.1.4. The lift machinery shall operate silently and without vibration. The lifts shall constantly operate and shall be maintained at noise levels not exceeding 56 DB (A). The noise level shall be considered acceptable if it does not exceed 56 DB (A) measured on the landing and in the car enclosure.

6.1.1.5. Provision shall be made for a safe method of moving the car by hand in the event of a power failure and all the necessary equipment required to carry out this task shall be mounted neatly in the motor room and shall remain on site at all times.

6.1.1.6. The successful service provider shall supply and install suitable structural steel beams with bearing plates for the mounting of the lift machine on the motor room floor, as well as supporting beams or deflector and secondary pulleys, as required. In the cases where machines are located below, the diverter sheaves shall be secured to the floor slabs and not to the overhead slabs, to prevent the transmission of vibration to the structure.

6.1.1.7. Anti-vibration mountings shall be provided to minimise the transmission of vibrations to the structure and to ensure the silent and smooth operation of all the equipment. Tenderers shall

describe the methods to be used to achieve the desired results.

6.2. Controller

- 6.2.1. Programmable solid state operation and motion controller shall be provided to control the operation, the starting, the stopping and the speed of the lift motor and also to apply the brake automatically if any of the safety devices operate or the power fails.
- 6.2.2. All solid-state controllers shall be enclosed in ventilated sheet metal cabinets with integral blowers. All power resistors and heat generating transformers shall be mounted in separate enclosures if necessary to maintain the specified control panel internal temperature. The control cabinets shall be totally enclosed, vermin and insect proof, drip proof and dust proof to at least class IP42 of IEC 144.
- 6.2.3. Contacts breaking heavy currents shall be provided with magnetic blowouts and arc chutes. Contact surfaces shall be of silver-to-silver except those for heavy currents, where carbon-to-silver or carbon-to-copper contact surfaces may be used.
- 6.2.4. All terminals of the machinery and control gear shall be marked with distinctive letters or numbers, and corresponding markings shall appear on the technical drawings.
- 6.2.5. All controllers shall be generic manufactured, assembled and supplied. PLC based lift controllers shall not be accepted.

6.3. Control system

- 6.3.1. The control system shall be capable of constantly producing the performance criteria specified.
- 6.3.2. The associated control equipment for each control system shall provide smooth acceleration and deceleration. In conjunction with the controller and machine, the system shall consistently provide the performance times specified.
- 6.3.3. The drive control system shall be capable of decelerating the lift to stand still without a “levelling in” or “creeping in” phase. Only lifts with direct floor approach capabilities shall be accepted.
- 6.3.4. The motor drive unit shall provide a smooth lift performance including acceleration, steady velocity and deceleration plus levelling to various floors within the time allowance and levelling tolerances specified. This performance shall be consistent under all conditions of loading and in either direction of travel.
- 6.3.5. The motor drive unit shall be equipped with all necessary monitoring circuits to maintain a safe and reliable operation. These shall include but are not limited to the monitoring of the load, direction of rotation, speed, supply voltage, and operating currents.
- 6.3.6. The hoist motor shall be provided with a thermostatically controlled blower if necessary, to dissipate the heat in order to maintain the equipment within the specified operating temperature range.
- 6.3.7. The control system shall provide a smooth acceleration and deceleration with the levelling accuracy

at all landings from no load to full rated load in the lift. This smooth operation shall be obtained for all lifts under stable conditions. A maximum of 0.8 seconds shall be allowed from door close to car start.

- 6.3.8. The equipment shall be designed to operate at plus or minus 15% of normal feeder voltage and plus or minus 5% of feeder frequency without damage or interruption of lift service.
- 6.3.9. The control system shall be designed to operate the hoist motor continuously at 100% of rated speed and at 100% of rated load in both directions without overheating or hunting.

6.4. Machine room indicators / rope markers, monitors and testing tools

- 6.4.1. Monitor and keyboard or hand held testing instruments for commissioning, re-commissioning and fault analysis of the lift control system shall be provided and shall remain on site at all times. Each group of lifts shall be supplied with its own monitor and keyboard or testing instrument.
- 6.4.2. As each lift travels through the lift shaft, a main hoisting rope marker shall indicate its floor level position by means of a mechanical selector attached to the machine control indicator. This indicator shall operate independently to the lift control and shall not be dependent on the lift supply for its operation.
- 6.4.3. The lift control system shall be capable of generating error/fault reports. Error logs for each lift showing at least forty (40) of the most recent faults shall be accessible. The error log shall clearly indicate the type of fault, lift number, date and time the fault occurred.

6.5. Safety gear and governor

- 6.5.1. An over-speed governor, driven directly by an independent rope attached to the car, shall be provided in the motor room and shall be designed to operate the safety gear fitted to the car when the speed of the car, due to any cause, exceeds its normal maximum speed by more than a predetermined value. The tripping speed of the governor shall be selected with due regard to the rated speed. The tripping speed shall be approximately inversely proportional to the rated speed and shall for rated speeds ranging from 0,25m/s to 5,0m/s not exceed the rated speed by more than 40% and 20% respectively.
- 6.5.2. The safety gear shall be arranged to stop the lift whenever excessive descending speed is attained. Means shall be provided to cut off power from the motor and apply the brake prior to application of the safety gear. The safety gear shall be released by moving the lift in the "UP" direction.
- 6.5.3. The governor rope system, including the governor and tension sheave, shall be arranged so that the carrier shall not be released due to system dynamics when the lift is subjected to an emergency stop in the "UP" direction.
- 6.5.4. Car and counterweight safety gear shall be provided with a switch to cut off the power from the motor and apply the brake, if the safety gear applies without tripping the governor.

6.5.5. Rope guards and an electrical contact to monitor the rope stretch shall be provided on the governor tension sheaves.

6.6. Rope guards

6.6.1. Rope guards shall be used to cover machine sheaves, secondary or deflector sheaves and governor sheaves to cover moving sheaves and ropes. Guards are also required on rope hole openings in the machine room and secondary level floors to prevent objects from falling into the lift shaft. Guards shall be provided in secondary level floors where ropes and tapes or selector drives pass through to prevent accidental contact.

6.7. Motor room ventilation and lighting

6.7.1. The successful service provider must ensure that the lighting levels and ventilation of the machine room provided are sufficient.

6.7.2. If any alterations have to be made the successful service provider must inform the University in writing, to ensure that it will be corrected.

6.8. Machine data submittals

6.8.1. The successful service provider shall supply all the relevant machine data to ensure the correct power feeder design, including, but not limited to the following:

- | | | |
|-----------|------------------------------|------------|
| 6.8.1.1. | Lift numbers | |
| 6.8.1.2. | Capacity / load | kg |
| 6.8.1.3. | Speed | m/s |
| 6.8.1.4. | Supply Voltage | Volts |
| 6.8.1.5. | Supply Frequency | Hertz |
| 6.8.1.6. | Number of wires | |
| 6.8.1.7. | Motor kW rating | kW |
| 6.8.1.8. | Roping | |
| 6.8.1.9. | Full load UP acceleration | Amps |
| 6.8.1.10. | Full load UP nominal speed | Amps |
| 6.8.1.11. | Machine heat release per car | BTU/hr/car |
| 6.8.1.12. | Power Factor | % |

6.9. Lift shaft requirements

6.9.1. In terms of SANS 1545, provide the necessary rope or selector tape guards in pit areas and landing door unlocking devices on all landings.

6.9.2. The successful service provider must provide safe Working Platforms in pits with depths more than two (2) metres and if necessary at the top of the shaft to create sheave-room platforms. The working platforms shall comply with SANS 1545 safety requirements pertaining to the depth/height and free space of these areas.

6.9.3. In terms of SANS 1545 shaft lights are to be provided and installed by the successful service provider.

6.10. Car and counterweight guide rails

6.10.1. The guide rails for the car and counterweight shall consist of planed steel tees with milled, tongued and grooved joints. Metal splice plates shall be of a suitable length and fixing brackets for guide rails shall be provided at intervals not exceeding 2,4 m. Guide rail fixings shall be in such positions that when the car is at any landing, the guide shoes on the car will be at a fixing bracket. The bottom end of each guide rail shall be provided with a sole-plate fixed to the pit floor.

6.10.2. All brackets shall be secured by means of approved expandable concrete anchor bolts of adequate size and length.

6.11. Hoist and governor ropes

6.11.1. The ends of the hoist ropes shall be properly secured to the car and counterweight cross-head or to the dead-end hitch plates on 2:1 roping, with adjustable rope shackles having approved sockets. Screw adjustment shall permit equalisation of the tension in all ropes.

6.11.2. The lift car hoisting rope attachment / hitch shall be suitably vibration isolated to prevent rope noise from being transferred to the car enclosure.

6.11.3. Governor ropes shall be in accordance with SANS 1545 and the steel rope shall be specially designed for lift service. The two ends shall be securely fastened together at the lift and shall be attached to the safety operating mechanism. The governor rope shall pass over the governor sheave and over an approved tensioner sheave in the pit. An electrical contact shall be fitted to the pit sheave and shall stop the lift if the governor rope becomes slack or breaks.

6.12. Counterweight

6.12.1. Each lift shall be suitably counterbalanced for smooth and economical operation. Cast iron or steel sub- weights shall be contained in a guided structural steel frame. The counterweight shall be equal to the weight of complete lift car plus at least 40% of the rated load. The weights in the counterweight frame shall be balanced with the weight equally distributed across the width of the frame to equalise guide pressures. The sub-weights shall be welded or fastened together as necessary to prevent rattling.

6.12.2. Counterweight screen guards shall be provided at the bottom of the shaft to a height of 2150 mm above the floor of the pit and approximately halfway up the shaft at the position where the car and

counterweight pass each other.

6.13. Car and counterweight guide rollers or shoes

6.13.1. The car and counterweight guide rollers/shoes shall constantly provide the ride quality as specified in in the operational requirements.

6.13.2. Guide rollers

6.13.2.1. Each lift shall be provided with car and counterweight rollers guides. Each roller guide shall consist of at least three wheels with a durable resilient material, each rotating on ball bearings having sealed-in lubrication, assembled on a substantial metal base and so mounted as to provide continuous contact of all wheels with the corresponding rail surface under all conditions of loading and operation. The wheels shall run on three machined rail surfaces. The roller guides shall be properly secured at top and bottom on each side of the car frame and counterweight frame.

6.13.2.2. The roller guides shall run on dry guide rails. Sheet metal guards shall be provided to protect wheels located on the top of the car and the counterweight. The roller wheels for the car shall not exceed 500- rpm and the roller wheels for the counterweight shall not exceed 1000-rpm at rated speed.

6.13.3. Guide shoes

6.13.3.1. If the speed and load nominated for a specific lift allows the use of guide shoes:

6.13.3.2. The lift shall be provided with car and counterweight spring loaded guide shoes. The spring tension shall be adjusted so as to maintain the lift in the centre of the rails and provide continuous contact with the corresponding rail surface under all conditions of loading and operation. The guide shoes shall be lined with a durable resilient material, which shall ensure a quiet and smooth ride. When oil buffers are attached to the bottom of the counterweight, additional guide shoes shall be installed on each side of the buffer cylinder frame.

6.13.3.3. The guide shoes shall run on lubricated rails. The guide rails shall be lubricated by a permanently mounted lubrication reservoir on top of the car and counterweight.

6.13.4. Electrical compensation

6.13.4.1. A sufficient extra hoisting kilowatt rating in the hoist motor, machine and motor generator capacity and control equipment may be provided so that effective electrical compensation for the weight of the hoist ropes and travelling cables shall be accomplished as the lift travels through the lift shaft.

6.14. Compensation cables

6.14.1. If Electrical Compensation, cannot be achieved the following shall apply:

- 6.14.1.1. Compensating trailing cables or compensating chains encased in a synthetic sleeve (whisper flex) shall be provided.
- 6.14.1.2. Compensating cable restraining rings shall be provided in each pit and mounted on both the car and the counterweight buffer supports.
- 6.14.1.3. Compensation shall be fixed to the bottom of the counterweight and car in a position which shall allow the counterweight to remain balanced in the guides and exert equal pressure on each face of the guide at the four guide locating positions.
- 6.14.1.4. The fixing of the compensation to the car shall be accomplished by a vibration isolating Compensation hitch.
- 6.14.1.5. Where compensating steel ropes are used for compensation they shall be accompanied by a statically balanced compensation pit sheave and shall be mounted centrally between the guides.

6.15. Buffers

- 6.15.1. Suitable oil, heavy spring or polyurethane buffers shall be provided for the car and counterweight and shall be so adjusted that in the case of over-travel, no parts of the car or counterweight will touch the shaft ceiling and that the retardation of the car does not exceed the limits as laid down in the SANS 1545 .
- 6.15.2. Hydraulic buffers shall be so constructed and shall be installed to allow the fluid level to be checked easily. Easy access to the buffer for testing and maintenance purposes shall be possible without having to remove the counterweight pit screen.
- 6.15.3. Energy dissipation type buffers shall have an electrical contact fitted to monitor the stroke (extended position).

6.16. Pit switches

- 6.16.1. Each lift pit shall be provided with watertight pit safety switches accessible from the entrance to the pits without the necessity of entering the pit and shall also be accessible from the pit while standing on the pit floor. The pit switch shall interrupt the power supply and apply the brake to hold each car so as to permit safe access to the pit. The pit switch shall be clearly distinguished from other switches that may be mounted in the pit area and the on/off position shall be clearly marked.

6.17. Stopping devices

- 6.17.1. Normal terminal stopping devices shall be enclosed in dust-proof enclosures for each lift. These devices, once operated, shall bring the lift automatically to a smooth stop at the terminal landing.
- 6.17.2. Final terminal stopping devices shall be positioned at the top and at the bottom of each lift shaft. A fixed cam securely attached to the lift shall operate these final limit switches. These limit switches shall be independent of any other stopping devices and shall positively open without the use of

springs to cut off all power from the driving machine motor and brake. It shall prevent the operation of the lift in either direction. They shall be so located that they open at the time the lift or the counterweight engages the buffer.

6.18. Travelling cables

- 6.18.1. Travelling cables between the lift and the fixed lift shaft wiring shall be flexible and suitably suspended to relieve the strains in the individual conductors. All cables shall contain an approximately equal number of conductors or shall have equal flexibility.
- 6.18.2. Travelling cables shall include two shielded pairs for each lift car to accommodate voice communication.
- 6.18.3. The travelling cables shall be positioned in such a manner to eliminate the possibility of interference with the shaft information, selector tape or governor rope and all the necessary travelling cable protection shall be fitted to the shaft wall and shaft trimmers to prevent damage to the outer cover during normal travel.
- 6.18.4. The travelling cables shall be neatly and adequately strapped to the side of the car enclosure and all the necessary protection shall be provided where the cables cross over metal extrusions.
- 6.18.5. Travelling cables for the counterweight shall comply with the requirements of this section.
- 6.18.6. Flat and round trailing cables shall be fixed and shall hang in accordance with the trailing cable manufacturer's requirements.

6.19. Electrical wiring and control communication

- 6.19.1. All low voltage and control communication cables shall be run in separate ducts, conduits and trailing cables.
- 6.19.2. Car top terminal boxes of ample size and car top inspection control units shall be provided.

6.20. Automatic self-levelling

- 6.21. All lifts shall be provided with both a self-levelling and a re-levelling feature that shall automatically bring the lift to the floor landings within a tolerance of 3.0 mm under no load to full rated load conditions without hunting. Self-levelling shall, within its zone, be entirely automatic and independent of the operating device and shall correct over-travel and rope stretch. The lift shall be maintained level with the landing, irrespective of load and while loading and unloading.

6.22. Lift car construction and enclosure

- 6.22.1. The lift car shall be an assembly consisting of the sling, the platform and the cabin.
- 6.22.2. The sling shall be constructed of rolled steel angle or channel sections bolted or welded together to form a rigid framework, which shall be suitably braced and reinforced to withstand the operation of the safety gear without permanent distortion.

- 6.22.3. The car platform shall consist of a 3-mm thick mild steel plate or 20 mm thick hardwood floor laid on closely spaced steel channel sections welded to a steel frame which in turn shall be laid on rubber pads in a structural steel frame. Load weighing devices shall be incorporated where specified.
- 6.22.4. The cabin shall be designed as a fully enclosed car with a flat roof and solid full height panels on the sides and the back.
- 6.22.5. The cabin shall be securely fixed to its sling and platform in such a manner that the cabin is not subjected to strain in the event of an unequal distribution of load occurring over the floor area.
- 6.22.6. The entire car assembly, including the car frame and the car platform shall be constructed to operate free from objectionable squeaks or metallic sounds, comprising of a rigidly tuned resonance car frame and acoustically treated superstructure.
- 6.22.7. The following features shall also be embodied in the lift car:
- 6.22.8. Luminous car position indicator and "Up/Down" travel indicators installed above the entrance doors.
- 6.22.9. Fixing clips for the attachment of canvas protective coverings which shall be supplied with the lift for the side and rear walls.
- 6.22.10. Silent running squirrel cage, centrifugal flow exhaust blowers for passenger and goods/passenger lifts shall be mounted to draw air into car enclosure when doors are open and through door side clearances when doors are closed. The blower shall be mounted on the car top, draw air from the car through the perimeter of the suspended ceiling and exhaust the air into the lift shaft. The fan shall without exception, be capable of delivering not less than 0.3 cubic meters of free air per minute per square meter of floor area. The fan shall be switched via a toggle switch mounted in the car operating panel.

6.23. Lift car finishes

- 6.23.1. Lift car finish detail shall be as specified in the equipment schedule of this specification.

6.24. Passenger & goods/passenger lift

- 6.24.1. The entire car internal finish including the area above the suspended ceiling shall be installed and finished off to the highest standard. All finished work shall be smooth and free from wraps, buckles, squeaks and rattles and all joints shall be light-proof.
- 6.24.2. All wall panelling shall be jointed with a pliable material /silicone to prevent squeaks generated by car panel movement / deflection.
- 6.24.3. A robust handrail, consisting of an "Intrad" poly-carbonate bumper rail, spaced 50 mm off the panelling, must be provided across the rear and side walls of the lift car. The spacer blocks to which the hand and bumper rails are secured shall be fixed to the panels by means of 2 x M10 bolts with locknuts or other approved method.

6.24.4. Goods/Passenger lift car panels shall be manufactured from at least 1.5 mm mild or stainless steel with at least two horizontal intermediate stiffening ribs and panels with a width greater than 400 mm shall have vertical stiffening ribs at intervals not exceeding 200 mm or equivalent construction. The successful service provider to provide available samples prior to ordering. Refer to technical data sheet for project specific details.

6.24.5. Only high efficiency, long life and low maintenance LED car interior lighting shall be used. The LED lamps shall be permanently fixed and wired and shall not be of the replaceable lamp type. The light colour shall be warm white.

6.25. Fixture faceplate and mounting

6.25.1. Unless otherwise specified, all landing fixture faceplates shall be surface mounted and shall be manufactured of at least 3.0 mm thickness stainless steel, with bevelled edges for all lifts if square rectangle stainless steel face plates are offered. However, Tenderers may offer alternative landing fixture face plates if these faceplates are generic products and aesthetically acceptable to the University.

6.25.2. The fixture faceplates in the lift car and at the landings shall be mounted with concealed security fastenings or fastenings requiring special tools to remove them, as approved by the University. Exposed fastenings shall match the material and finish of the faceplate.

6.25.3. The following fixture face plates shall be located and sized in accordance with dimensions approved by the University:

6.25.3.1. Car operating panels.

6.25.3.2. Car position indicators.

6.25.3.3. Car direction indicators.

6.25.3.4. Landing push button stations.

6.25.3.5. Landing position indicators and signals.

6.25.3.6. Blanking-off plates

6.25.4. Without exception, the University shall approve the final design of the fixture faceplates before placing the order or manufacturing of this equipment.

6.25.5. Car and landing door operator

6.25.5.1. Only door operators with the capabilities of coping with medium to heavy traffic shall be accepted and the type of door operator offered shall be clearly shown in the tender submitted. The door system shall be capable of controlling the position of the doors at any given moment and shall constantly produce a smooth, accurate and efficient operation.

6.25.5.2. The doors on the lift car and at each landing opening shall be opened and closed quietly and

smoothly by an electric operator.

- 6.25.5.3. The motion of the door operator shall be accomplished with arms and appropriate linkages to the approximate centre of gravity of the driven door panel.
- 6.25.5.4. Each landing door shall be equipped with Electro-mechanical interlocks so that the lift can operate only when the interlock circuit is established. Landing door locks shall meet the SANS 1545 safety requirements. All work and material related to this section shall form part of the successful service provider's scope of works.
- 6.25.5.5. An independent auxiliary self-closing device shall close each landing door panel whenever the door is not in the closed position and the equipment relating to the car and landing door system does not restrain it.
- 6.25.5.6. An electric contact for the lift car door shall be provided which shall prevent the lift moving away from a landing unless the door is in the closed position.
- 6.25.5.7. An electrical contact shall be fitted to the non-driving car door if its linkage is dependent on a wire rope or chain.
- 6.25.5.8. Emergency Triangle access key mechanisms shall be provided on each entrance.
- 6.25.6. **Lift door hangers**
- 6.25.6.1. Hangers shall be equipped with ball bearing adjustable rollers to take the up-thrust of the doors. The hangers and rollers shall be designed to accommodate the size and weight of the doors operated with a high-speed door operator.
- 6.25.7. **Car door control**
- 6.25.8. **Car door motion controllers**
- 6.25.8.1. Car door motion controllers dependent on resistors, rheostats or switches to control the opening and closing motion shall not be accepted. The car door motion controller shall be capable of controlling the position of the doors at any given moment and shall constantly produce a smooth, accurate and efficient operation.
- 6.25.8.2. (For Group controls only) Adjustable hardware or software timers shall be provided to hold the doors open for the dwell times specified below. The tabulated dwell times are initial adjustment standards. Further adjustment to suit specific traffic movement capabilities and the arrangement of car and landing stations shall also be possible. The first passenger dwell times are those measured from door fully open to door start-to-close. The second and succeeding dwell times are from restoration of the light beam to door start to close from its fully reopened position.

Passenger Conditions	Stops for Car Call	Stops for Landing Call
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First Passenger	3.0 sec.	3.0 sec.
Succeeding Passengers	1.0 sec.	1.0 sec.

6.25.8.3. Stops at the high or low car call reversal floors shall be considered as landing call stops.

6.25.8.4. If doors are held open for an adjustable period of time by a passenger standing in the entrance or by constant pressure of the door open button, a buzzer shall sound and the doors shall start to close at a reduced speed and force level. When the doors touch an obstruction, they shall re-open.

6.26. Door protection devices

6.26.1. A non-retractable electronic infra-red/ultra-sonic protective leading edge shall be provided and shall extend at least 2100-mm above the platform and its active surface/area shall project beyond the front edges of each leading car door panel. Should this device come in close proximity, or touch a person or object whilst the car doors are closing, the car and shaft doors shall return to their open position. Manual reversal of the doors while the lift is on automatic operation shall be accomplished by pressing a door open button in a car-operating panel. Should this device be activated while the car doors are closing, the car and shaft doors shall return to their open position?

6.26.2. Without exception, the successful service provider shall demonstrate on the day of completion that the door closing pressures comply in full with the SANS 1545 under normal and forced closing conditions.

6.26.3. The door protection device shall have the capabilities of detecting metal/plastic trolleys.

6.27. Car platform

6.27.1. The car platform with enclosure of each lift shall be balanced by arranging balancing weights to equalise the guide pressure (front to back and side to side) so that the pressure on any guide shoe roller does not exceed 18 kg without load in the car. (Statically balanced).

6.28. Landing entrances

6.28.1. Each lift shaft landing entrance assembly shall consist of unit frame, door panels, fascia, sill, hanger, closer and interlock. The installation shall comply with the applicable code requirements.

6.28.2. As a standard, all lift landing equipment including doors, signal faceplates shall have a two (2) hour fire rating.

6.29. Door panels

6.29.1. The door panels for all openings shall be constructed of at least 1.5 mm thick mild or stainless steel.

Continuous stiffener channels must be provided to the top, bottom and edges at the faceplates. The bottom of each door panel shall be provided with removable laminated phenolic guides, which run in the sill slots.

- 6.29.2. Door panels shall be constructed to operate free from squeaks or metallic sounds and shall be adequately treated with a sound deadening material to produce a quiet door operation under all operating conditions.
- 6.29.3. The leading edge of the car and landing doors shall have an interlocking profile with rubber stoppers (top and bottom) to prevent the door panels closing metal to metal. Add on rubber profiles shall not be accepted.
- 6.29.4. All landing door site guards shall have a stainless-steel box type construction for added rigidity.

6.30. Goods/Passenger Lift and Access, Goods Only Lift Car Doors

- 6.30.1. Car and landing sills shall have additional angle iron supports (reinforced sills) to accommodate the applicable point loads.
- 6.30.2. Landing and car door panels shall have reinforced sliding shoe supporting sections.
- 6.30.3. Only reinforced sliding door panels shall be accepted. Door panels shall be at least 1.5 mm thick Mild Steel or Stainless Steel with at least two horizontal intermediate stiffening ribs.

6.31. Sills and support angels

- 6.31.1. The landing sills for all openings shall be of narrow extruded aluminium. Grooves in all sills for the door guides shall be machine planed with minimum clearances for the guides. The sills shall be supported on steel angles provided by the successful service provider and securely fastened to the building floor construction.

6.32. Toe guards

- 6.32.1. Toe guards shall be of at least 1.5 mm thick steel and shall be installed on all landings. They shall extend the full width of the door opening and be gradually bevelled to the wall. The straight vertical portion of the guards shall at least be 400 mm long or as in the case of the lowest landing shall equal the distance travelled by the car sill from the bottom terminal landing to when the car is on the fully compressed buffer.

6.33. Car position indicators

- 6.33.1. Electronic LED digital readout position indicators shall be incorporated in each lift car operating panel at a height of not less than 2100 mm above the floor. As each lift travels through the lift shaft, its position shall be indicated continuously by the illumination of the numeral or letter corresponding to the landing that the lift is stopped at or is passing.
- 6.33.2. The digital readout shall be at least 50 mm in height.

6.34. Car operating panel (cop) for passenger and goods/passenger lifts

- 6.34.1. The operating device for each lift shall include a series of buttons, numbered to correspond to the active landings served and various additional buttons and key switches, including emergency alarm, intercom, door open and door close buttons, independent control, fire control and rear door control key switches.
- 6.34.2. The car call buttons shall be numbered to correspond to the landings served or the numbers shall be engraved with recessed background adjacent to the car buttons.
- 6.34.3. Car, landing and emergency buttons shall be of the Micro push operation type and shall be approved in terms of the Occupational Health and Safety Act. Each button shall be clearly marked with its corresponding floor position. The demarcation shall either comprise a raised or recessed numeric or alphabetic character. Car call buttons shall have Braille incorporated into the button unit.
- 6.34.4. The car operating station shall be paraplegic friendly and shall be located so that all operating and emergency buttons are located between 1500 mm and 900 mm above the car platform. The emergency buttons and switches shall be mounted at the bottom and the call buttons in numerical order starting above the emergency button and numbering from left to right.
- 6.34.5. Swing front return panels used in the passenger car enclosures shall be arranged so that the call buttons and the control and signal devices are substantially flush to the vertical surface and shall be mounted on the return panel. The wiring to the individual components shall permit the panel to swing open for maintenance purposes.
- 6.34.6. A second rear door car-operating panel for lifts with two entrances shall operate independently to the front panel and shall comply in full with this section.
- 6.34.7. As a standard, the lift signage shall include No Smoking, Load, Passengers, Certificate Number and Lift Number / Designation, as required by the applicable standards and regulations. All signage shall be engraved into the Car Operating Panel.
- 6.34.8. Without exception, the University shall approve the final design of the car-operating panel before placing the order or manufacture of this equipment.
- 6.34.9. The number of Car Operating Panels per lift shall be as nominated by the University.
- 6.34.10. The button markings/engraving shall be such that it does not fade or wear with continuous operations. The markings, whether engraved or raised shall remain clearly visible and the Coloured epoxy shall remain intact throughout the life of the button.
- 6.34.11. All key switch cylinders in the fixture faceplates of landing stations, car stations and supervisory control stations shall be master keyed with removable core cylinders (KABA type or equivalent).

6.35. Emergency car lift

6.35.1. Provide an emergency car lighting unit designed as part of the general lighting with maintained functionality to automatically provide emergency light in the lift car in the event of the normal electric light supply to the car failing. The successful service provider shall ensure that the general lights selected within the lift car, have functionality to act as a maintained emergency light and ensure that suitable emergency backup battery control gear is provided.

6.35.2. The emergency lighting shall be capable of providing the necessary level of illumination (20 lux) for at least two (2) hours.

6.35.3. The top of the lift car shall also be fitted with an emergency lighting unit.

6.36. Call acknowledging lights

6.36.1. All car and landing buttons shall be of the call acknowledging type. The registering of a call button shall illuminate the button to acknowledge that a call has been registered. Incandescent indicator lamps shall not be accepted.

6.37. Landing call buttons

6.37.1. All car and landing buttons shall be of the call acknowledging type. The registering of a call button shall illuminate the button to acknowledge that a call has been registered. Incandescent indicator lamps shall not be accepted.

6.38. Passenger and goods/passenger lifts

6.38.1. A riser of landing micro push button stations shall be provided. Terminal floors shall contain a single button station and intermediate floors shall contain both up and down buttons. Pressure on the button in one fixture shall cause the electronic illumination of the corresponding button unit in the other fixture at the same landing. Incandescent button illumination shall not be accepted.

6.38.2. Landing push buttons shall be of the Micro push operation type and shall be approved in terms of the Occupational Health and Safety Act.

6.38.3. The location of the centreline of each landing micro push button fixture shall be located at 1050 mm above the floor.

6.38.4. Each button shall be clearly marked with its corresponding direction of travel. The demarcation shall either comprise a raised or recessed approved symbol.

6.38.5. The button markings/engraving shall be such that it does not fade or wear with continuous operations. The markings, whether engraved or raised shall remain clearly visible and the coloured epoxy shall remain intact throughout the life of the button. Buttons shall have Braille incorporated into the button unit.

6.39. Access goods only lifts and dumbwaiters

All buttons shall be micro-push buttons.

6.40. Waiting passenger lanterns and gongs

- 6.40.1. Provide an up and down, LED digital readout electric indication waiting passenger lantern at each intermediate landing and an up or down single indication lantern at a terminal landing of all lifts. The lanterns shall be mounted above the head jamb or beside the side jamb of each typical entrance. Incandescent indicator lamps shall not be accepted.
- 6.40.2. Supply and fit adjustable electronic arrival gong to each entrance. The fixture face plate shall contain an approved pattern of slots to enable the transmitting of the sound from within the shaft to the lift foyer. In terms of the paraplegic/blind person's requirements the gongs shall have a different tone when announcing cars travelling in the up and down directions - two "gongs" for down and one "gong" for up.
- 6.40.3. As soon as a lift has reached a predetermined distance from a landing and is going to stop at that landing, the corresponding waiting passenger lantern shall be illuminated and the gong shall sound whether or not a landing call has been registered. The waiting passenger lantern shall remain illuminated until the lift leaves the landing or if the car becomes filled, whichever occurs first.
- 6.40.4. The type and design of the landing signals shall take into account long lift lobbies associated with groups of lifts installed adjacent to each other. After installation the landing direction and/or announcing arrows shall be clearly visible from any position within the lift lobby. It shall be the successful service provider's responsibility to inform the University if the selection of landing signal design is not going to achieve the visual requirements detailed under this section.
- 6.40.5. As an exception and if specifically requested by the successful service provider and accepted in writing by the University, adjustable gongs may be fitted to the car. Gongs fitted to the car shall be positioned in the header section of the car and the sound shall be contained and directed towards the entrance so as not to be transmitted to the floors above and below the lift. The gongs shall further only sound when the lift is within 200 mm from the landing level.
- 6.40.6. As an exception and if specifically requested by the successful service provider and accepted in writing by the University, announcing arrows may be fitted in the side jambs or incorporated in the push button unit. However, this option shall be restricted to Simplex and Duplex units with a single riser of buttons.

6.41. Landing position indicators

- 6.41.1. Electronic LED digital readout position indicators shall be provided over the architrave of each lift in the main lift lobby. As the lift travels through the lift shaft, its position shall be indicated continuously by the illumination of the numeral or letter corresponding to the landing that the lift stopped at or is passing.
- 6.41.2. The final number of landing indicators required for each lift and their locations shall be as approved by the University.

- 6.41.3. The digital readout shall be at least 50 mm in height.
- 6.41.4. Landing position indicators shall not illuminate if the lift can no longer respond to calls as a Result of a fault condition or when undergoing routine maintenance.

6.42. Landing doors and architrave finishes

- 6.42.1. All stainless-steel landing doors and architraves shall be cleaned prior to final acceptance and receive a coat of an approved stainless-steel polish.
- 6.42.2. When spray painting the landing doors and frames, the successful service provider shall ensure that the landing door panels are satisfactorily prepared before the final coat of Duco is applied.
- 6.42.3. Floor designation shall be permanently marked on the inside of the landing doors (shaft side).

6.43. Landing door frames

- 6.43.1. Each landing entrance shall be provided with a unity type door frame consisting of jambs, door head, rider plate, vertical angles, tracks and sill plates, designed to provide a clear door opening in accordance with the dimensions specified in the bill of quantities (see tender documents for more information).
- 6.43.2. The passenger lift door frames shall be of splayed full depth / full depth / box design as per the bill of quantities (see tender documents for more information).
- 6.43.3. The successful service provider shall ensure that jambs and head sections are adequately supported, reinforced and fixed to the wall surfaces to ensure that they do not move from the wall finishes. Fixing methods shall ensure that the solution prevents warping, bulging or misalignment. Unsatisfactory work shall be dismantled and made good.
- 6.43.4. The rider plate shall be supported by vertical angles attached to the bottom track plate.
- 6.43.5. Each doorframe shall be provided with metal fixings to enable them to be securely fixed into the enclosure walls. The doorframes shall also be provided with grout guards or equivalent to achieve fire rating. Lifts shall have door frames back filled to ensure durability and robustness.
- 6.43.6. The successful service provider shall ensure that jambs and head sections are adequately supported, reinforced and fixed to prevent warping, bulging, or misalignment which may be caused during the installation. Unsatisfactory work shall be dismantled and made good.
- 6.43.7. The bottom track and sill plate shall be constructed from aluminium for the general passenger lifts and milled steel or stainless steel for goods lifts. Plates shall not be less than 30 mm thick where the door tracks occur and not less than 6 mm thick elsewhere. The bottom door track grooves shall form a non-slip surface in the door opening, and shall not be less than 12 mm x 12 mm.
- 6.43.8. All equipment associated with the landing doors shall be directly attached to the frames and shall not be mounted independently on the lift shaft enclosure, and where located by means of slotted

holes, shall be either pinned to approval or provided with flat washers and spring washers.

- 6.43.9. Rubber door buffers shall be provided to take the shock from the door panels if the panels travel beyond their normal open or closed position.
- 6.43.10. Special care shall be taken to protect the doorframes and doors from damage during their supply and installation; all parts shall be wrapped in a protective covering. All damage to door frames shall be made good to approval.
- 6.43.11. All landing doorframes of each lift shall each be provided with a mechanic's maintenance door unlocking device. The associated keys shall be placed in a suitable approved location.
- 6.43.12. At the bottom landing served it shall be possible for the landing door to be conveniently unlocked and opened by a person standing on the pit access ladder.

6.44. Lift intercom system

- 6.44.1. Provide an intercommunication system complete with talk-back speakers with all required auxiliary equipment, wiring and a six (6) hour minimum back-up power supply or POE supply.
- 6.44.2. Lift travelling cables shall contain two (2) shielded pairs of conductors for each car for the intercommunication system.
- 6.44.3. Terminal strip boxes for all wiring shall be provided.
- 6.44.4. All wires in the wiring system shall be shielded without exception.
- 6.44.5. Wiring between all master stations in the building shall comply with manufacturer's recommended standards.
- 6.44.6. The voice link shall constantly produce a sound/speech quality comparable to that of the normal telephone network. All provisions to adequately address interference in the lines shall be included.

6.45. Load switches

- 6.45.1. All load switches and sensors which influence the control and the drive shall be adjusted in order to achieve an optimum operation, and their operating loads documented for future reference on the data sheet or certificate of compliance SANS 1545 - Annex "A". These load contacts may include but are not limited to the over-load, minimum load and the landing call by-pass functions.

6.46. Car top requirements

6.46.1. Car top working platforms

- 6.46.1.1. Securely fitted working platforms of adequate strength shall be provided on the top of the car roof to create a level and safe working area. The platform shall be free of any electrical cabling and lift equipment. The car roof shall not be regarded as a working platform.

6.46.2. Car top guard rails

- 6.46.2.1. In terms of SANS 1545 the car top shall be provided with a balustrade (guard-rail) where the free distance in the horizontal plane beyond and perpendicular to its outer edge exceeds 300 mm.
- 6.46.3. **Car static balance**
- 6.46.3.1. The completed car(s) shall be free from twist, i.e. the guide shoes shall lie in one plane independently of the effect of the guide rails.
- 6.46.3.2. The car supporting means shall be located to compensate for the unbalancing effect of car doors, door operator gear and other attachments. After installation of the car superstructure, and all equipment and wiring on the car has been completed, a final balance shall be affected by adding balance weight to the car frame where necessary to ensure that the complete car is truly balanced.
- 6.46.4. **Car superstructure**
- 6.46.4.1. The design, construction and finish of each car superstructure shall be in accordance with the requirements set out below.
- 6.46.4.2. Detailed drawings of car superstructure shall be submitted for approval before manufacture
- 6.46.4.3. The whole of the car superstructure design and construction shall comply with the requirements of SANS 1545.
- 6.46.4.4. Top of car areas shall be free of trip hazards, all external support gussets of lift car roof shall be covered with chequer plate or timber to reduce risk
- 6.46.4.5. All fan flexible ducts and light fittings shall be mechanically protected from accidental damage from persons working on lift car roof
- 6.46.4.6. Roof top maintenance controllers are to be located within reach of the landing when the access to the car is obtained via the top floor access device on the same side as the MRL controller side
- 6.46.4.7. The car superstructures shall be fully protected by the successful service provider until the lifts are formally handed over to the University
- 6.46.4.8. The car design shall include a steel cabin as a base and the interior finishes shall be fitted to same, ensuring that future removal of finishes is possible without dismantling the car shell.
- 6.46.4.9. The car walls shall be constructed in such a manner as to allow each section to be dismantled as a unit in sizes to allow easy assembly in the lift shaft. Their sizes shall also be such as to pass through the landing doors for assembly. Each section shall be securely bolted together for strength and rigidity and securely fastened to the car platform.
- 6.46.4.10. Perforations for natural ventilation shall be provided at the bottom and top of the side and rear wall panels and shall be located so that they are not directly visible from within the car
- 6.46.4.11. The ventilating fan unit shall be of the single phase, axial type provided with speed control and

suitable for mounting above the car roof. The fan shall discharge air vertically upwards from the car and shall be silent in operation. The fan capacity shall be a maximum of 20 air changes per hour with a maximum noise level of 45 Db (A). The fan shall be sound-isolated from the superstructure and protected by a suitable expanded-metal, or similar cover

- 6.46.4.12. Wherever possible the lift car interior finishes and surfaces will be designed to facilitate effective cleaning of all contactable surfaces. Measures such as minimising joins in wall finishes materials incorporation of hospital grade vinyl flooring with coved skirting and floor corners will be considered when developing the performance criteria for these assets.

6.47. Pit access

- 6.47.1. Access to the lift pit shall be from the lowest floor served or pit access doors should pit depth exceed 2500 mm.
- 6.47.2. Provide suitably treated, corrosion resistant steel access ladder(s), maintenance access platforms as required to safely maintain plant.

6.48. Guard and screens

- 6.48.1. Provide all permanent guards and screens required by SANS 1545, including protective screens for travelling cables as necessary. All steelwork shall be treated and corrosion resistant paint finished before installation.

6.49. Power saving operation

- 6.49.1. During periods of low demand, the lifts shall park at the last level served with the doors closed. After a pre-determined time, the car lights and fan shall automatically switch off until increased demand warrants the lifts recommence normal operation.

6.50. Momentary loss of mains power

- 6.50.1. Provide all necessary protective components to ensure that in the event of a momentary loss of mains power, lifts shall remain in service.

6.51. Electrical

6.51.1. Sub-mains

- 6.51.1.1. The Electrical Tenderer shall supply, install and terminate suitable sub-main cables from the main switchboard to the lifts in accordance with the requirements of SANS 1545
- 6.51.1.2. The successful service provider shall formally advise the Electrical Tenderer of the maximum demand and circuit breaker current rating required by the lifts.

6.51.2. Light and power

- 6.51.2.1. The successful service provider shall supply and install from the distribution board to the lift car,

lift shaft and lift pit, all wiring, etc., for light, power, fan and emergency light circuits.

6.51.3. Above the car

6.51.3.1. Provide a stop switch and car control station on the roof of the car, to the requirements of SANS 1545

6.51.3.2. Provide one general-purpose outlet comprising an approved 3-pin switch-plug. One B.C. permanently wired hand lamp complete with wire guard and reflector connected by a 3 metres of oil resistant flexible lead. Provide approved means for storing the lead and hanging the lamp on the car crosshead

6.51.3.3. Provide one approved pedestal fitting with prismatic polycarbonate diffuser mounted on the car crosshead

6.51.3.4. Provide emergency lighting on the lift car roof

6.51.4. In the car

6.51.4.1. Lighting to be either fluorescent or LED lamp technology and to Consultant and Architects' approval.

6.51.5. Lift shaft lighting in accordance with SANS 1545.

6.51.5.1. The lift shaft fittings shall be of the fluorescent luminaire type with guard of high impact material or wire positioned vertically at intervals of not more than 6.0 m

6.51.5.2. Provide two-way switches, located within easy reach of both the top and bottom entrances which shall control the luminaires, or a pull switch with a cord that runs the full height of the lift shaft

6.51.5.3. The light circuit shall originate from the lift circuit breaker panel within the LMR controller, the Lift Machine room or from each individual lift car roof top.

6.51.5.4. Paint all areas of the lift shaft that can be seen from the landing levels and cars on passenger lifts that incorporate glass doors.

6.51.6. Lift pit

6.51.6.1. Lift pit lighting shall be in accordance with SANS 1545.

6.51.6.2. The light fittings shall be of the fluorescent type. Provide light switches as required by SANS 1545.

6.51.6.3. The light circuit shall originate from the lift circuit breaker panel.

6.51.6.4. Emergency communication point within lift pit or under car floor.

6.51.7. Circuit breaker panels

6.51.7.1. The circuit breaker panel shall be located in control cabinet and incorporate the following:

- 6.51.7.2. Approved manufacture main and sub-circuit triple pole circuit breakers with thermal magnetic overload releases on each pole adjustable to the desired settings
- 6.51.7.3. Current limiting circuit breakers with RCD protection (where required) for all light and power circuits
- 6.51.7.4. The panels shall include any other equipment necessary for the control and protection of the plant installed and shall be labelled as specified.
- 6.51.8. **Cabling and wiring**
- 6.51.8.1. The successful service provider shall provide all necessary wiring and connections for the operation of the lift, including wiring to the car lights, fan, emergency communication and general power as well as lift shaft and lift pit lighting.
- 6.51.8.2. All power, control and other fixed wiring shall be low fume, low smoke, halogen free, insulated multi- strand copper cable enclosed in suitable, complaint ducting or conduit with inspection type fittings.
- 6.51.9. **Car light and power circuits**
- 6.51.9.1. Supply and install to the car, circuits for lights and fan. Connections shall be made from the individual circuit breakers on the incoming panels. In addition, provide approved inspection lights and power outlets on the top and below each car superstructure wired as above.
- 6.51.10. **Labels**
- 6.51.10.1. All switchboards and equipment including circuit breakers, switches, fuses, contactors, relays, lamps and similar items, panels and circuits shall each be designed with approved type labels to clearly indicate their respective functions.
- 6.51.10.2. Wiring in the control cubicles shall be identified by means of clearly marked identification numbers or letters near the point of termination. These numbers or letters shall correspond with the identification markings on the circuit drawing.

7. Standards

- 7.1. The following standards and codes are applicable and enforceable:

Standard	Title
SANS 1545-1	Safety rules for the construction and installation of lifts
SANS 50081-1 EN 81-20 EN 81-50	Safety rules for the construction and installation of lifts
SANS 50081-70	Particular applications for passenger and goods lifts – accessibility to lifts for persons, including persons with disability
SANS10400 T	Application of the National Building Regulations: Fire protection

SANS10400 S	Application of the National Building Regulations: Facilities for persons with disabilities
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7.2. The installation shall be erected and tested in accordance with the following acts and regulations:

- 7.2.1. The latest issue of SANS 10142: "Code of practice for the wiring of premises",
- 7.2.2. The Occupational Health and Safety Act, 1993 (Act 85 of 1993) as amended,
- 7.2.3. The Local Government Ordinance 1939 (Ordinance 17 of 1939) as amended and the municipal by-laws and any specific requirements of the local supply authority,
- 7.2.4. The Fire Brigade services Act 1993 Act 99 of 1987 as amended,
- 7.2.5. The National Building Regulations and Building Standards Act 1977 (Act 103 of 1977) as amended,
- 7.2.6. The Post Office Act 1958 (Act 44 of 1958) as amended,
- 7.2.7. The Electricity Act 1984 (Act 41 of 1984) as amended and
- 7.2.8. The Regulations of the local Gas Board where applicable.
- 7.2.9. The installation shall be erected and tested in accordance with the local and standard best practices including but not limited to local regulation, rules and standards. Any equipment identified as being not in compliance with relevant Standards, as in force at the time of tender, shall be removed and replaced with equipment that complies with the relevant Standards at the expense of the successful service provider .

8. Training

The successful service provider is required to facilitate basic training programme for the University and its employee including but not limited to the operation of the lifts, supporting and maintenance, incidence management protocol and safety features.

9. Service Provider Responsibilities

9.1. Structural Drawings

- 9.1.1. The successful service provider shall supply to the University marked-up structural drawings or other drawings showing any changes or additional requirements to be made in the structure in order to fit apparatus and materials to be installed by him. However, it will be the successful tenderer's responsibility to ensure that sufficient installation clearance is provided for positioning the selected equipment into the building space provided.

9.2. Shop Drawings

- 9.2.1. Layout drawings are required for all lift work, including car enclosure and landing entrance coordinating drawings. Drawings shall show top clearance above cross-heads and counterweight frames, machine room layouts with power requirements and heat release data, location of all

equipment on tops of cars, overhead beams and elevations, and reactions which will be transmitted to the building structure during normal operation of lifts.

- 9.2.2. Shop drawings are required for car enclosure, landing entrances and signal fixture work showing construction, finish and fastening details. Furthermore, show drawings shall clearly show the motor room construction detail, shaft construction detail including all the required internal supporting beams, pit dividing walls for multi-lift shafts and pit sump pump drains. Composite shop drawings shall be submitted for areas, which require close co-ordination with the work of the different trades.
- 9.2.3. All special equipment and fixture faceplates shall be submitted for approval. Drawings and samples or brochures shall be submitted for each type of fixture and shall be co-ordinated with the architectural drawings. Final design and material proposed for fixture faceplates and special equipment shall be approved by the University.
- 9.2.4. Confirm dimensions by site measurement.
- 9.2.5. Format: AutoCAD with standard metric scale and dimensioned scale line for drawing reduction.
- 9.2.6. Drawings shall be checked and signed by a responsible person to verify conformity with the design requirements

9.3. Submission

- 9.3.1. Submission for approval will consist of the following activities executed by the successful service provider and other relevant third parties involved:
- 9.3.1.1. The successful service provider shall review, stamp, date and sign to signify its approval and submit in the manner required by the University and with reasonable promptness and in orderly sequence so as to cause no delay in the work, all successful service provider's drawings and samples required by the documents or subsequently by the University. The successful service provider's drawings and samples shall be properly identified as specified or as the University may require.
- 9.3.1.2. At the time of submission, the successful service provider shall inform the University in writing of any deviation in the successful service provider's drawings or samples from the requirements of the documents.
- 9.3.1.3. The drawings shall be submitted in a number of copies and along the channels directed by the University for approval.
- 9.3.1.4. By submitting drawings and samples, the successful service provider represents that it has determined and verified all site measurements, site instruction criteria, materials, catalogue numbers and similar data, or will do so, and that it has checked and co-ordinated with the drawings with the requirements of the works.
- 9.3.1.5. The University will review and approve construction drawings and samples with reasonable

promptness so as to cause no delay, but only for conformance with the design concept of the works and with the information given in the documents. The University's approval of a separate item shall not indicate approval of an assembly in which the item functions.

- 9.3.1.6. The successful service provider shall make any corrections required by the University and shall re-submit the required number of corrected copies of successful service provider's drawings or new samples until approved. The successful service provider shall direct specified attention in writing on re-submitted drawings to revisions other than the corrections required by the University on previous submissions.
- 9.3.1.7. No portion of the works requiring a successful service provider's drawing or sample submission shall be commenced until the submission has been approved by the University in writing.

9.4. Samples

- 9.4.1. Samples are any samples required by the University. Samples shall be physical examples to illustrate materials, equipment or workmanship, and to establish standards by which the works may be judged. Such samples, after approval, will be retained by the University for a period sufficient to ascertain that the relevant component is actually provided as per such sample, but will then be returned to the successful service provider for incorporation in the works.

10. Project Plans & Timelines

- 10.1. The successful service provider shall submit within 2 (two) weeks of the awarded contract start date, the successful provider's overall program, a practicable work program in reproducible form, based on the successful service provider's program in accordance with the University's expectations. The program shall be updated and controlled in accordance with this section.
- 10.2. The section of the program covering submission of equipment selection and installation drawings, preparation of operating and maintenance Manuals, testing, balancing and commissioning shall be presented in the form of a network analysis in accordance with procedures generally referred to as Program Evaluation Review Technique (PERT) or Critical Path Method (CPM).
- 10.3. Meetings shall be arranged and attended in accordance with the University's protocol.
- 10.3.1. **Organisation and staff of successful service provider**
- 10.3.1.1. The successful service provider shall employ qualified, responsible and experienced employees including but not limited to engineers, programmers and administrators as may be necessary for the purpose for the successful service provider to ensure:
- Selection and/or engineering or equipment and components into working assemblies all in conformance with the design concept contained herein.
 - Equipment and shop drawings are submitted for approval in accordance with the required procedure.

- Attendance of meetings.
- Conducting of all tests required.
- Expediting of the work.
- Testing, balancing, commissioning, operating of plant and balancing.
- The successful service provider operator(s) shall be fully conversant with the operation and experienced in running similar installations.

11. Cost Management

- 11.1. The successful service provider and the University will closely manage any instances that may result in change management. It is the successful service provider duty to immediately inform the University in writing of a variation with any cost implication of whatsoever nature before undertaking any further work.
- 11.2. Should the University not approve in writing via a duly authorised representative the extra work carried out with authorisation will be for the successful service provider's account.