PROPOSED NEW POLICE STATION FOR SOUTH AFRICAN POLICE SERVICES (SAPS) - MAKHAZA, CITY OF CAPE TOWN, WESTERN CAPE

SUPPLY, DELIVERY, INSTALLATION AND COMMISSIONING OF LIFT INSTALLATION

PROPOSED NEW POLICE STATION FOR SOUTH AFRICAN POLICE SERVICES (SAPS) - MAKHAZA, CITY OF CAPE TOWN, WESTERN CAPE

LIFT INSTALLATION

C O N T E N T S

PROPOSED NEW POLICE STATION FOR SOUTH AFRICAN POLICE SERVICES (SAPS) - MAKHAZA, CITY OF CAPE TOWN, WESTERN CAPE

LIFT INSTALLATION

PART 1: STANDARD MECHANICAL SPECIFICATION

I N D E X

SAPS MAKHAZA

LIFT INSTALLATION

PART 1: STANDARD MECHANICAL SPECIFICATION

1. PART OF THE SPECIFICATION

The Standard Mechanical Specification covers the general technical requirements of the lift installation. These specifications shall be read in conjunction with the document in its entirety. If the conditions and/or specifications contained herein are at variance with anything contained in the detail specification, the latter shall take preference; otherwise these Standard Mechanical Specifications shall apply as if duly included. This is a contract without other parties. Any reference to builder or main contractor means the contractor appointed in terms of this contract.

2. MINIMUM REQUIREMENT

The conditions and/or specifications in this section shall be regarded as the absolute minimum requirement. More stringent similar conditions and/or specifications stated in the detail specification shall take preference to those in these Standard Mechanical Specifications.

3. PROPRIETARY MATERIALS

The Tenderer's attention is drawn to the Detail Specification and Price Schedules generally which forms an integral part of the specification, specifically to the following clauses:

Where the term "or other approved" is used in connection with proprietary materials or articles, it is to be understood that approval shall be at the discretion of the Employer.

Where brand or trade names are referred to in the Detailed Specification and Price Schedules, these shall indicate the quality and type of material or fitting required and no substitution of materials so specified will be permitted unless the authority of the Employer has been obtained in writing before tender closes.

4. STANDARD TYPE AND MAKE OF EQUIPMENT

Once installation has commenced with the appropriate approvals for using any type and make of article or equipment, the same type and make of article or equipment shall be used throughout the project for that specific application unless otherwise specified.

5. STANDARD OF WORKMANSHIP

The workmanship under this contract shall be of a high standard and to the satisfaction of the engineer.

6. STANDARD OF MATERIALS

All materials and equipment supplied and/or installed under this contract shall be new and the best of their respective kinds and shall comply with the requirements laid down in the latest editions of the relevant SANS or BS and their amendments and with the requirements of this specification.

7. VARIATIONS

The Employer reserves the right to instruct the contractor to carry out variations to the contract in accordance with the conditions of contract.

8. CONSTRUCTION, PLANT, ETC.

Tenderers shall include an amount for the supply of all scaffolding, ladders, trestles, dust sheets and everything necessary for the proper performance of the contract, for clearing and removal of all rubbish due to the work, for the protection of the work from damage due to the building operations, other contracts and the weather. In existing buildings contractors shall in particular take adequate precautions to the satisfaction of the engineer to prevent damage to existing apparatus during erection operation.

9. **MATERIAL, OFF-LOADING AND STORAGE**

Tenderers must make due allowance in their tenders for the off-loading of materials and the storage and safe custody thereof according to manufacturers' specifications on or off site until such can be accommodated or is required on site.

10. **INSPECTION OF LOCALLY MANUFACTURED SUPPLIES**

Where locally manufactured plant or materials are offered, the Employer reserves the right to inspect such plant or goods during manufacture and to reject items that do not conform to the owner's requirements. Where a number of units are ordered by the owner the contractor shall notify the representative of the Employer when one unit has been completed so that the representative of the Employer may inspect and approve it.

11. **ORDERING MATERIALS**

The contractor is warned to place all orders for materials or special articles as early as possible as he will be held solely responsible for any delay in the delivery of such goods.

12. **PACKING**

The contractor will be held responsible for packing all plant and other goods in such a manner as to ensure freedom from any loss or damage in transit. Unless otherwise specifically agreed upon, receptacles will not be returned or paid for and no additional charges will be allowed for packing or packing materials.

13. **SAMPLES FOR TEST**

The contractor shall furnish, without delay, such samples for testing, or other purposes, as called for, or may be called for, by the Engineer, who may reject all materials or workmanship not corresponding with the approved sample.

Notwithstanding that samples and approved brands of materials, etc. are exhibited or included in classified lists at the offices of the owner, the Engineer may retest any samples, brands of materials, etc. included in the contract and reject articles and materials, etc. that do not strictly comply with the specification.

14. **DAMAGE TO BUILDINGS AND THE MISUSE OF FACILITIES**

Any damage done to the buildings, roads and landscaped areas by the contractor, or his men, shall be made good by the contractor. Should the contractor, or his personnel, be granted leave by the Employer to utilise on-site facilities and such facilities be misused or damaged, the facilities shall be cleaned and/or repaired to the satisfaction of the Employer (it should be understood however, that the provision of facilities (toilets, etc.) in terms of the Preliminary and General costs called for in the tender document, are the responsibility of the contractor). If the contractor fails to attend to such damage, the Employer will take care of remedial work required and shall deduct the cost of such work from the contract monies due to the contractor.

15. **PROTECTION OF OWNER'S EQUIPMENT**

The contractor shall ensure that any computers or other valuable equipment of the owner is sufficiently protected against work or dust by means of temporary coverings or sealed-off partitions.

16. **INSPECTIONS, TESTING, COMMISSIONING AND HANDING OVER**

16.1 The contractor shall provide all tools and instruments required for inspections, testing and commissioning of the works as detailed in the detail Technical Specification.

16.2 **First Offer for Acceptance (First Inspection)**

Once the contractor has completed the total installation, written notice shall be given to the representative in order that a mutually acceptable date may be arranged for a joint inspection. A representative of the employer shall be invited, with sufficient notice, to attend all inspections. During

the course of the inspection the Engineer, in collaboration with the owner's quality inspector, will compile a list of items (if any) requiring further attention. These items shall be identified by checking each and every clause in the contract (all specifications and drawings) in relation to the offered installation.

A copy of this list of outstanding items will be provided to the following:

(a) Contractor – for action.
(b) Inspector of the Employer – for information.

16.3 **Subsequent and/or final offer for Acceptance (Subsequent and/or final Inspection)**

The contractor shall similarly provide written notice that he is ready for an inspection of the remedial work done on the offending items. If the installation is accepted as complete at this stage, by both the Engineer and Employer's Inspector, the Engineer may certify the works as completed. If at this stage there are still outstanding items requiring attention, irrespective of whether those items were identified during prior inspections or not, the procedure will continue until the entire installation has been correctly completed to the satisfaction of the Employer.

16.4 **Tests**

In addition to the above, the contractor shall have the complete installation tested and the correct operation of all plant demonstrated to:

(a) the consulting engineer, and/or

(b) the Employer.

Subsequent to the above testing and approval, the contractor, in the presence of the Engineer, shall test the works as per the Detail Technical Specification.

17. **CONTRACTOR'S LIABILITY IN RESPECT OF DEFECTS (Maintenance Period)**

The contractor shall make all adjustments necessary for the correct operation of the plant for a period of 12 (twelve) months after the date of first delivery of the installation to the Employer. The contractor shall make good any defects due to inferior materials or workmanship that may arise during this period. If during this period, the plant is not in working order for any reason for which the contractor can be held responsible or if the plant develops defects, the contractor will be notified and immediate steps shall be taken by him to remedy the defects or to make any adjustments required.

Should such defects occur so frequent as to become objectionable or should the equipment otherwise prove unsatisfactory during the abovementioned period, the contractor, if called upon by the Engineer, shall replace at his own expense the whole, or such parts thereof, as the Engineer may deem necessary, with apparatus to be specified by the Engineer.

18. **ARRANGEMENTS WITH SUPPLY AUTHORITIES**

The contractor shall apply for and complete all the formalities necessary for compliance with any statutory requirements as necessary. He shall also make himself available for all statutory authority inspections in order to complete all the formalities and tests. Inspection fees shall be allowed for in the tender.

19. **COMPLIANCE WITH REGULATIONS**

The entire installation shall be carried out in accordance with the latest revision and amendments of the following:

(a) The Code of Practice for the Wiring of Premises issued by the South African Bureau of Standards, SANS 10142-1987.

(b) The Occupational Health and Safety Act, Act 85 of 1993 (South African Law).

(c) The municipal by-laws and any special requirements of the supply authorities of the area and district concerned.

(d) The local fire-brigade regulations.

(e) The applicable SANS specifications or the BS specifications where no SANS specifications exist.

No claims for extras in respect of failure by the mechanical contractor to comply with any of the above regulations will be considered.

Where conflict exists between any of the above regulations and the specification, the said conflict must be referred to the Engineer in writing for his ruling.

The contractor shall be responsible for serving all notices and paying all fees due in terms of the laws and regulations mentioned.

20. **TAKING RESPONSIBILITY FOR THE INSTALLATION (For normal electrical or electrical within mechanical installations as well as lift installations)**

With first delivery, the contractor shall accept in writing the responsibility for the total installation as installed by him by certifying the correctness of the installation in accordance with and on the certificates of compliance of the work as per the Specification. In addition, a certificate of compliance with the Occupational Health and Safety Act, issued by an approved independent lift inspector, needs to be provided. If applicable a certificate of compliance regarding any electrical work issued by a qualified master electrician shall be provided as well.

21. **SUBMISSIONS FOR APPROVAL**

21.1 The Contractor shall submit engineering and other applicable details of all the equipment offered for approval prior to ordering.

21.2 The successful tenderer shall prepare detailed shop drawings, builder's work and electrical details of the proposed installation and shall submit these for approval to the Engineer, within 2 weeks after the contract has been awarded.

All construction drawings, circuit or schematic diagrams prepared by or on behalf of the Subcontractor shall be submitted to the Engineer for approval and shall have been thoroughly checked, corrected where necessary and signed as approved by the Subcontractor, prior to such submission.

The Engineer's approval of any drawings will cover the arrangement, type and operational suitability of the equipment in general only. Such approval will not release the Subcontractor from his responsibility for the proper operation of the installation or for its full compliance with the specification, drawings, local authority and statutory requirements, or for ensuring that the equipment can be physically accommodated within the space and via the access provided.

21.3 The contractor shall be held responsible for costs to replace unapproved, pre-ordered equipment as a result of non-compliance with these requirements.

22. **ELECTRICAL INSTALLATION**

22.1 **POWER SUPPLY**

A three phase, 50 hertz electrical supply will be provided by others in each at least 1m away from the device at a position agreed with the subcontractor. The supply will terminate in a bare ended cable and the lift subcontractor shall terminate the supply on the main isolator inside the panel. This tender shall include for the supply points and all other cabling, conduits, cable racks, trays, switchgear, panels, distribution boards, etc., necessary for the satisfactory operation of every part of the installation as well as for the connection of the supply cable into this panel. Three-pin socket outlets will be provided for 220 volt equipment where necessary, by others.

22.2 **ELECTRICAL CONTROL AND SWITCHGEAR PANEL**

A motor control and switchgear board shall be supplied and installed adjacent to the landing door on the top floor of each lift. This is only a requirement if the panels do not form an integrated part of the equipment provided.

Each board shall be fitted with the following:-

(i) A Main circuit breaker.

(ii) A set of copper busbars of adequate size, if the peak current on the board exceeds 50 amperes per phase.

(iii) Individual motors shall be supplied through a circuit breaker and suitable D.O.L., automatic Star-Delta, or slip ring starter.

(iv) All other equipment shall be supplied through a circuit breaker.

(v) In the case where the rupturing capacity of a circuit breaker is lower than the rupturing capacity of the electric feed system at the specific point, the circuit breaker shall be protected by H.R.C. fuses of adequate size.

All starters shall be equipped with auxiliary contacts, which shall be brought to an easily accessible terminal block for the purpose of remote control (if specified). An ammeter with suitable scale shall be fitted to each motor above 7, 5 kW output on at least one phase, and shall be installed in the panel next to the relevant switchgear.
Switchgear panels and boards shall be factory pre-wired so that the only "on site" connections to be made will be the main connection, the supply to each motor, and the control system connections to the terminal block.

All switchgear and distribution boards shall be of the metal clad surface type, with a framework, which is electrically continuous and properly bonded to earth.

The boards shall be equipped with hinged steel doors adequately braced each with a flush lock and two keys.

All boards shall be treated with two layers of rust inhibiting paint.

Switches, push-buttons, and indication lamps and gauges shall be so installed that they remain fastened to the doors when doors are opened.

All boards, which are to be mounted outdoors, shall be weather proof and guaranteed by the manufacturers for such outdoor operation.

The layout of each board as well as the wiring diagrams and details of the switchgear provided shall be approved by the Consulting Engineer before any manufacture is commenced.

All wiring in distribution boards shall be labelled to ease the later tracing of circuits; these shall correspond to drawing labelling.

22.3 **WIRING**

22.3.1 **General**

The wiring of the plant shall be carried out by the contractor in concealed work in all finished spaces. Wiring shall be done by means of solid drawn or lap-welded screwed tubing and PVC insulated copper conductors, or in multicore PVC/SWA/PVC cable. The main runs of conduit or cable shall preferably be carried out at high level (if possible in false ceiling spaces). Distribution shall be vertically down to the required points. All electric conduit and conduit fittings must be thoroughly inspected for defects before installation, and all sharp edges and burrs removed. Bushes and locknuts are to be used where conduit enters switch boxes.

The proposed location of tubing and cables shall be approved by the Consulting Engineer before commencement of work.

Conduit to be installed under plaster finish shall be installed in good time so as not to delay the Building Contractor or cause finished plaster to be chased.

All electrical cables shall be fastened to cable racks or shall be laid in cable ducts. Cables carried in racks shall as far as possible be laid parallel and shall be neatly installed. Descents shall be firmly secured with provision for the swinging of flexible tubing or cables where attached to moving machines and electrical motors.

Sizes of conduit, conductors and cables shall be at least equal to those laid down in the relevant tables of the Code of Practice.

Flexible conduit and cables shall be provided wherever it is necessary to avoid transmission of vibration. No joints in cables or wires will be permitted in a conduit. The ends of cables shall be properly made off. Terminal lugs shall be used wherever special clamp-washers or sleeve terminals are not provided on equipment. Conductor strands may not be cut away or reduced in size, and care must be taken to select switchgear, etc., with terminals of adequate size for looping, etc., where necessary.

No open wiring will be permitted at any point in the system, with the exception of the copper bus-bars in the switchgear boards. These shall be taped up with PVC tape with the relevant phase colours.

22.3.2 **Wiring in Conduit**

No joints shall be allowed and all looping must be done through approved connectors at fitting points.

The live phase shall be connected at the switching point. All wiring in conduit shall conform to the requirements of table 4 of SANS 0142-1981 as amended. Not more than one circuit shall be accommodated in one circuit unless special permission is obtained from the Engineer. Before any wires are drawn into the conduit, a swab is to be drawn through to clear any water, dirt etc.

22.3.3 **PVA Insulated Cables**

LT cables with PVC insulation must conform to the requirements of SANS 150 of 1990 as amended, and must be laid according to the requirements of paragraph 1.16 of this Section B of this specification.

22.3.4 **Solid Conduit**

All conduit shall be of heavy gauge steel, screwed and conform to SABS 1065 of 1985 as amended. No conduit shall be less than 20 mm in diameter. **No PVC conduit will be allowed or accepted.**

All joints shall be screwed and all outlets fitted with rustproof iron boxes. Conduit must be either screwed and lock-nutted on both sides and bushed on the inside of the box or board to which it is attached.

The whole conduit system shall be electrically and mechanically continuous over all joints by means of screwed couplings, well bonded and efficiently earthed by means of earthing terminals and earth continuity conductors. The contractor must keep in touch with the builder and install all conduits so as not to delay his work and to ensure the closest co-operation. Every effort must be made to avoid running conduit in "U"-form, but where this is unavoidable; provision should be made, if possible, to drain the conduit.

All chasing of brickwork, etc., for conduit shall be carried out under this contract.

22.3.5 **Fuses**

Where circuits are scheduled to be fed through fuses, these shall be mounted directly on the panel. All rewireable fuses shall be of the porcelain bridge type, of approved manufacture, connected through bushed insulated holes in the panel. An I.C. fuseboard unit may be used instead of separate fuses. Connections shall be made through the back of the panel so that no surface wiring results. Tinned copper fuse wire shall be fitted to suit the loading indicated in the schedules, where rewireable fuses are used, and cartridge fuses shall be fitted with the appropriate cartridges.

22.3.6 **Earthing**

The whole installation shall be efficiently earthed to the satisfaction of the Engineer, the Inspector of Factories, the Supply Authority, and strictly in accordance with the Code of Practice for the Wiring of premises. Any points proposed as earthing points by the Contractor shall first be approved by the Engineer before connection.

22.3.7 **Boxes**

Where boxes are used in concrete or masonry, approved removable cover plates shall be supplied. For 100 mm x 100 mm boxes, standard blank metal switch-type cover plates may used, but for larger boxes, removable cover plates of metal or other approved material must be supplied with bevelled edges and must be neatly painted.

Cover plates shall be large enough to overlap and cover any gaps between the draw box and the masonry or concrete, and must be finished off to match the surroundings so as not to mar the architectural appearance of the building.

22.4 CABLE TRAYS AND LADDERS

22.4.1 The contractor shall supply and install all cable trays or ladders as specified or as required by the cable routes including the necessary supports, clamps, hangers, fixing materials, bends, angles, junctions, reducers, T-pieces, etc.

22.4.2 Metal cable trays shall be manufactured from perforated rolled steel. Only the following metal cable tray types may be used:

(a) Less than 250mm wide 1,6mm minimum thickness with 12mm minimum return.

(b) 250mm and Wider equivalent to trays supplied by "PERFORATION AND CONDIDURE", or other approved, manufactured from 2mm thick steel with folded over returns and a minimum up stand of 50mm.

(c) 250mm and Wider 2,4mm minimum thickness with 76mm minimum return as alternative to (b) above.

The return of trays shall not be perforated and the top of the return shall be smooth. The same cable tray type shall be used in long parallel tray runs.

22.4.3 Metal cable ladders shall consist of a 76mm high side rail of 2mm minimum thickness. Cross pieces consisting of P3300 "SANKEYSTRUT", or other approved, channel sections shall be spaced at maximum intervals of 250mm. where cables of $10mm^2$ or cross pieces shall be 125mm. Cables shall be clamped in position by means of purpose made cable clamps that fit into the cross pieces. Cross pieces consisting of slotted metal rails which accommodate plastic or metal cable binding bands, may be used in vertical cable runs against walls, etc. where the prior approval of the Engineer has been obtained. These cross pieces are not acceptable in horizontal cable runs.

22.4.4 Metal cable trays and ladders shall be finished as follows:

(a) In coastal areas (for all applications): Hot-dipped galvanised to SABS 121 or epoxy powder coating.

(b) False ceiling voids: Electro-galvanised or epoxy powder coating.

(c) Vertical building ducts: Hot-dipped galvanised to SABS 121.

(d) Substations, service tunnels or basements: Electro-galvanised or epoxy powder coating.

(e) Damp areas, exposed to weather: Hot-dipped galvanised to SABS 121 or epoxy powder coating.

(f) Undercover industrial applications: Hot-dipped galvanised to SABS 121 or epoxy powder coating.

The abovementioned finishes shall apply unless specified to the contrary. Hot-dipped galvanised or electro-galvanised trays and ladders shall be cold galvanised at all joints, sections that have been cut and at places where the galvanising has been damaged. Powder coated trays and ladders shall likewise be touched up at joints, cuts and damaged portions using spray canisters recommended by the manufacturer of the trays and ladders.

22.4.5 Trays shall be supported at the following maximum intervals:

(a)	1,6mm thick metal trays with 12mm return	1,22m maximum spacing
(b)	Metal trays with folded over return and 50mm up stand	1,22m spacing
(c)	2,4mm thick metal trays and 75mm return	1,5m spacing
(d)	Metal cable ladders	1,5m spacing
(e)	3,0mm thick PVC trays with 40mm return	1,0m max spacing
(f)	4,0mm thick PVC trays with 60mm return	1,5m maximum spacing

In addition, trays and ladders shall be supported at each bend, off-set and T-junction.

22.4.6 Joints shall be smooth without projections or rough edges that may damage the cables. The Specialist Controls Contractor will be required to cover joints with rubber cement or other hardening rubberised or plastic compounds if in the opinion of the Engineer, joints may damage cables. Joints shall as far as possible be arranged to fall on supports. Where joints do not coincide with supports, joints shall in the case of trays with single returns be made by means of wrap-around splices of the same thickness as the tray ends shall butt tightly at the centre of the splice and the splice shall be bolted to each cable tray by means of at least 8 round head bolts, nuts and washers. Splices shall have the same finish as the rest of the tray. Where joints which do not coincide with supports occur in trays with folded over returns, tight fitting metal guide pieces, at least 450mm long, shall be inserted in the folded returns to provide the necessary support to the two cable tray ends. Splices as described above shall be provided if trays sag.

22.4.7 Trays shall be bolted to supports by at least two round head bolts per support. Bolts shall be securely tightened to avoid cables being damaged during installation.

22.4.8 The supports for cable trays and ladders shall in all cases be securely fixed to the structure by means of heavy duty, expansion type anchor bolts. It is the responsibility of the Specialist Controls Contractor to ensure that adequate fixing is provided since cable trays and ladders that work loose shall be rectified at his expense.

22.4.9 Horizontal and vertical bends, T-junctions and cross connections, shall be supplied by the Specialist Controls Contractor. The dimensions of these connections shall correspond to the dimensions of the linear sections of which they are connected.

The radius of all bends shall be 1000mm minimum. The inside dimensions of all horizontal angles or connections shall be large enough to ensure that the allowable bending radius of the cables is not exceeded. Sharp angles shall have 45° cornices.

22.4.10 Cables shall be installed adjacent and parallel to teach other on the trays with spacings as determined by the current ratings. Horizontal trays and ladders shall in general be installed 450mm below slabs, ceilings, etc. to facilitate access during installation.

22.4 11 All metal trays and ladders shall be bonded to the earth bar of the switchboard to which the cables are connected. Additional bare copper stranded conductors or copper tape shall be bolted to the tray or ladder where the electrical continuity cannot be guaranteed.

23. ELECTRIC MOTORS

23.1 STANDARD SPECIFICATION

All electric motors shall comply fully with the relevant standard specifications:

- SANS 1948: "Standard Specification for Three Phase Induction Motors".
- BS 2613: "The Electrical Performance of Rotating Electrical Machinery".
- BS 170: "The Electrical Performance of Fractional Horsepower Electric Motors and Generators".

23.2 MOTOR SPECIFICATIONS

(a) Standard Squirrel Cage Motors shall be three phase (or single phase up to THREE kW), continuously rated, screen-protected drip-proof, suitable for direct-on-line or star-delta starting.

(b) High-starting-torque squirrel-cage motors shall be three-phase, continuously rated, screen-protected drip-proof, with a special arrangement of rotor conductors giving high starting torque and moderate starting current and suitable for direct-on-line or star-delta starting.

(c) Slip-ring motors shall be three-phase, continuously rated, screen-protected drip-proof, with continuously rated slip rings and brushers and brushgear suitable for automatic starting.

(d) Fractions kW motors shall be continuously rated, totally enclosed single phase, capacitor-start induction run type, shaded pole of three-phase squirrel-cage where required.

(e) Motors suitable for part-wound starting shall be three phase, continuously rated, screen-protected drip-proof with wound rotor circuits suitably rated to provide continuous full load power when fully switched and to provide starting in graded steps sufficient to overcome the starting load torque without exceeding the specified starting current.

(f) Hermetically sealed motors shall be three phase squirrel cage motors, totally enclosed with suitable internal cooling medium and suitable insulation to provide continuous full load power under the specified ambient conditions.

(g) Pole-changing motors shall be three-phase, continuously rated, screen-protected drip-proof with cage rotor and separate stator windings providing several numbers of poles with various interconnections of the windings. The use of pole-changing motors to alleviate starting conditions shall be limited to 2:1 speed ratios. Additional speed ratios shall only be used where the driven load specifically so requires. Pole-changing rotor circuits are not recommended and shall only be used in exceptional circumstances with the proper approval of the Department. Dahlander connections providing a 2:1 speed ratio with variable torque and variable power characteristics of the motor may be used to drive centrifugal fans and centrifugal pumps. Dahlander connections providing constant torque characteristics may be used for high friction loads and connections providing constant power characteristics may be used for constant power loads viz. machine tools.

Motors with a speed in excess of 1500 r/min except in the case of centrifugal compressors, will not be accepted unless agreed to by the Engineer.

23.3 MOTOR RATINGS

When determining motor rating, the following shall be taken into account:

(a) All motors shall be rated for continuous full load duty.

(b) The Continuous Maximum Rating (C.M.R.) of the motor shall be 20% in excess of the full load running duty of the load in order to withstand the tolerance of 105% - 120% in the tripping characteristics of over-load protection devices allowed in BS 4941 Part 1.

(c) All starting times, irrespective of the load characteristics or the method of starting **shall be limited to 20 seconds** unless prior approval to the contrary is obtained from the Engineer.

The safe locked rotor time shall be well in excess of the run-up time to allow protection discrimination.

(d) All motors shall be capable of a **minimum** of three **consecutive** starts per hour with the load connected and employing the method of starting to be installed without exceeding the allowed temperature limits of the insulation. In addition, the motor shall be capable of the numbers of starts per hour for the particular load as may be specified or as may be experienced under normal operating condition.

(e) Unduly over-rated motors resulting in a low power factor and efficiency are not acceptable.

(f) The motor starting torque and speed/torque characteristics shall be carefully matched to that of the load to ensure that the motor does not stall at a low speed. A safety margin shall be allowed to overcome voltage drops and load fluctuations.

The maximum torque developed by the motor in its final running condition (i.e. when the motor is switched to it's final running configuration in the case of pole-changing motors and all starting devices have been switched out of circuit in the case of assisted starting) shall be 1.6 times the rated full load torque to overcome temporary overloads and voltage fluctuations.

(g) The actual ambient temperature in which the motor will be operating (and not the prevailing outside ambient temperature only) shall be taken into account.

It is a requirement that the above information and any other requirements that will affect the type of motor to be used, be submitted to the motor manufacturer when ordering the motor. The Contractor may at the discretion of the Engineer be required to submit written proof that the **motor manufacturing** will guarantee the performance of the motor for the expected duty and load.

Special attention shall be paid to the starting requirements of motors. It is essential that the starting torque produced by motors under the starting conditions specified, will be sufficient to accelerate the load within the time period allowed by the manufacturer of the motor with a maximum starting time of 20 seconds (refer above). The contractor may be required to submit calculations showing accelerating torque available, load torque characteristics and run-up time. The following formula may be used to calculate the run-up time:

$$T_e = \frac{\left(\frac{T_1}{T_2} - 1\right) x (T_1 + T_2)}{\left(\frac{T_1}{T_2} + 1\right) x Log_e\left(\frac{T_1}{T_2}\right)} \qquad t = \frac{GD^2 N}{9.55 T_e}$$

T_e	=	equivalent accelerating torque in N-m
T_1	=	Maximum accelerating torque in N-m
T_2	=	Minimum accelerating torque in N-m
GD^2	=	Moment of inertia of the rotating parts of the load and motor in kg-m^2
N	=	Final speed in r/min.
t	=	Run-up time in seconds

Accelerating torque is the difference between motor torque and load torque at any given speed on the torque/speed characteristic curve.

Where inching operations occur or where motors are controlled by pressure or level switches where frequent cycling duty may occur, motors shall be capable of 40 starts per hour.

23.4 **MOTOR WINDINGS**

All motor windings shall have Class E or better insulation. The following maximum temperatures as determined by the resistance method may not be exceeded:

Class of Insulation	Altitude					
	0 – 1000m	1200m	1400m	1600m	1800m	2000m
E……	150°C	112.6	111.2	109.8	108.4	107
B……	120°C	118.4	116.8	115.2	113.6	112
F……	140°C	138	136	134	132	130
H……	165°C	163.7	162.5	161	160	158.7

The above figures comply with BS 2613 and SABS 948 for a maximum cooling air temperature of 40°C. Where higher ambient temperatures occur (particularly in cases where heaters are installed), the above temperatures shall be reduced in accordance with BS or SANS specifications.

All windings shall be varnished and baked. The insulation shall provide protection against dust, oil and high humidity as well as aggressive vapours and gases where these are specified.

End-windings shall be carefully wrapped and supported to prevent movement and prevent mechanical damage due to vibrational stresses.

23.5 **MOTOR PROTECTION**

23.5.1 Motor protection shall be provided as follows:

Type of Protection	**Application**
Thermal overload	All motors
Magnetic overload	Only for short circuit protection when acting on circuit breakers with sufficient rupturing capacity
Thermistor over-temperature	All motors of 25 kW and more.
Single phasing	Al 3-phase motors without thermistor over-temperature protection
Earth fault	Only when condensation in motors can take place, e.g. standby close coupled pumps on chilled water system.
Phase reversal	All centrifugal compressor circuits and large reciprocal compressors or other circuits where phase reversal can cause damage.
Under voltage	As specified.
Over-temperature	Auto-transformer starters, liquid starters and resistor starters

23.5.2 All the protection specified in the detailed Technical Specification shall be supplied.

23.5.3 Motor overload (O/L) protection shall be provided in accordance with BS 587. O/L protection shall be provided by means of thermal trips or relays actuating contactors, manual motor starters or circuit breakers. **HRC fuses are not acceptable for this purpose.**

23.5.4 On motor starters on which the overload protection forms an integral part of the starter the protection shall be by means of temperature compensated bimetal thermal O/L trips indirectly heated by separate heating elements in each phase and connected in series with the load. The O/L trips shall be adjustable within the range of approximately 75% to 120% of the rated current of the motor.

23.5.5 Where motors are used frequent repetitive cycles or for inching operations, magnetic overload protection with time delays may be used provided the motor is suitably rated for the duty.

23.5.6 Single phasing protection where provided shall be inherent in the overload protection unit in the case of integral motor starters. Protection schemes depending solely on the excess current drawn by the motor during the single phasing are not acceptable.

23.5.7 Magnetic over current trips or relays for short circuit protection may never be allowed to actuate contactor starters and may only operated on suitably circuit breakers.

23.5.8 Short circuit protection shall be provided by means of HRC fuses or suitably rated circuit breakers.

23.5.9 Thermistor over-temperature protection shall be installed. The thermistor control units shall where possible be integrated with the motor starter. Care shall be taken to select units with sufficient current rating to operate the contactor coil.

23.5.10 **Thermistor protection may not be provided in lieu of over current protection.**

23.5.11 Motor protection shall be “ENGLISH ELECTRIC” type “CMM” OR “P & B GOLDS” type “M”, or other approved, for all motors where preferred. Thermal (or magnetic if required) overload, single phasing (or phase unbalance) and earth fault protection relays as well as auxiliary relays where required, shall be included. The relays shall be housed in a panel mounted unit in a withdrawable case.

23.5.12 Motor protection relays shall not be allowed to operate on metering current transformers, but shall be connected to separate protection class current transformers matched to the motor full load current and the relay power consumption.

23.5.13 In all cases where protection relays are used, “CHAMBERLAIN AND HOOKHAM”, or other approved, test blocks type shall be provided to facilitate remote testing or relay operation, current transformers, etc.

23.5.14 Proven electronic protection relays are acceptable.

23.5.15 Where motors which are not described in BS specifications, e.g. semi-hermetic compressor motors, etc. are used, protection shall comply with the manufacturer’s requirements.

23.5.16. Special attention shall be paid to motors driving high inertia loads to ensure that motors are adequately protected against sustained over currents but do not trip unnecessarily during starting.

(a) Shorting of the over current protection during starting is not acceptable.

(b) Increased overload settings on protection units are not acceptable.

(c) Connecting the overload relay in the delta loop in star-delta starting applications thus providing no protection during starting, is not acceptable.

Saturable core current transformers providing a normal over current characteristic up to 120% of full load current may be used provided they are properly matched. Alternatively, separate starting and running over current protection units shall be used. For star-delta starting methods, the latter can be achieved by connecting the starting over current unit in

the main supply line to the motor and the running over current unit in the delta loop. For other starting methods, a change-over arrangement is required to switch from the starting to the running after the starting time has lapsed. For motors larger than 50 kW electronic integrating type relays with individually adjustable time/current characteristics shall preferably be used. Whichever protection method is used, a safe discrimination between "safe locked rotor time" and "starting time" shall be maintained.

23.6 MOTOR PROTECTION - THERMISTORS

All motors with ratings of 25 kW and higher and all motors with a rating of 15 kW and more that are subjected to run-up times in excess of 15 seconds shall have thermistors for over-temperature protection installed in the stator windings. Three thermistors, one per phase, shall be installed in single wound motors and 6 thermistors shall be installed in double wound motors.

Where thermistors are installed in the end-winding, the "Curie Point" shall be 5°C above the temperature. Where thermistors are installed in the winding "hot spot", the Curie Point shall be 15°C above the temperature values stated.

The thermistors shall comply with the following:

(a) Only Positive Temperature Co-efficient (PTC) thermistors shall be used.

(b) Thermistors installed in motors connected to supply voltages up to 600 V shall be flash tested at 2 kV r.m.s. Additional insulation shall be provided on higher voltage machines.

(c) A varnished Terylene or glass fibre sleeve shall be fitted around those parts of the thermistor leads, which are embedded in the winding for mechanical protection of the leads. Care shall be taken that the sleeve does not cover the thermistor bead.

(d) The thermistor shall be inserted in the winding in such a way to ensure best thermal contact with the adjacent conductors of the winding.

(e) All leads from thermistors to the protection control units shall be twisted pairs to minimise stray voltage pick-up. Screened cables shall be used where the control units are far from the motor.

(f) All the thermistors acting on one control unit shall be connected in series.

Where thermistors are installed it is essential that relay panels be safeguarded against high voltages in case of a short circuit between sensor and motor windings. Isolation transformers are recommended for this purpose.

23.7 MOTOR CONSTRUCTION

The housing, end-shields and feet of totally enclosed surface-cooled motors shall be of cast iron to BS 1452. Standard protected, internally cooled motors may be of welded steel construction. A condensation hole shall be provided at the lowest point in the motor frame.

It is essential that the correct mounting type is selected for each application.

Motor terminals shall be clearly marked, U, V, W or U1, V1, W1 and U2, V2, W2. An earth terminal shall be provided at a convenient position on the motor frame. Vulcanised rubber insulation shall not be used for the connection from windings to the terminals.

When viewed from the drive shaft end, the motor rotor shall rotate in a clockwise direction when the R-W-B supply leads are connected to the U-V-W motor terminals.

All terminals shall be totally enclosed in a waterproof box sealed with gaskets and shall be complete with nuts, locknuts, lugs, etc. Cable boxes for PILCA cables shall be complete with tinned brass wiping gland and armour clamps. PVC cables shall be terminated using compression glands with shroud. Cables shall be provided with a means of support to remove the weight of the cable from the gland. All terminal boxes shall be large enough to ensure proper termination of the cables and connection of cores without exceeding the allowable bending radius. All terminal boxes shall be capable of being rotated

through 360°. Where condensation may form on motor terminals, e.g. certain centrifugal refrigeration compressors, terminal boxes shall be hermetically sealed and filled with silica gel.

Motors shall as far as possible have pre-lubricated and sealed ball or roller bearings. Unsealed bearings shall be loaded conservatively in order that the grease need not be renewed at intervals of less than one year. Bearings shall be suitable for flat or V-belts drives where these are indicated without the use of outrider support bearings. Belt pulleys and couplings shall be balanced.

Bearings shall be protected against possible shaft eddy current and shall be suitable to withstand vibrations caused by reciprocating or unbalanced loads.

Anti-condensation heating elements shall be provided in the motor windings for the following motor applications:

(a) Close-couples motors and pumps in chilled water systems.

(b) Standby motors in refrigeration installations where the ambient air surrounding the motor may drop below the dew point.

(c) Pumps installed in damp areas where the pumps will not run continuously.

The heating elements shall be arranged to prevent terminals and exposed connections becoming damp. As an alternative to heating elements, a low voltage transformer (approx. 50V) can be switched into the circuit when the motor is stationary to provide a continuous circulating current in the motor windings.

Where requested copies of type test certificates for routine and performance tests in accordance with SABS 948, BS 2613 or BS 170 shall be submitted before delivery of the motors. In additions the Manufacturer's guarantee that the motor will comply with the duty as described in this specification, shall be submitted. Curves of Torque/Speed and Current/Speed shall be provided on request.

The client reserves the right to witness all routine or performance tests and shall be notified in writing 14 days before the commencement of such tests.

Motors that have become damp shall be dried out before connection to the supply. Damaged motors resulting from non-compliance with this requirement, shall be rectified by the Contractor at his cost.

24. CONTRACT PRICE ADJUSTMENTS PROVISIONS

This contract is a fixed price contract.

Tenderers must allow in their prices for any future escalation in the cost of labour, materials currencies, etc. as no claims for increased costs will be entertained.

25. PROGRAMME AND COMPLETION

The contract period will be as per the main contract programme stipulated elsewhere. The installation of the various items of equipment specified in this document is to be completed either before or concurrent with the building work.

26. MAINTENANCE

After first delivery of the lift, a 12 month free maintenance period will follow, thereafter the Client may enter into a Service and Maintenance Agreement.

26.1 TERMS OF MAINTENANCE CONTRACT

Service both lift installations (to include all materials components etc, carry out all examinations and/or tests which are annually, five yearly, 10 yearly and re-roping, main hoisting and governor ropes, attendances to breakdowns and carrying out repairs and replacement of equipment, parts, components).

27. GUARANTEE PERIOD

The installation and all materials shall be guaranteed against latent defects for a period of 12 months satisfactory service from the date on the completion certificate issued by the Engineer.

28. **LOCAL CONDITIONS**

Tenderers must acquaint themselves fully with the situations, the local conditions and the requirements of this specification. The Client will not consider later claims by the successful tenderer for extra payment arising out of underestimating any of the requirements.

29 **TEMPORARY POWER**

There will be no need to acquire temporary power as the power on site may be used by the contractor.

30. **STANDARDS AND CODES**

The various types of equipment shall comply with the European Safety Rules for Electric Lifts and Escalators, but if the equipment is manufactured to a different safety code, then that code must be specifically mentioned in the Information Schedule of this document.

Motors, generators and starters may be manufactured in accordance with either British, European or American standards. Tenderers must state, however, to which standard the machines offered are made, and must give details of the time rating of the machines in the Information Schedule of this document.

31. **SETTING OUT OF WORK**

The Contractor shall before placing orders for the lifts, scrutinise all Architectural drawings and shall ensure that the equipment purchased shall fit into and operate satisfactorily within the required safety standards in the building.

The Contractor shall be responsible for the correct setting out of any holes that may be required in the shaft walls or floors or machine room for which he must submit detailed drawings to the Engineer.

The Contractor shall before taking over the shaft, shaft openings, lift pit and hoist machine compartment satisfy himself with the builder's work, and check all relevant dimensions on site.

Any discrepancies found must be reported immediately to and make good where necessary.

No extras will be considered for any work carried out by the Contractor arising out of incorrect dimensions or other defective builder's work associated with the installation of the relevant equipment.

32. **APPLICATION TO THE DEPARTMENT OF MANPOWER**

The Subcontractor shall submit all the necessary drawings and information to the Regional Director of the Department of Manpower and shall submit the necessary applications for the erection and use of the lift, goods hoist and escalator installations.

33. **IDENTIFICATION OF PLANT AND EQUIPMENT**

The whole of the plant control equipment, etc., shall be identified.

All equipment switchgear panels, electrical, electronic and pneumatic control panels and control equipment shall be labelled and identified in accordance with the approved wiring diagram or approved control schematic diagram.

Labelling shall be done in white print or black hard plastic labels, which shall be glued onto panel covers and equipment. No label shall be less than 50mm high unless those on and in switchboards where it is permitted to use smaller labels to suit the application.

Labelling shall be done in both official languages.

34. **MANUALS AND LITERATURE**

At the stage of performance testing, the Contractor shall submit to the Consulting Engineer, **three copies** of maintenance and operating instructions each containing the following:

a) A full set of electrical drawings of the final installation.
b) A full set of control drawings of the final installation.
c) Literature on all other equipment installed including wiring diagrams, recommended spare parts lists together with the model number, etc., and the name and address of the supplier.
d) A list of all control components installed together with model numbers.
e) All workshop drawings of the plant as installed.
f) Pre start-up checklist.
g) Start-up procedure.
h) Routine maintenance procedure.
i) Trouble-shooting checklist.
j) All wiring diagrams. Additionally, a copy of the wiring diagram is to be framed and hung in the plantroom.

All wiring diagrams are to be correct in every respect and checked before being submitted i.e. they are to be correct for the operation of the plant as specified and installed.

All the above relevant information shall be properly filed and indexed in an appropriate file.

NOTE

In addition to the above the Contractor shall hand over a reprolar (plastic) print if each wiring-, control- and piping diagram etc., as well as "as installed" drawings.

Approved maintenance and operating instruction manuals to be handed to the Engineer.

35. **SCHEDULE OF TENDERER'S TECHNICAL CAPACITY**

List largest lift installation projects completed within the past 5 years (not more than ten).

Project	Value R	Number of Lifts and Capacity	Client & Telephone No.	Consultant & Telephone No.

2. Provide company data on technical personnel only.

	Technical Person	**No.**
(a)		
(b)		
(c)		
(d)		
(e)		
(f)		
(g)		
(h)		
(i)		
(j)		

PROPOSED NEW POLICE STATION FOR SOUTH AFRICAN POLICE SERVICES (SAPS) - MAKHAZA, CITY OF CAPE TOWN, WESTERN CAPE

LIFT INSTALLATION

PART 2: DETAIL SPECIFICATION

I N D E X

SAPS MAKHAZA

LIFT INSTALLATION

PART 2: DETAIL SPECIFICATION

This Standard Specification outlines general requirements for the execution of contracts and sets standards for materials, equipment, workmanship, quality control, testing commissioning, and guarantee of mechanical building services installations.
Please note that it is the tender's responsibility to check the onsite conditions and access available, do all required measurements as per requirements.

1. SCOPE OF CONTRACT

1.1. The contract comprises the supply, installation, commissioning and handing over of:

1.1.1 One (1) Passenger lifts with a capacity of 1000 kg respectively, including new cables and distribution boards.

1.1.2 A three phase, 50 hertz waterproof electrical supply will be provided within 1m of the unit in a position suitable agreed. The supply will terminate on the main isolator. This tender shall include for the supply points and all other cabling, conduits, cable racks, trays, switchgear, panels, distribution boards, etc., necessary for the satisfactory operation of every part of the installation as well as for the connection of the supply cable into this panel. Three-pin socket outlets will be provided for 220 volt equipment where necessary, by others.

1.2 The equipment offered shall be suitable for continuous operation under the following conditions:

1.2.1 **Electricity Supply**

3-phase, 50Hz AC with a nominal voltage of 400V varying between 95% and 105% of the nominal voltage.

1.2.2 **Location**

Cape Town Province.

2. LIFT SPECIFICATION

The work comprises the complete supply, installation, commissioning, testing and handing over of one (1) new electrically operated passenger lift.

The lift shall hold a maximum capacity of 1000 kg respectively and shall operate from ground floor to first floor level.

2.1. General Characteristics

2.1.1 Main Detail

Type of device	:	Passenger Lift
Quantity	:	1
Capacity	:	1000 kg/ 13 persons
Rated speed	:	1 m/s
Stops	:	2
Travel Height	:	4m

2.1.2 **Drive System**

Power supply	:	400V Three Phase
Location	:	Within 1m of device

2.1.3 **Control System**

Control system principal	:	Simplex

2.1.4 **Shaft**

Pit	:	1700mm
Headroom	:	3800mm
Machine	:	Gearless

2.1.5 **Car**

Type	:	Passenger
Car dimensions	:	1600mm W ×1900mm D×2200mm H
Cabin Front/Side/Rear Walls	:	Full brushed SST
Floor	:	PVC/ Local tiled
Hand rail	:	On rear wall

3. LIFT CAR

3.1 Platform

The platform shall be of durable material

3.2 Car Enclosure

As per general characteristics

3.4 Flooring

As per general characteristics.

3.5 Car Operating Panel

The Car Operating Panel shall be located within the car wall in accordance with the requirements of the SANS Regulations to ensure it is suitable for use by disabled persons.

3.6 Car Wall Finish

As per general characteristics

Note: Details of the lift car interior finishes shall be submitted by the contractor to the engineer for approval prior to ordering of the lift.

4. OPERATIONAL CONTROL

4.1 Controls

Two wall mount controls and one onboard control (call and send)

5. EMERGENCY RESCUE

The unit shall be complete with emergency back up battery

6. TESTING

The completed installation shall be inspected and tested to ensure it meets the requirements of the latest SANS Lift Regulations.

Two (2) complete set of documents to be handed to the client, including all test certificates, and manuals as per SANS requirements.
It is the supplier's responsibility to make sure that the installation complies with all the regulatory requirements.

7. BUILDERS WORK

All building work required must be specified and any additional work not noted in tenders document will be for their account.

8. PENALTIES

Please see contract document for penalties.
Should the project overrun the completion date, the costs incurred for any additional meetings will be to the contractor's costs.

9. GUARANTEE

The equipment shall be guaranteed for a period of 12 months against any defects and equipment failure. The contractor shall, at their cost, make every effort to attend to the defects or replace the faulty equipment.
Twelve (12) month free maintenance period shall form part of the guarantee period, which shall commence on the date of final handover, or when all outstanding items are completed.

10. PROTECTION OF WORK AREA

The contractor shall ensure that the entrances are securely blocked off with boarding of at least 2 meters high and that all entrances are locked at all times.
The contractor shall ensure that no unsafe situation arises due the work undertaken and shall ensure the safety of the public at all times.

11. SAFETY

The contractor shall ensure that it's employees and agents work in a safe manner at all times, has attended documented safety meetings, and the all equipment used on site is in good condition.
All employees should have trained and be competent to carry out the functions they are required to do.
Employees are to be easily identifiable and should act at all times in professional manner.

12. SUPERVISION AND CONTROL

The Technical Officer appointed by the owners will administer the contract and provide overall superintendence over the Contractor's performance. The Technical Officer may direct the Contractor in terms of the provisions of the contract or in regard to any measure he may require for the operations of UDT and for the safety of their property and personnel and that of other persons.
The Contractor shall permit the Technical Officer or any person appointed and duly authorized by him access to inspect the Equipment and work performed on it, at any time.
The Contractor shall be responsible for supervision and control of the contract work performed by him and shall advise the Technical Officer the name of the responsible person appointed by him to undertake such supervision and control.

13. STORAGE AND REMOVAL OF MATERIAL

The contractor to liase with the builder about on site storage