

Technical Specifications

Annex

ELECTRICAL ELEVATORS

SPECIAL SPECIFICATION

GENERAL

1201A SCOPE

This specification covers the complete supply and installation of lifts plant intended to be used for the Project in accordance with the Drawings, specifications, schedules and to the satisfaction, of the Engineer.

All electrical and other works related to the complete installation of lifts shall comply fully with the relevant provisional By-Laws (if any) issued by the Local Authorities and in accordance with the applicable requirements of the Section "ELECTRICAL SYSTEM".

The Contractor shall provide a third party testing certificate and shall fulfil all requirements to the approval and satisfaction of the local Civil Defence Authorities.

All accessories or other items necessary to the completeness of the lifts work, though not specifically shown on the Drawings or specified herein, shall also be provided under this Section.

Work under this Section shall include but shall not be limited to the following:

- Installation of passenger, service and bed lifts with system control operation as specified under the summaries at the end of these specifications.

The Contractor shall submit full details of proposed lift cabin interior finishes along with material samples for Engineer's approval.

The lift supplier shall be the authorized distributor of such equipment, maintaining a local staff of specialists for engineering assistance, installation and maintenance of lift equipment.

1201B GENERAL REQUIREMENTS

The Contractor shall supply all labour and material necessary and shall install, complete and ready for use, the lifts plant.

The Contractor shall carry out the whole of the lifts work in a worker like and substantial manner and in strict conformance with the codes listed in the following clauses or approved equal.

All equipment and material supplied for the lifts plant of this project shall be manufactured in strict compliance with the standards listed in the following clauses, or approved equal.

The Contractor's attention is directed to the requirements of the GENERAL CONDITIONS OF CONTRACT, and Section - GENERAL REQUIREMENTS of the Specifications as applicable to the Lifts Work.

1201C ELECTRICAL SERVICE

The system shall be designed to accept the incoming A/C power supply, which is 415V volts, three phase, 50 Hz, alternating current. The supply for illumination, fan and control shall be on, 240 volts, single-phase alternating current.

1201D COORDINATION WITH OTHER TRADES

The Contractor shall at an early stage coordinate with work to be done under other sections such as shaft dimensions, pit depth, overhead dimensions, levels, structural requirements, doors clearances, distribution board including number of circuits allocated, circuit breaker ratings, feeders sizes, conduits and empty boxes for control wiring and signalling equipment, etc.

The Contractor shall be responsible for any future problems that might arise due to the incoordination with other trades and shall foresee at an early stage all necessary requirements to be able to install the system as specified herein.

1201E PROTECTION OF LIFTS EQUIPMENT

Lifts equipment shall be protected against mechanical damage and from the weather especially from water dripping or splashing upon it, at all times during shipment, storage and construction. Equipment shall not be stored outdoors. Where equipment is installed or stored in moist areas such as unheated buildings, etc., it shall be provided with an acceptable means to prevent moisture damage. This may be a uniformly distributed source of heat to prevent condensation.

Should any equipment or material be subjected to possible damage by water, it shall be dried out thoroughly and put through a special dielectric test as directed, at the expense of the Contractor or shall be replaced by the Contractor without additional charge.

1201F WIRING

Only cables forming part of the lift installation shall be run in the lift shaft. Cables fixed in the lift shaft shall be one of the following types:

- a) Armoured,
- b) Insulated,
- c) Heat, oil and flame retardant sheathed,
- d) Enclosed in metal conduit, metal duct or metal trunking, high impact rigid PVC conduit.

Travelling cables shall be elastomeric insulated with braided moisture resistant textile outer finish treated with fire resisting compound and manufactured to BS 6977.

The minimum size of one core shall be 2.5 mm².

Each travelling cable shall contain one earth conductor and one spare conductor. The travelling cables shall be supported at the top of the lift shaft and at the car, as to relieve the strain on the conductors. The method of support shall be to the approval of the Engineer.

The Contractor shall supply, install and connect all wiring from the lift distribution board adjacent to the lift room door until the Controller and lift car, and from controller to all stations, panels and signalling devices.

1201G DISCONNECTING AND PROTECTION MEANS

The disconnecting and short circuit and earth fault protection means of the Controller which will be provided under a separate section in the form of a distribution board will be as follows (unless otherwise indicated):

- Individual triple pole circuit breakers for every lift motor.
- Individual single pole circuit breakers for the control circuit of every lift motor.
- One single pole circuit breaker for common group system control and common signalling lights as applicable.

In addition, lighting and fan of each lift car will be provided with a separate circuit breaker(s).

The controller shall be electrically assembled and connected such that it shall accept separate circuits from every breaker described above.

A mushroom headed lock down type emergency stop switch shall be provided adjacent to machine or pulley. The emergency stop push button shall be provided at a readily accessible position to personnel in an emergency situation.

A warning sign both in Arabic and English shall be provided on the door of each controller with the following inscriptions:

"WARNING-EVERY COMPARTMENT HAS THE FOLLOWING SWITCHES IN THE DISTRIBUTION BOARD ADJACENT TO THE LIFT ROOM DOOR TO BE OPENED TO DE-ENERGIZE THE COMPARTMENT COMPLETELY: MOTOR BREAKER, CONTROL BREAKER, AND COMMON GROUP SYSTEM CONTROL BREAKER".

A similar warning shall be provided on a board and shall be hung above the distribution board adjacent to the door.

The contractor shall coordinate with the Electrical Works section for the appropriate breakers ratings and quality and shall submit the same for the approval of Engineer.

1201H CODES AND STANDARDS

The Contractor shall carry out all lifts work in accordance with ANSI Code A 17.1 Safety Code for Elevators, Escalators, NFPA No. 101, Life Safety Code, NFPA No. 70 as applicable; BS 5655 & EN (81) for lifts.

Approval of the Engineer.

1201I SHOP/CONSTRUCTION DRAWINGS

The Contractor shall submit all necessary drawings for the general layout of the lifts equipment to the Engineer for approval prior to order. These drawings, when approved by the Engineer shall include the guarantee of hoist way sizes and the confirmation of power supply characteristics.

1201J MODIFICATIONS

If during the work, the Contractor wishes to make changes or modifications, these modifications shall be submitted to the Engineer for approval. If these changes result in extra expenses in design and/or material, these expenses shall be borne by the Contractor.

1201K MAINTENANCE AND WARRANTY

The Contractor shall be responsible for the maintenance of the lifts at his own expense for duration of one year starting from the date of issue of the project completion certificate. Maintenance shall include replacement of parts or whole equipment that shows any manufacturing or installation defects during operation.

The Contractor shall guarantee every piece of equipment from any manufacturing or installation defects for a period of one year, starting from the date of issue of the completion certificate. The Contractor shall supply two copies of a maintenance manual for the lifts system in English.

The warranty details shall be displayed on the equipment. These details shall include:

- Warranty start and end date.
- Supplier's contact phone number.
- Local service centre

The warranty details shall be engraved on appropriate brass plates and shall be affixed to the equipment.

TRACTION EQUIPMENT

1202A GENERAL

The lift machine(s) shall be of the worm-gear traction types with a traction sheave and brake. The worm and its shaft shall be accurately machined from one piece of high tensile strength solid forged steel shafting, and shall be provided with approved thrust bearing designed to take the thrust of the worm in both directions.

The brake shall be spring applied, magnetically released, self-cooling and capable of holding the car securely under maximum speed and load, designed to be automatically and instantly applied in the event of interruption of the power supply. The brake springs shall work in compression. Means shall be provided for manual release of the brake in order to allow manual winding of unit in emergencies. The brake emergency release shall be self-resetting.

1202B SHEAVES

The traction sheave shall be made of fine-grained cast iron of the proper hardness accurately grooved for the proper number and size of hoisting ropes and shall be designed to give constant traction and long rope life. All deflector sheaves necessary to obtain the proper lead of the ropes shall be provided and shall have similar construction as the traction sheave. Approved bearing such as rolled steel beams or channels shall be provided for all sheaves.

A guard extending below the machine level shall be provided underneath of deflector and secondary sheaves.

1202C MACHINE - MOTOR ASSEMBLY

Machine shall be provided with an electro-mechanical brake. The brake shall be spring applied and electrically released. Swivel type brake shoes shall be applied to the braking surface simultaneously and with equal pressure.

The electromagnet brake shall ensure smooth and gradual application of brake shoes.

Each lift machine shall be adequately isolated from the main building structure by means of 50 mm thick cork slabs to prevent transmission of noise and vibration. There shall also be statically and dynamically balanced for quiet operation.

A steel joist, of adequate strength shall be furnished and fixed in the top of the hoist way for each lift to facilitate lifting of the machinery.

1202D MOTOR CONTROL

The motor drive shall be of the microprocessor controlled high performance fully digital variable voltage, variable frequency (VVVF) type consisting of a converter/inverter system which first rectifies the AC supply to DC power, then using PWM technique converts DC into variable voltage and variable frequency AC Power to drive the hoisting motor. The speed of the motor shall be controlled by varying the power supply frequency and voltage level. A closed loop feedback control and car position transducer shall be provided for smooth operation and accurate levelling.

The controls shall provide step-less acceleration/deceleration regardless of load, accurate speed regulation and efficient operation.

The motor control unit shall be provided in a ventilated cabinet with hinged doors. The regulator and control section shall be separated and isolated from the control unit.

Built-in protection devices shall include:

- Reverse phase relay.
- Phase loss relay.
- Tachometer over-speed and tachometer loss protection.
- Thermal protection.
- Short circuit and earth leakage protection.

1202E ELECTRIC LIFT DRIVE

Motors used for lift drive shall be suitable for operation in accordance with the size and speed of the proposed lift.

The hoisting induction motor shall be of the squirrel cage type suitable for operation at all load condition without noise and hum and shall be constructed specially for variable AC operation. The induction motor shall be in accordance with BS 5655, part 6 and shall comply with BS 5000, part 99.

Motors shall be fan cooled and shall have high starting torque and low starting current.

All motors shall bear the manufacturer's name plate with all relevant details of rated voltage, rated frequency, type of insulation, etc.

Protection shall be provided against phase failure and phase reversal. When pole changing motors are used, the transition between windings shall be carried out in such a manner as to ensure smooth deceleration and acceleration between stops.

If the drive system gives rise to excessive flow of harmonic currents, the contractor shall install filtering equipment to reduce harmonic currents and voltages to safe limits.

During any motor fault conditions, the lift car shall be brought to rest and held in a secure position. The control system shall be such that the power supplies are cut-off and it shall not possible to re-energize the motor until the faults is cleared.

Where the contractor specified shall provide lift pit moisture detector to provide an alarm signal to control room.

AUXILIARIES

1203A GUIDE RAILS AND OTHER STEEL WORK

The Contractor shall supply and install all supporting and separator steel beams and all other steelwork required for the lifts.

T-Section rails of highest quality steel shall be provided as guides for cars and counter weights. The guide surfaces shall be accurately machined and polished. Steel splice plates of adequate strength shall be used to connect the rails together in proper alignment.

The guide rails shall be fixed to the walls of the hoist way by means of heavy steel brackets to metal inserts built into the walls. The brackets shall be so spaced that rail vibration during lift operation is minimized.

The guide rails and their fixing shall be capable of withstanding the sudden application of the safety gear under maximum load conditions.

1203B COUNTER WEIGHT

The counterweight shall be designed for smooth and economical operation. It shall consist of a structural steel frame fitted with the necessary cast iron sub-weights. These sub-weights shall be secured to the frame by the rods passing through holes in all of them.

1203C GUIDE SHOES

Guide shoes on car and counterweight, which can be easily renewed, shall be provided with non-metallic gibs suitably impregnated to afford natural lubrication of guide rails.

The weight of the counterweight shall be equal to the total weight of the car plus approximately 40% of the contract load.

1203D ROPES

The hoisting/compensation ropes shall be of special anti-acid quality high grade traction steel of suitable size, construction and number especially designed for lift duty, having a factor of safety of 12. Approved means of attaching the ropes to the car and counter weight shall be provided.

The minimum number of ropes shall be three.

Independent adjustment shall be provided for each rope.

A rope slack switch shall be incorporated in the safety system.

Governor ropes shall be of steel.

1203E SAFETY DEVICES

A centrifugal Governor, independent of the other elevator machinery shall be provided. On over-speed, the governor shall cut off the power to the motor and set the brake should the speed still increase; the governor shall actuate two safety rail clamps mounted at the bottom of the car. These devices shall clamp the guide rails by wedging action, bringing the car to a smooth stop.

Polyurethane, energy accumulation buffers shall be provided for car and counter weight for speeds up to and including 1.0 mps (60 mpm).

For speeds higher than 1.0 mps (60 mpm) oil-type buffers shall be provided.

Oil buffers shall be placed in the elevator pit to bring the elevator to a partially cushioned stop if it over-travels the lower terminal.

Electrical final-limit switches shall be located at proper distances below and above the safe travel limits of the car. These switches shall de-energize the traction motor and shall set the main brake.

1203F PIT SCREEN

A substantial screen shall be fixed at the bottom of the elevator well where the counterweight comes down to the buffers.

1203G ALARM BELL

An emergency alarm bell, including wiring shall be provided and connected to plainly marked push button in the car operating panel. The alarm bell shall be located in the Traffic Director's panel if any or individually mounted at the main lobby. Batteries and trickle charger shall be provided for the alarm circuit.

1203H COMPENSATING CHAIN

Each lift with a total travel of 28 m and over shall be provided with compensating chains attached to the car frame and counterweight to compensate for the weight of the suspension (hoist) ropes. Chains shall be interwoven with each core to minimize noise.

1203I INSTANTANEOUS SAFETY GEAR TYPE

The safety gear to be provided shall comply with BS5655, CEN81, TRA200 and other international lift codes.

The device shall be operated by an over-speed governor via a linkage on top of the car frame, which causes movement of steel rollers within the safety ranges. This locks the car frame to the guide rails and simultaneously operates an electrical switch which disconnects the power to the lift motor.

CONTROL SYSTEM

1204A OPERATION – DUPLEX (COLLECTIVE/SELECTIVE)

The lifts shall have up and down collective and selective automatic operation whereby both lifts operate from a single pushbutton station at the landings. Only one car shall respond to any one landing call, when it is travelling in the direction of the call.

The control shall be arranged so that, normally, one car shall be parked at the main floor, and the other free car, at the landing last served, to answer the landing calls. Should both car happen to finish their calls at the main floor, the car which arrived there first shall become the free car to answer subsequent landing calls. An idle free car shall answer any landing call either above or below where it may be standing.

When the free car is attending calls, the car parked at the ground floor shall start automatically when a landing call is registered behind moving free car or if call remains unanswered after a predetermined time.

Either car shall always respond to its own car button calls regardless of the direction of the landing call, or car movements shall be subject to the interlock circuits being established. When either car is taken out of service for any reason, the other car shall automatically answer all calls from the landing and its own car buttons.

1204B AUTOMATIC TERMINAL STOPS

Each lift shall be equipped with an automatic stopping device, arranged to bring the car to a stop accurately at the terminal landing independent of the regular operating device in the car. Final limit switches shall be provided in the hoist way, operated by the car and arranged to stop the car and prevent normal operation, should it travel beyond the zone of the normal stopping device.

Automatic Levelling Device shall provide compensation for thermal expansion, elevator loading and normal rope stretch.

1204C OVERLOAD ALARM

Each car shall have an overload protection control to interrupt operation and sound an alarm bell within the car when the car is overloaded and to lit an overload indicating pilot light.

1204D AUTOMATIC BY-PASS

A full load by-pass feature shall be provided which prevents a fully loaded cab from stopping to answer landing calls, such calls to remain in the system to be answered by the other elevator (if any).

1204E CAR PREFERENCE

Car preference shall be provided with the provision of a key operated switch in each car operating panel which, when operated shall remove the car from the control system. On this mode, the car shall only respond to car calls non-collectively and upon arrival at a floor the doors shall remain in the open position until a car call is registered.

1204F AUTOMATIC OPERATION BY EMERGENCY POWER

The electric control system shall have automatic change over switches to operate the system using emergency power source in case of power failure. This automatic switch shall automatically operate one car at a time, to bring it to the nearest landing, and shall operate one reassigned car on emergency power. When normal power is restored, all cars shall automatically return to normal operation.

1204G EMERGENCY LANDING DEVICE

A battery-operated emergency landing device shall be provided for each lift regardless the availability of emerging power source.

The batteries shall be of the sealed lead acid type housed in sheet metal ventilated cubicles.

Batteries shall be recharged automatically by means of an integral battery charger.

The emergency landing device shall drive the hoist motor in the event of normal power failure and shall descend the lift car to be nearest landing and open its doors.

1204H CONTROLLER

The lift controller shall be of the microprocessor type totally enclosed; cubicle type constructed of sheet steel with hinged doors on the front and screwed panels on the back, giving easy access to all components inside the controller. The cubicle enclosure shall be such as not to post any danger of shock or injury to personnel. The cubicle closure shall be well ventilated by means of louvers or other approved method, such that the temperature inside never exceeds the safe temperature of the equipment.

The storage and operating functions within the controller shall be implemented by means of integrated circuits, while the hoisting and door operating motors shall have conventional control components. The microprocessor and associated logic boards shall be designed to accept programming on site with minimum down time.

The controller shall house microprocessor based computerized integrated circuits, contactors, relays, selectors, timing devices, transformers and all apparatus associated with the control of the lift in the top of the hoist way.

All power contactors shall be electromagnetically operated and shall have carbon to copper contacts to prevent fusing. All control circuits shall have silver contacts. All contacts shall close with wiping, self-cleaning action. Reversing contactors shall be mechanically interlocked to prevent the contacts for one direction from closing while the contacts of the other direction are close.

All coils and other components of the controllers shall have "Class B" or equivalent insulation throughout.

The controller shall provide protection against the following:

- a) No-volt and sustained under voltage.
- b) Phase reversal of the power supply.
- c) Overload.
- d) Failure of any of three phases.
- e) Earth leakage protection if not provided in relevant power source.

The Controller shall be arranged to cut off the power supply, apply the brake and bring the car to rest in the event any of the above failures occur.

In case of power failure and after the standby generator if any has operated, each lift shall descent one after another to the main landing and opens its doors. Afterwards only one or more pre-selected passenger lifts shall resume normal operation.

If the stand-by generator power supply (if available) fails to operate the lifts within a pre-assigned time, the emergency landing device shall take over the operation as described under "Emergency Landing Device", clause herein before.

1204I Door Operator

Doors shall be power operated by means of quality operator mounted on top of the car. The motor shall have positive control over door movement for smooth operation. A double linkage arrangement driver both car door panels directly. Landing and car doors are coupled by a retractable door lock cam which holds the panels securely during the complete door motion. Each car door shall be provided with a protective device.

Door operation shall be automatic at each landing with door opening being initiated as the car arrives at the landing and closing taking place after operation of a time interval. An electric car door contact shall prevent the elevator from operating unless the car door is in the closed position.

Door operation “notification, open, close, hold-open” shall be arranged to meet ANSI code and AMERICAN with Disabilities Act guidelines. Doors will be provided with evacuation deterrent devices on each hoist way door as required by code.

The time interval for which the elevator doors remain open when a car stops at a landing shall be independently adjustable for response to car calls and response to hall calls.

1204J Adjustable Door Time

The time interval that elevator doors stand open after a stop will be independently adjustable for car call stops and hall call stops. More time will be allowed for hall call stop. The timing should be adjustable to suit the needs of the building and to suit handicapped code requirements. The lobby door time should be adjusted longer than the time at other landings to allow extra passenger traffic at the lobby.

ARCHITECTURAL FEATURES

1205A ENTRANCE ARCHITRAVES

The entrance architraves shall be made of stainless steel at all floors.

1205B CAR

The car frame shall be manufactured from robust structural steel members, properly braced and securely fastened together.

The car platform shall be constructed of structural steel frame filled with plywood flooring. The platform shall be equipped with an aluminium threshold plate and shall be mounted on rubber pads forming an isolating cushion between the car and steel car frame.

The underside of the platform shall be protected against fire by a covering of steel of at least No. 27 U.S. gauge.

The car shall be provided with a high capacity-ventilating fan of the silent-running type and of approved manufacturer. The fan and lights shall be automatically switched on when the car is called. Furthermore, fan and lights shall continue to be switched on while the car is not in operation. A time delay relay shall switch off the fan and light 30-60 seconds after the car has stopped. Provision shall also be made for natural ventilation of each car. Sockets shall be provided for inspection lamps inside the case, on the roof and below the car.

An emergency light with batteries and charger shall be incorporated.

1205C CAR FINISHES

The passenger lifts shall be provided with: Stainless steel interior finish, completely illuminated suspended ceiling, glass mirror, kick plates, stainless steel handrails unless otherwise specified at the summary sheets at the end of these specifications.

Service Lifts shall be provided with stainless steel finish, ceiling fluorescent fixture, kick plates, stainless steel handrails unless otherwise specified at the summary sheets at the end of these specifications.

1205D LANDING DOORS (PASSENGER LIFTS)

Landing doors of lifts shall be of the sliding, automatic, power operated centre opening type, of hollow metal construction, packed with fire resistant filling. Doors shall operate silently and their hangers and tracks shall be of the two-point suspension ball or rolling bearing type. Doors shall be guided at the bottom of gibes in a groove in an approved type sill. The grooves and tracks shall be so designed that they are automatically cleaned by the operation of the doors.

Landing doors shall have a minimum 30 minutes fire resistant rating complying with the local civil defence requirements and the international standards.

An electronic non-contact (infrared beam) safety device extending the full height of car door shall be provided such that if this beam is crossed by obstruction it shall automatically cause the car and landing doors to open.

The safety edge device shall be fully retractable. After a certain allocated period of time, if the safety edge device keeps the doors open, an emergency alarm bell shall be activated.

The car shall in addition be provided with photoelectric device, which shall open the car door automatically when the light beam is interrupted.

The landing doors shall have such interlocks as to prevent operation if the lift doors are open. In addition, it shall not be possible to open any landing door until the car arrives and stops at the

landing. In case of interruption or failure of electric power, provision must be made for opening all landing doors by a special key.

The doors other than the swing doors shall normally open automatically once the car reaches and stops at the required floor. The doors shall then remain open for a reasonable adjustable period of time to enable passengers to enter or leave the car. Door opening time (Dwell) for car call and hall call should be individually adjustable.

Each landing entrance shall be fitted with a self-contained unit for supporting the door panel. Each unit shall consist of a sill, two angle uprights and header. A suitable non-slip sill shall be installed at each landing and car entrance. The sill shall be made of stainless steel to approved texture.

Doors finish shall be as specified in the summary at the end of these specifications.

1205E LANDING DOORS (SERVICE LIFT)

Unless otherwise specified in the summary at the end of these specifications, the landing doors of each lift shall be of centre opening type, constructed of sheet steel. Each door shall comprise a frame, door with wired glass vision panel, sill, and hinges, pull handle, push plate and masonry anchors complete. The door and frame shall be flush on the hoist way side and each lift shall be painted with one coat of "Galvafruid" rust inhibitive primer and two coats of chlorinated rubber paint as specified under "PAINTER".

1205F CAR DOORS

Car doors construction and finish shall be similar to the landing doors and they shall open and close simultaneously with the landing doors.

In case of power interruption, it shall be possible to open car doors manually from within the car.

1205G FACEPLATES

Unless otherwise specified all faceplates for operating and signal fixtures shall be provided in aluminium or stainless steel; to Engineer's approval.

BUILDER'S WORK

The expression Builder's Work shall mean the ancillary work carried out by the Contractor in connection with the lifts and escalators installation.

Builder's work in connection with the lift and escalators installation shall include the following, but it should be noted that the list is not intended to be exhaustive:

- a. Drilling, cutting or leaving of holes for conduit, cables, trunking, channels and the like through walls, floors, etc. and subsequent making good.
- b. Cutting and pinning ends of supports for equipment, gear, motors and the like to walls, floors, etc. and making good.
- c. Cutting mortises, recesses, etc. for indicators, call buttons, etc. and subsequent making good.
- d. Cutting and fitting around, boring holes through and making good of finishing up to indicators, call buttons, panels and the like.
- e. The construction of concrete, brick or steel bases for plant and equipment including anti-vibration pads if necessary.
- f. The construction of concrete, block, steel or timber buffers and buffer supports.
- g. The building in or cutting and pinning of guide inserts, sill fixings and the like and making good.
- h. The provision of timber grounds, plugs or other fixings for the lift and escalator opening surrounds the fascia's.
- j. The provision of conduits and control wiring for lifts and escalators' control system.

Builder's works is under the scope of Main Contractor.