

**Part 1 General****1.1 RELATED REQUIREMENTS**

- .1 Related sections
  - .1 Section 14 00 00 – Additional General Conditions

**1.2 SYSTEM DESCRIPTION**

- .1 Modernize the existing elevators as described in the following tables and the requirements of this section:
  - .1 (1) existing elevator (no 1) hydraulic type with inground cylinder.
  - .2 (1) existing elevator (no 2) hydraulic type with inground cylinder.
  - .3 (1) existing elevator (no 3) hydraulic type with inground cylinder.
  - .4 (1) existing elevator (no 4) hydraulic type with inground cylinder.
- .2 The following requirements must be met for all elevators described in this section:
  - .1 Barrier-Free in accordance with CAN/CSA B651-18, Barrier-Free Design.
  - .2 Bilingual Markings:
    - .1 Provide identification and instructions on operating panels and on signal equipment in English and French except where design is such that inference is obvious and readily understood.
  - .3 Retain existing car speed and capacity.
  - .4 Provide equipment to suit the existing hoistway and machine room dimensions.
  - .5 Check all dimensions on site.
  - .6 Design and modernize elevator in accordance with ASTM A17.1-2010/CSA B44-2010, local codes and regulations.

## .3 Existing system – Elevators #1, 2, 3, 4

System BEFORE modernization:

Unit number :	1, 2, 3, 4
Designation :	Passengers
Installation date :	1992
Floor served :	Elev 1, 2, 3 : 3 stop : 1, 2, 3 Elev 4 : 4 stop : 1, 2, 3, 4
Nominal speed :	125 fpm
Capacity :	Elev 1, 3, 4: 2500 lb Elev 2 : 4000 lb
Machine manufacturer :	Otis
Machine type :	Hydraulic - submersible, inground cylinder
Motor manufacturer :	Leroy Sommer
Controller manufacturer :	Otis
Controller type :	Relay
Dispatch type :	Simplex
Door type :	Elev 1, 3, 4 : Center opening one speed Elev 4 : Side Opening 2 speed
Door dimensions :	Elev 1, 3, 4 : 42" X 84" Elev 2 : 48" X 84"
Door fire rating :	ULC 1h1/2

**Car equipment description****Fixture**

Position indicator	Digital
Car lantern	Provided
Arrival gong	
Floor gong	
Voice synthesizer	Not Provided
Button - height	Conform
Button - model	Otis
Braille	Provided
Independant service	Provided
Emergency In-car Operation	Not Provided
Communication system	Provided (intercom)

**Equipment**

Emergency light	Provided
Door protection	Infrared
Handrail	3 sides
Handrail - height	Conform
Door operator	Otis
Interlock	Otis
Car guides	Roller
Inspection unit	Not Conform
Refuge area	Provided

**Hall equipment description****Fixture**

Position indicator	Digital
Hall lantern	
Gong	
Button - height	Conform
Button - model	Otis
Braille	
Emergency Recall	Not Provided
Operation	
Emergency power	Provided (elev 3, 4)
Battery backup	Provided (elev 1, 2)

**Equipment**

Interlock	Otis
Door track	Otis
Door closer	Enrolling
Door fire pin	Bottom & Top
Mechanical access	Provided (lev 1, 2)
Electricall access	Provided

**1.3 PERFORMANCE REQUIREMENTS**

- .1 Codes and Regulations
    - .1 Design, supply and install all equipment in accordance with the latest editions of the ASTM A17.1-2010/CSA B44-2010 Code (update included), CAN/CSA-B651-18 Code and any other federal, provincial and municipal regulations applicable for this type of installation, including the National building Code of Canada and the Quebec Electrical Code.
  - .2 Driving Force
    - .1 Equipment driving force must comply with existing systems. In the case of non-compliance of the driving forces the Contractor shall assume all costs associated with this change (electrical, air conditioning, etc.).
  - .3 Controller
    - .1 Provide Simplex Collective Selective microprocessor controls.
    - .2 Elevator controller systems must not be equipped with a programmable logic controller and of a generic type.
  - .4 Hall Calls
    - .1 Elevators to answer hall calls during working day; within following times:
      - .1 38% of calls within 10 seconds maximum.
      - .2 63% of calls within 20 seconds maximum.
      - .3 80% of calls within 30 seconds maximum.
      - .4 88% of calls within 40 seconds maximum.
      - .5 93% of calls within 50 seconds maximum.
      - .6 95% of calls within 60 seconds maximum.
  - .5 Call Sequence
    - .1 Provide a control system managing car and hall calls in ways to minimize overall average waiting time.
    - .2 Upon arrival at destination floor, the call must be canceled.
    - .3 Do not permit registration of car calls behind the running position of an elevator.
    - .4 Cancel all car calls in situation of excessive car calls according to cab occupation.
  - .6 Direction Sequence
    - .1 The elevator starts when one or more car or hall push buttons are activated, other than the one where the elevator stands. The cab stops at the first call from cab or hall depending on the travelling direction.
    - .2 The elevator should answer all car and hall calls; it should stop at every called floor, in numerical order, depending on the travelling direction. The call should have been made some time before the elevator gets to this floor.
    - .3 If no order from the cab has been made, the cab travelling in up direction to answer calls for down direction should stop at the top floor where a call has been registered, reverse elevator direction, and answer all floors requested, in decreasing numerical order. The opposite should occur when elevator is travelling down to answer up calls.
    - .4 The elevator answering a car call will be designated to answer the hall call at this level in the opposite direction given this elevator has not been assigned more call in its direction of travel.
-

- .7 Parking
    - .1 Not Used
  - .8 Fault recovery
    - .1 Recall an elevator to the nearest floor and open door when an operation fault is detected within the system.
  - .9 Pre-opening
    - .1 Provide advance opening operation of the car doors.
    - .2 Ensure that the door will initiate the opening cycle at a maximum of 75mm from the landing floor.
  - .10 Speed Control System
    - .1 Ensure that the average acceleration is not less than 0.60 meter per square seconds and not exceeding 1.1 meter per square second.
    - .2 Ensure that the rate of change in acceleration does not exceed 1.8 meter per cubic second.
    - .3 Ensure that the car stop and start smoothly.
  - .11 Door Operation
    - .1 Provide smooth door open and close cycle.
    - .2 The doors shall open automatically when the car arrive at a landing floor.
    - .3 The doors shall reopen when the door protective devices are activated.
    - .4 Arrange that when the door protective devices are activated for more than 20 seconds continuously, a nudging buzzer signal be activated
    - .5 Arrange that and the door closes at reduced torque and speed when the door protective devices are activated for more than 20 seconds.
    - .6 The door speed must be reduced in half when the doors are closing and the reopening device has been rendered inoperative by the fire recall.
  - .12 Performance levels
    - .1 Design and adjust the equipment to meet the following performance levels:
      - .1 Operating time shall be as follows. Measure from the time doors closing cycle begins until doors are three quarters opened at next floor, assuming a maximum floor height of 4000mm.
        - .1 Up: 14.5 seconds
        - .2 Down: 14.5 seconds
      - .2 Door open and close time equal to values shown below.
        - .1 Open: 3.0 seconds
        - .2 Close: 4.0 seconds
      - .3 Door dwell time in response to a car or hall calls equal to values shown below.
        - .1 Car call : 2.0 seconds
        - .2 Hall call : 3.0 seconds
      - .4 Speed variation shall not exceed 5% of nominal value.
      - .5 Door noise level shall not exceed +6 dBa higher than ambient noise.
      - .6 Car running noise level shall not exceed +6 dBa higher than ambient noise.
-

- .7 Machine room noise level shall not exceed 75 dBa, as measured when one elevator is running.
  - .13 Levelling
    - .1 Ensure automatic levelling of the car at reduced speed in both up and down directions.
    - .2 The automatic levelling will be made with an accuracy of 6 mm unrelated to the car load.
    - .3 The levelling of the car sill compared to hall sill should not exceed +/- 6mm in either direction as long as the car is in the levelling zone.
  - .14 Independent service
    - .1 Provide in-car independent service operation.
    - .2 Cancel door protective device operation.
    - .3 Cancel hall button operation.
    - .4 Cancel hall lanterns operation.
    - .5 When the car is parked doors must remain open.
    - .6 Elevator will be control only from inside the car.
    - .7 Elevator may respond to car calls only once the full closing of the door, by maintaining a constant pressure button "CLOSE" or the button corresponding to the desired level.
    - .8 Arrange that the doors will reopen if the door "CLOSE" button is released prior to elevator motion.
  - .15 Emergency Operation
    - .1 Provide Emergency Recall Operation - Phase I in accordance with ASTM A17.1-2010/CSA B44-2010 Code.
    - .2 Provide Emergency In-car Operation - Phase II in accordance with ASTM A17.1-2010/CSA B44-2010 Code.
  - .16 Emergency Power Operation on battery lowering system – Elevators 1 & 2
    - .1 Provide lower level as elevator stop level.
    - .2 The system must allow the opening of the main hydraulic valve for a controlled descent of the elevator to the lower level.
    - .3 Once the car is parked, the system must open the car doors.
    - .4 The opening of the car doors must be possible at all times from inside the car.
  - .17 Emergency Power Operation – Elevators 3 & 4
    - .1 Emergency power will be available for all elevators.
    - .2 Provide Emergency Power Operation in accordance with ASTM A17.1-2010/CSA B44-2010 Code and as describe below.
      - .1 Two signals indicating the normal and emergency power connecting dry contact relay will link the transfer switch and the controller. A pre-transfer signal will be given by these signals
      - .2 A normally close circuit will be opened when normal alimentation is lost. When it's open, recall the elevators sequentially (1 elevator per group) to the recall level and open the door.
      - .3 Not used
      - .4 Once the sequence recall is complete, elevators must run automatically on emergency power as follows:
-

- .1 Elevator No 3: elevator will remain available on emergency power for public use.
  - .2 Elevator No 4: elevator will remain available on emergency power for public use.
  - .5 Management of the recall sequence will be provided by the elevator controller.
  - .6 Not used
- .18 Car intercommunication system
  - .1 Provide connection to the existing bilateral intercommunication system.
- .19 Access control
  - .1 Not used

## **Part 2 Products**

### **2.1 MACHINE – HYDRAULIC SYSTEM**

- .1 Remove existing hydraulic machine
  - .2 Supply and install a hydraulic power unit located in the machine room, meeting the requirements of ASTM A17.1-2010/CSA B44-2010 code and according to the following requirements:
  - .3 Supply and install a power unit, dry unit type, designed and manufactured for the use of hydraulic elevator.
  - .4 Provide AC motor specially designed for 80 starts per hour duty.
  - .5 Supply and install a motor with maximum temperature of 50°C and minimum class B insulation.
  - .6 Motor start-up shall be made by an electronic soft-start.
  - .7 The oil tank must be a minimum 11 gauge.
  - .8 Supply and install a pulsation free screw type of pump directly coupled with the motor design for silent operation.
  - .9 Supply and install a uniform flow, pulsation free pump.
  - .10 Supply and install a manual shutoff valve between the pump and the hydraulic cylinder located near the unit.
  - .11 Supply and install a relief valve located between the pump and the check valve. It must be installed so it can not be isolated from the hydraulic system.
  - .12 Supply and install a check valve capable of holding the car with its rated load when the pump stops.
  - .13 Supply and install a manual lowering valve located on the control valve to allow lowering the car at a maximum speed of 0.10 m/s. This valve must be marked to indicate the down direction.
-

- .14 Supply and install a pressure gauge with shut-off valve on the cylinder side of the check valve or magnetic valves speed control system.
- .15 Supply and install a flow restrictor.
- .16 Supply and install a graduated glass tube type oil level gauge.
- .17 Supply and install a self-cleaning filter system inserted on the hydraulic line in the pit.
- .18 Supply and install a speed control system controlled by magnetic valves regulators.
- .19 Provide new hydraulic fluid, with a flash point of at least 190°C specifically designed for this duty.
- .20 Install a protection against tank oil overheating. If oil overheats, park the car at the nearest lower floor until temperature return to normal.
- .21 Supply and install dripping oil tray under the pump to collect leakage.
- .22 Paint all metal non machined surfaces.
- .23 Identify hydraulic components and install a plate detailing the adjustments to the hydraulic system as required by ASTM A17.1-2010/CSA B44-2010 code.

## **2.2 HYDRAULIC OIL**

- .1 Perform complete change of existing hydraulic oil.
  - .1 Perform an analysis of PCB congeners (full test for 41 types of PCBs) by a specialized laboratory on a sample to determine the presence of such contaminants in the existing hydraulic oil to measure and assess the environmental risk of the existing facility.
  - .2 Dispose of existing hydraulic oil according to the environmental laws of the Province of Quebec.
- .2 Provide new hydraulic fluid, with a flash point of at least 190°C specifically designed for this duty.

## **2.3 HYDRAULIC LINE**

- .1 Remove existing hydraulic line.
- .2 Supply and install hydraulic pipes between the cylinder and the power unit with a minimum diameter of 50 mm.
- .3 Supply and install vitaulics joints.
- .4 Provide spacings for hydraulic pipe supports according to table 8.4.11.3 of ASTM A17.1-2010 / CSA B44-2010 code for the seismic condition.
- .5 Provide permanent fixings for hydraulic pipe supports.

## **2.4 MAGNETIC VALVES SPEED CONTROL SYSTEM**

- .1 Remove existing equipments
-

- .2 Supply and install a speed control system controlled by magnetic valves regulators.
- .3 Provide manual lowering valve, a check valve, pressure gauge and pressure gauge connection, safety valves, safety restraint valve, level and tank stop valves.
- .4 Provide each valve with its own adjustment device.
- .5 The system must allow the fluid to be pumped directly into the cylinders at the required pressure and at a sufficient rate so as to move the load at the rated speed.
- .6 Ensure a smooth and uniform accelerations and decelerations.
- .7 Ensure the voltage of the module according to existing power line.
- .8 Make any required changes to the conduits for the installation module.
- .9 Do not make splice. Replace existing wiring between the module and the controller.
- .10 Ensure that the average acceleration is not less 0.6 m per square second and not exceeding 1.1 m per square second.
- .11 Perform any required adaptation work.

## **2.5 LOW-LEVEL OIL CONTROL**

- .1 Supply and install a low-level oil control to recall the elevator to lowest level when car is travelling up and is running short of oil.
- .2 The system will send an alarm to the controller.

## **2.6 OIL HEATER**

- .1 Supply and install a hydraulic oil heater to be connected on a 120V, 30A disconnect switch.
- .2 The system shall be equipped with a thermostat to control the temperature of the hydraulic oil at a set value.

## **2.7 OIL COOLER**

- .1 Not Used

## **2.8 CYLINDER AND PLUNGER - EXISTING**

- .1 Remove existing cylinder and plunger:
  - .1 Secure the car at the upper part of the hoistway.
  - .2 Remove plunger.
  - .3 Remove the cylinder from the ground (if necessary, use water or other technique to release the sand that lies at the bottom).
- .2 The contractor must include an allocation of 15 000 \$ in its bid for the pumping of residual liquids.



- .3 Pumping residual liquids due to the work of this division and clearing debris will be done by the contractor at the expense of the Departmental Representative. A margin of 10% profit and administration are allowed on pumping costs. Submit supporting documents.
- .4 In the case of presence of residual liquid not due to the work of this division, the cleaning work will be done by the contractor at the expense of the Departmental Representative. A margin of 10% profit and administration are allowed on pumping costs. Submit supporting documents.
- .5 In case of additional drilling is required, the contractor shall have the responsibility and costs will be paid by the Departmental Representative. The Departmental Representative reserves the right to expertise to evaluate and accept the extra costs.
- .6 Remove existing cathodic protection.

## **2.9 CYLINDER AND PLUNGER - NEW**

- .1 Supply and install a new plunger.
  - .1 Provide a plunger with diameter and thickness to comply with the requirements of CAN/CSA-B44-10 code for the car travel and rated load.
  - .2 Fabricate the plunger with steel tubes, perfectly bored and having an outside finish surface of 0.0008 mm.
  - .3 Inner plunger must be made of adjustable soft steel.
  - .4 Provide a locking ring on the plunger to hold it inside the cylinder at all times.
  - .5 Do not install follower guides on the plunger.
- .2 Supply and install a new cylinder (including head) with a safety wall diameter and thickness in accordance with the regulations 302.3g of ANSI A17.1 standard and the requirements of article 3.18.3.4 of ASTM A17.1-2010/CSA B44-2010 code.
  - .1 Provide a device in the cylinders to adjust from outside the tension of package and inner pistons using a conventional key without having to do any disassemble the cylinder.
  - .2 Provide the cylinder head with a new gland with self-adjusting seal or packing.
- .3 Install the cylinder and plunger assembly plumb to minimize the friction at the head joint.
- .4 When it is necessary to weld the cylinder and pressure piping, first prepare the joints, and then solder in the approved manner. The work must be done by properly qualified welders.
- .5 Engineer reserves the right to submit welds to radiographic or other non-destructive process. In the case of negative testing result the Contractor shall carry out corrective work and assume the costs associated with this test and the following.

## **2.10 CYLINDER PROTECTION AGAINST CORROSION**

- .1 Determine when the existing cylinder is removed from the hole, if the size of the existing hole allows the installation of a rigid PVC casing.
  - .2 If the size of the existing hole allows the installation of a rigid PVC casing, the article < Rigid PVC casing > applies.
  - .3 If the size of the existing hole do not allows the installation of a rigid PVC casing, the article < Flexible liner - Alternative > applies.
-

- .4 Rigid PVC casing
  - .1 Supply and install a PVC casing designed to protect the cylinder against corrosion or other deterioration phenomenon.
  - .2 Supply and install PVC casing with appropriate diameter for the new cylinder.
  - .3 Supply and install PVC casing sealed at both ends to protect the cylinder.
  - .4 Provide a vent at the top of the PVC casing to allow moisture removal.
- .5 Flexible liner - Alternative
  - .1 Applies only if size of the existing hole does not allow adequate installation of a rigid PVC casing.
  - .2 Provide a flexible protective liner, JACK-IT<sup>™</sup> Hydraulic Jack Liner by Laird Plastics, with appropriate diameter for the new cylinder designed to protect the cylinder against corrosion or other deterioration phenomenon.

## 2.11 CYLINDER BASE

- .1 Supply and install a new structural base for the cylinder and buffer made of steel elements. Paint the assembly with two primers coat and a black anti rust paint.
- .2 Enlarge the hole at the base of the cylinder (on the floor) if necessary to install the new cylinder.
- .3 Redo the pit floor finishes around the cylinder with quick setting cement.
- .4 Make a new concrete base between the cylinder supports with quick setting cement.
- .5 The Contractor is responsible for providing adequate seal between the floor, the concrete base and cylinder.
- .6 Clean and scrub the floor to remove any traces of oil.

## 2.12 OIL RETURN

- .1 Supply and install a pump oil return fitted with a filter connected to the head of cylinder.
- .2 Ensure the pump is properly anchored to prevent it from being moved or overturned by an accumulation of water in the pit.
- .3 Ensure the pump includes a water detection device to stop pumping in case of water infiltration in the pit.

## 2.13 SAFETY STOP FOR MAINTENANCE

- .1 Supply and install a complete safety stop system for maintenance in the elevator pit including the following requirements and elements:
  - .2 Design the maintenance safety stop system to allow safe access to the workspace in the pit. The access maneuver must be capable of being performed by a single elevator mechanic.
  - .3 Provide and install the connection and programming of this maneuver to the elevator controller.
    - .1 When the posts are in place in the fixed bases, only allow movement of the car using the inspection device.

- .4 Supply and install two posts meeting the following requirements:
  - .1 The length of the posts must allow their handling by a single mechanic.
  - .2 The posts must be able to support the weight of the car.
  - .3 Provide the lower end with a key of at least 50 mm in length allowing the post to be properly positioned in its fixed support.
  - .4 Provide the upper end of the post with a 12mm thick plate which will serve as a support for the lower car frame.
  - .5 Paint the posts yellow
  - .6 When the car rests on the posts, access to the pit must be restricted.
- .5 Supply and install two fixed bases meeting the following requirements:
  - .1 Provide bases composed of a minimum 450mm high tube to ensure the stability of the posts and a minimum 10mm thick base plate.
  - .2 Provide the fixed bases with a keyway allowing the correct positioning of the post in its fixed support.
  - .3 Equip each fixed base with a switch to send a signal to the controller when the posts are in place in the fixed bases. The switch used must be a robust model of the same type as the limit switches installed in the duct.
  - .4 Position the fixed bases on each side of the shock absorbers.
  - .5 Permanently fix the bases on the floor of the pit.
  - .6 Paint with a water-based polyurethane paint (odorless).
- .6 Provide and install an inspection device in the pit that meets the following requirements:
  - .1 Provide and install near the access ladder a portable device, yellow, for maneuvering at inspection speed with constant pressure buttons. Provide the following buttons:
    - .1 Up
    - .2 Make active
    - .3 Down
    - .4 Start / stop
    - .5 Normal / inspection
    - .6 Emergency stop (mushroom type)
  - .2 Provide a sufficient length of mobile wiring to maneuver from the landing.
  - .3 Provide a fixed location, easily accessible, on one of the walls to store the portable device and wind up the mobile wiring
  - .4 Provide for the connection of the portable device to the controller.
  - .5 Provide a interlock between the two inspection devices (cabin roof and mechanical room). When one device is active, the second device cannot take control of the elevator.
  - .6 Supply and install all the wiring required to connect this device to the controller.

## **2.14 CONTROLLER CABINET**

- .1 House the controller in a metal cabinet with hinged doors.
  - .2 Controller cabinet shall be NEMA Type 1.
  - .3 The controller cabinet shall be made with material limiting propagation of sound in the control room.
-

- .4 Provide in the controller cabinet, two fans to ensure proper ventilation of the cabinet.
- .5 Provide the controller cabinet, lighting compact fluorescent type and an electrical outlet service unit.
- .6 Coordinate cabinet size according to available space.
- .7 Provide dimensions and layout of control devices at the beginning of the project for approval.

## **2.15 CONTROLLER**

- .1 Supply and install generic non-proprietary controller compatible with hydraulic system.
  - .2 Motor start-up shall be made by an electronic soft-start.
  - .3 Install a low-level oil control to recall the elevator to lowest level when car is travelling up and is running short of oil. Design control so that the oil tank is filled before the car can be returned to service.
  - .4 Design the controller to recall the elevator to lowest level when car is travelling up and there is a failure due to relay, a valve, or to a lack of oil.
  - .5 Ensure redundancy of safety systems and power circuits as required by ASTM A17.1-2010/CSA B44-2010 code.
  - .6 Upon detection of a system failure or malfunction, the elevator will be stopped at the nearest floor and open its doors until a reset is done by a technician.
  - .7 Provide a system that can normally operate in an ambient temperature range of 3°C to 40°C.
  - .8 Insulate external signals, such as the hall and car calls, using optical devices. Do not use electro-mechanical relay for these circuits.
  - .9 Provide a digital position indicator in the controller.
  - .10 Provide a protection device against phase reversal and phase loss.
  - .11 Provide a separate power supply for each printed circuit board.
  - .12 Provide a ground connected in parallel to the building ground for each printed circuit board.
  - .13 Do not install electronic boards near heat dissipating resistance.
  - .14 Electro-mechanical relays used shall have a minimal lifespan of 25 years.
  - .15 Make all connections to properly permanently identified terminals.
  - .16 Properly identify relays, contactors, fuses and other components.
  - .17 Provide an errors recording device with a capacity of 30 days reading.
  - .18 Provide a digital clock with multiple programmable alarms.
-

- .19 Provide, permanently in the controller, all necessary tools (communication port for access) to view programming, fault identification and history.
- .20 Provide with the maintenance manuals, the controller programming and all related software.
- .21 Identify the applicable elevator code inside the cabinet.
- .22 Identify the controller using a number.

## **2.16 CONTROLLER – GROUP DISPATCH**

- .1 Not Used.

## **2.17 CONTROLLER – INSPECTION AND TEST PANEL**

- .1 Supply and install an inspection and test panel as required by ASTM A17.1-2010/CSA B44-2010 Code (art 2.7.6.5) including among others the following items:
  - .1 Stop switch.
  - .2 Visualisation panel as required in article 2.7.6.4.1 of the ASTM A17.1-2010/CSA B44-2010 code providing the following information: position, direction of travel, operating status (stop/run), door status (opened/closed), door unlocking zone, speed and operating mode (automatic / independent / recall).
  - .3 Auxiliary power source (4 hours autonomy) for the visualisation panel.
  - .4 «CAR DOOR BYPASS» and «HOISTWAY DOOR BYPASS» switches.
  - .5 Devices for the manual reset of the detection means for ascending car overspeed protection and protection against unintended car movement
- .2 House the device in the controller cabinet

## **2.18 CONTROLLER – COMMUNICATION MODULE**

- .1 Not Used.

## **2.19 CONTROLLER – ACCESS CONTROL**

- .1 Not Used.

## **2.20 PROTECTION AGAINST ELECTROMAGNETIC FIELDS**

- .1 Provide adequate immunity of electronic components against interference and influences due to the surrounding electromagnetic fields to eliminate any source of interference. The equipment shall comply with the standard EN12016 Part 2.

## **2.21 NOISE CONTROL**

- .1 All rollers and guides shall be designed and adjusted for silent operation.
  - .2 The door operation mechanisms shall incorporate resilient bumper in order to eliminate the impact sound when doors reach the end of their opening and closing movement.
  - .3 Provide two flexible type connections to prevent contact between sections of metal pipes.
  - .4 Mount the pump on anti-vibration pads to reduce noise transmission to the power unit and the building structure.
-

- .5 The pump/tank unit of the hydraulic circuit must be mounted on neoprene vibration isolators selected for deflection under load of 12.7 mm.
- .6 Provide two (2) double wall muffler on the hydraulic fluid lines of adequate size to reduce the pulsations to a minimum. Install a muffler near the power unit and the other near the cylinder and plunger.
- .7 Piping must be insulated from the building structure incorporating at all support brackets, neoprene sleeves, medium density, 12.7 mm, or equivalent.
- .8 Adequate restraints must be provided to limit the potential side movement of the pipe when starting or stopping the pump movement. The valves must be properly adjusted to avoid waterhammer in the pipe network.
- .9 Ensure hydraulic lines do not come into direct contact with the building structure.

## **2.22 POSITION TRANSDUCER**

- .1 Remove existing equipment.
- .2 Supply and install an electronic device to transmit position of the elevator cab to the controller.
- .3 Ensure automatic levelling of the car at reduced speed in both up and down directions.
- .4 A levelling device with automatic correction in both directions must allow the car to remain level with the floor as long as the car is in the levelling zone.
- .5 Ensure a minimum accuracy of at least 5 mm at any position in the hoistway.
- .6 Ensure at least a reference reading at all levels.
- .7 Strobe devices are acceptable to the extent that the position of the car is controlled at all 5 mm.
- .8 Do not use electro-mechanical switches.

## **2.23 ELECTRIC WIRING - GENERAL**

- .1 Remove existing equipment
  - .2 Supply and install all the wiring to interconnect the elevator components.
  - .3 Supply insulated multi-stranded ETT-type wiring having a 60°C flame-retardant and moisture-resisting outer cover.
  - .4 Supply and install metal conduits (EMT) ducts or flexible conduits as needed to install all the wiring inside the machine rooms, hoistway or other spaces reserved for the installation of elevator equipment.
  - .5 Supply and install wire protection when wiring comes into contact with a sharp surface that can damage the wire protective envelop.
  - .6 Provide (10%) additional spare conductors, as a minimum in each cable.
  - .7 Provide colour or number-coded conductors in multi-conductor cables.
-

- .8 Terminate cables on terminal blocks having identifying numbers.
- .9 Make no splices.
- .10 Spare wiring shall be properly identify, insulated and terminated on terminal blocks
- .11 All wiring must be CSA rated.
- .12 Ensure adequate protection of the traveling cable to avoid any contact against hoistway walls and structure.
- .13 Ensure that all circuits are properly grounded.
- .14 Install anti-shorts at wiring entry points within main control and junction box.
- .15 Supply, install and identify junction box for the communication systems, cameras, card readers and others.

## **2.24 ELECTRIC WIRING – TRAVELING CABLE**

- .1 Remove existing equipment
- .2 Supply and install traveling cable between the car and controller.
- .3 Supply and install traveling cable between the car and controller with the required wires needed by the elevator plus the following connectors: 6 shielded pairs 18 AWG, 3 twisted & shielded pairs for communication, 18 shielded pairs 22 AWG for the card reader, 1 coax cable (with RGU6 connector) at the center of the traveling cable for a camera, 2 shield pairs 20 AWG for camera and 15% spares of each cable type.

## **2.25 HOISTWAY SWITCHES**

- .1 Remove existing equipment.
- .2 Supply and install hoistway switches for a reliable and smooth operation without significant noise.
- .3 Properly doll the switches following the adjustments..
- .4 Supply and install stop switches (mushroom type) in the pit connected in series. Install a first stop switch near the ladder at 460mm above the floor level and a second stop switch near the ladder at 1200mm above the pit floor if the pit is deeper than 1700mm.

## **2.26 BUFFERS**

- .1 Retain existing equipment.
- .2 Clean, brush and paint with a black epoxy paint all the non-machined metal surfaces.
- .3 Perform all tests required by codes and present the result list to the Departmental Representative.

## **2.27 PIT**

- .1 Paint the pit floor with water-based polyurethane (odorless) paint.
-

- .2 Paint all pit equipments on a minimum height of 914mm with water-based polyurethane (odorless) paint.
- .3 Paint the refuge area (600mm x 1220mm) with black and yellow line on the pit floor.
- .4 In any area in the pit, outside the refuge space, where the vertical clearance is less than 600 mm shall be clearly marked on the pit floor as specified by section 2.4.1.6 of ASTM A17.1-2010/CSA B44-2010 code.

**2.28 HOISTWAY**

- .1 Chamfer any surfaces which project more than 100 mm inside the hoistway with steel sheets to obtain a bevel of 75deg with respect to the horizontal, as required by ASTM A17.1-2010/CSA B44-2010 code.

**2.29 GUIDE RAILS**

- .1 Retain existing equipment.
- .2 Check and correct the tightness of all rail anchors and bolts of all rail joints.
- .3 Clean and brush the machined guide rail surfaces to ensure adequate rolling surface without irregularity and paint in black all non machined surfaces.
- .4 Clean rails along the entire height of the hoistway to eliminate any presence of oil.

**2.30 RIDE QUALITY**

- .1 The variation between the car guide rails should not exceed  $\pm 1$ mm on a vertical distance of 30 m.
- .2 Clean and brush the machined surfaces of the rails to ensure a smooth ride.
- .3 Check the rail joints and polish all horizontal deflections.

**2.31 GUIDES: CAR**

- .1 Retain existing equipment.

**2.32 FASCIAS PLATES**

- .1 Retain existing equipment.
- .2 Properly identify with large 100mm markings each floor on fascia plates.

**2.33 CAR PLATFORM AND FRAME**

- .1 Retain existing equipment.

**2.34 PLATFORM GUARDS - TOE GUARD**

- .1 Supply and install a platform guard (toe guard) with a straight vertical face extending below the floor surface of the platform for a minimum of 21" as required by section 2.15.9 of ASTM A17.1-2010/CSA B44-2010 code.
- .2 Paint the plate in yellow.



**2.35 INSPECTION UNIT**

- .1 Supply and install an inspection unit on the car top for the operation in inspection speed with constant pressure control.
- .2 The device shall include a Stop Switch, a Transfer Switch, Up and Down push buttons and Fire Signal light.
- .3 Supply and install a 100 W protected light.
- .4 The device shall be permanently located on top of the car and readily accessible to maintenance technician.

**2.36 CAB**

- .1 Remove existing cab finishes.
- .2 Remove existing metallic cab shell.
- .3 Supply and install a 16 gauge metal cab shell.
  - .1 Ensure solid construction of the cab shell using external profiles in sufficient numbers.
  - .2 Interior walls: panels made of sheet steel, attached to the car frame and platform.
- .4 Supply and install a new sub floor made of two (2) plywood sheets (marine grade) 19 mm thick, fully fireproofed, secured in place (glued & screwed every 150mm) using mechanical flush fasteners.
- .5 Supply and install a roof made of reinforced steel sheet to support the weight of the equipment and the two mechanics.
- .6 Supply and install a metal guard rails at all edges (on the 3 sides without door) of the roof as required ASTM A17.1-2010/CSA B44-2010 code. Position the guard to optimize space on the roof of the cab.
- .7 The cab shall meet ASTM A17.1-2010/CSA B44-2010 code requirements.
- .8 Wall:
  - .1 See plans for new finishes to supply and install. All stainless steel finishes shown on plan will be no4 finish.
  - .2 Cover the front wall with stainless steel 20ga, no4 finish. Polishing shall be vertical.
  - .3 Provide the necessary ventilation opening.
- .9 Ceiling:
  - .1 See plans for new finishes to supply and install. All stainless steel finishes shown on plan will be no4 finish.
  - .2 Include an emergency exit in the ceiling.
  - .3 Ensure that no anchor or fastener exceeds the car roof.
  - .4 Supply and install a two-speed electric air exhaust fan, with a capacity of 200 liters per seconds and producing no more than 55 dBA at low speed.
- .10 Lighting system:
  - .1 See plans for lightning to supply and install on the walls and ceiling of the cab.

- .2 Supply and install a Tivol brand lighting system ([www.tivolighting.com](http://www.tivolighting.com)) as described below:
  - LED band : TPL-LB-I-30-12volt
  - Transformer : EMECH601512
  - Channels (extrusions) : ALTN-CHAN-SLV-6.5
  - ALTN-LNS-OPL-6.5
  - ALTN-EC-01
  - ALTN-EC-02
- .3 The lighting system must be sufficient to provide a consistent light intensity of 215 lx, measured at 0.75m above the floor.
- .11 Floor:
  - .1 See plans for new finishes to supply and install.
- .12 Door:
  - .1 Supply and install a stainless steel 24ga, no4 finish car door. Polishing shall be vertical.
  - .2 Supply and install an extruded nickel silver cab door sill with non-slip wearing surface.
  - .3 Supply and install door nylon gib.
  - .4 Supply and install all equipment required for a durable and efficient system operation.

**2.37 CAR DOOR EQUIPMENT**

- .1 Remove existing equipment.
  - .2 Supply and install heavy duty type closed-loop variable speed and torque control door operator rated at speed of 910 mm per second.
  - .3 Supply and install a car door clutch.
  - .4 Supply and install car interlock.
  - .5 Supply and install a door lock to restrict the opening of the car door from the inside when it is outside the unlocking zone as required by article 2.12.5 of ASTM A17.1-2010/CSA B44-2010.
  - .6 Supply and install all equipment doors needed for a durable and efficient system operation.
  - .7 Supply and install a new suspension rail fitted with rubber bumpers. Rail shall be easy to replace.
  - .8 Supply and install two suspension rollers per door panel with a minimum diameter of 75 mm.
  - .9 The suspension rollers shall be made of material designed to retain lubricant and be equipped with cleaning felt.
  - .10 Provide on the edge of the door panels, a rubber bumper to eliminate the slap at the time of closing.
-

**2.38 HALL DOOR EQUIPMENT**

- .1 Remove existing hall door equipment (suspension rollers / pickup rollers / interlock / door closer).
- .2 Supply and install all door equipments needed for a durable and efficient system operation.
- .3 Supply and install door equipment compatible with existing equipment retained.
- .4 Supply and install two suspension rollers per door panel with a minimum diameter of 75 mm. The suspension rollers shall be made of material designed to retain lubricant and be equipped with cleaning felt.
- .5 Supply and install complete new hall door interlock systems (interlock and opening mechanism) at all floors.
- .6 Supply and install a ground connected on all interlocks.
- .7 Supply and install new door closer at all floors.
- .8 Retain existing hall door suspension rails. They shall be thoroughly cleaned, re-polished and lubricated to ensure smooth and quiet door operation.
- .9 Elevator 1 & 3 : Retain existing hall door panel and entrance frame and do the following work:
  - .1 Replace damaged door astragals;
  - .2 Replace the lower door guides;
  - .3 Add fire retaining metal guides at the lower and upper part of the doors.
- .10 Elevator 4 :
  - .1 Level 1 : Supply and install new stainless steel no4 finish hall door panels. Polishing shall be vertical.
    - .1 Remove existing door panel.
    - .2 Supply and install door astragals;
    - .3 Supply and install lower door guides;
    - .4 Supply and install fire retaining metal guides at the lower and upper part of the doors.
    - .5 Supply and install on the edge of the door panels, a rubber bumper to eliminate the slap at the time of closing.
  - .2 Level 2, 3 & 4 : Retain existing hall door panel and entrance frame and do the following work:
    - .1 Replace damaged door astragals;
    - .2 Replace the lower door guides;
    - .3 Add fire retaining metal guides at the lower and upper part of the doors.
- .11 Elevator 2 :
  - .1 Remove existing door panel.
  - .2 Supply and install stainless steel no4 finish hall door panels and frames at all floors. Polishing shall be vertical.
    - .1 Supply and install door astragals;
    - .2 Supply and install lower door guides;

- .3 Supply and install fire retaining metal guides at the lower and upper part of the doors.
- .4 Supply and install on the edge of the door panels, a rubber bumper to eliminate the slap at the time of closing.
- .3 Protection of landing entrance frames
  - .1 Supply and install, at all levels, protective frames in 18 gauge stainless steel finish no4 at the elevator landing entrances on all surfaces (vertical and horizontal).
  - .2 The protective frames must cover the interior face of the entrance with a 3 inch return on the front wall. Submit drawings for approval.
- .12 Correctly align the hall door panels.
- .13 Clean the existing sills.
- .14 Provide on the edge of the door panels, a rubber bumper to eliminate the slap at the time of closing.

**2.39 HOISTWAY DOOR UNLOCKING DEVICES**

- .1 Supply and install a hoistway door unlocking devices at all floors as required by section 2.12.6 of ASTM A17.1-2010/CSA B44-2010 code.

**2.40 HOISTWAY ACCESS SWITCHES**

- .1 Supply and install a hoistway access switches at the bottom & top floor as required by section 2.12.7 of ASTM A17.1-2010/CSA B44-2010 code.
- .2 Install the switch in the hall station.

**2.41 HALL CALL STATIONS**

- .1 Remove existing equipment.
  - .2 Supply and install Tactile Compact 2 Dupar US91BB (steel/steel) red LED illuminated call stations (or replacement product approved by addendum in accordance with the Instructions to Tenderers) at each floor
    - .1 Each button will become a high intensity when the button is pressed (one intensity model).
  - .3 Provide in the main floor call station the following items:
    - .1 Visual signal, LED type, for Phase I Emergency Recall Operation;
    - .2 A three-position key-operated switch (group 3) labeled "FIRE RECALL" and its positions marked "RESET – OFF – ON" (in that order). The letters shall be a minimum of 5mm high in red.
    - .3 Visual signal for Emergency Power Operation labeled "EMERGENCY POWER". The letters shall be a minimum of 5mm high in red.
  - .4 Provide a hoistway access switch as required by code. Insert the switch in the hall station.
  - .5 The LED lights used in call stations shall have a useful life of at least 100 000 hours.
  - .6 Provide all plates in stainless steel no4 finish.
-

- .7 Engrave all required markings, in French & English language, directly on the plates, as per ASTM A17.1-2010/CSA B44-2010 code.

## **2.42 HALL POSITION INDICATOR**

- .1 Supply and install a digital position indicator at main floor. Characters shall be 50mm high.
- .2 Provide no.4 finished stainless steel plates of sufficient size to cover existing openings.

## **2.43 HALL DIRECTION LANTERN**

- .1 Supply and install a direction lantern, raised arrow type, with electronic gong at each floor for each elevator.
- .2 When the car is within a certain distance of a floor where it should stop, the direction lantern must illuminate with tone sounds to indicate the direction of the car.
- .3 The lantern must remain illuminated until the car leaves the floor.
- .4 In Up direction, the tone must ring once, and in the Down direction, the tone must ring twice.
- .5 Include an adjustable gong tone device.
- .6 Provide No. 4 finished stainless steel plates of sufficient size to cover existing openings.

## **2.44 CAR OPERATING PANEL - MAIN**

- .1 Supply and install one (1) car operating panel, mounted on invisible hinge, in stainless steel finish No. 4 integrated in the car front return as per requirements of ASTM A17.1-2010/CSA B44-2010 code and the following requirements:
  - .1 Dupar US91BB (steel/steel) Tactile Compact 2, red LED illuminated push button (or replacement product approved by addendum in accordance with the Instructions to Tenderers) with integrated Braille tag corresponding to floors served.
  - .2 Each button will become a high intensity when the button is pressed (one intensity model).
  - .3 Door open button labeled "OPEN" and door closer button labeled "CLOSE".
  - .4 Alarm button, with a raised ring,
  - .5 Emergency button, with a raised ring, with a phone symbol labeled "PUSH TO CALL" above and "HELP" below button. The button light will remain permanently on a low intensity (white) and become a high intensity (red) when the button is pressed (model with two colors (white / red) and two intensities).
  - .6 Not Used
  - .7 Visual signal for Phase I Emergency Recall Operation;
  - .8 Visual signal for Emergency Power Operation;
  - .9 A red LED light <hidden legend> indicating the activation of the independent service operation marked independent service.
- .2 Supply and install a firefighters' operation cabinet (as per section 2.27.3.3.7 of ASTM A17.1-2010/CSA B44-2010 code), at the top of the car operating panel, with the following items:

- .1 A three-position key-operated switch (group 3) labeled "FIRE OPERATION" and its positions marked "OFF – HOLD – ON" (in that order). The letters shall be a minimum of 5mm high in red. It shall become effective only when Phase I Emergency Recall Operation is in effect and the car has been returned to the recall level.
- .2 A button labeled "CALL CANCEL" which shall be effective during Phase II Emergency In-Car Operation. When activated, all registered calls shall be canceled and a traveling car shall stop at or before the next available landing.
- .3 Door open and close buttons;
- .4 A "RUN" / "STOP" switch
- .5 Visual signal for Phase I Emergency Recall Operation;
- .6 A descriptive plate with marking shown in figure 2.27.7.2 of ASTM A17.1-2010/CSA B44-2010 code.
- .7 The cabinet door access key must be the same as phase II switch.
- .8 The cabinet door must lock automatically when the door is closed.
- .3 Supply and install a service cabinet at the bottom of the car operating panel, locked by a key switch with the following items:
  - .1 Stop key switch with marking <STOP / RUN>
  - .2 Independent service key switch;
  - .3 Light switch;
  - .4 Emergency light test switch;
  - .5 Fan key switch;
  - .6 Hoistway access key switch.
  - .7 A key switch on door panel
- .4 The LED lights used in car operation panel shall have a useful life of at least 100 000 hours.
- .5 Engrave all required markings directly on the plates.
- .6 Provide all plates in stainless steel no4 finish.
- .7 Supply and install a digital position indicator on the car operating panel. Characters shall be 50mm high. The unit must have direction arrow.

## **2.45 CAR INTERCOMMUNICATION SYSTEM**

- .1 Retain and reinstall the existing car intercommunication system
  - .2 Connect the emergency call button and the visual indicator of the car operating panel.
  - .3 Provide the location as well as the holes on the car operating panel.
  - .4 Supply and install a plate labelled "PRESS TO CALL" above & "EMERGENCY" below with embedded Braille inscription.
  - .5 Supply and install a plate labelled "COMMUNICATION ESTABLISHED WHEN LIGHT ON" indicating that communication is established.
  - .6 Install these plates near the call button of the existing communication system on the car operating panel.
-

**2.46 VOICE SYNTHESIZER**

- .1 Supply and install a voice synthesizer in each car.
- .2 The system will announce the floor of arrival before opening the doors.
- .3 The system must be able to store 40 customized messages (8 seconds each) for a total or 5 minutes of capacity.
- .4 The speaker system shall be at least 0.5 Watts and 8 Ohm type.
- .5 The microphone for recording messages must be 1 K Ohm type with minimum sensitivity of 64 dB.
- .6 The device must be easily programmable. The memory access must be code protected.
- .7 Install the system so that the message is clear and noise free anywhere in the cab.

**2.47 CAR EMERGENCY LIGHT**

- .1 Supply and install an emergency lighting unit, in the car operating panel, with autonomy of 4 hours, designed for this application.
- .2 The unit will produce an instant lighting when normal power is lost.
- .3 The emergency lighting unit must provide a general brightness of 22 lux in the cab at a distance of 1200 mm.
- .4 Supply and install a sealed rechargeable battery and powered by the normal current.

**2.48 DOOR PROTECTION DEVICE**

- .1 Supply and install multibeam infrared door protection device.
- .2 The detection field shall start at a maximum of 150 mm from the floor and extend up to a maximum of 300 mm from the top of the entrance.
- .3 The system must remain operational until a failure of 10% of the infrared rays. A light shall indicate the device failure. In case of failure, deactivate the nudging except for emergency recall.
- .4 The door shall reopen completely when the door protection devices are activated.
- .5 Arrange that when the door protective devices are activated for more than 20 seconds continuously, a nudging buzzer signal be activated

**2.49 ENGRAVING**

- .1 Identify the elevator at main floor with a number 75mm in height. This number should be engraved on a stainless steel plate.
  - .2 Identify the elevator with engraving on the car operating station.
  - .3 Identify all equipment parts located in machine room.
  - .4 Identify the refuge areas on the car top.
-

- .5 Supply and install Arabic numerals and Braille markings designating levels on the two doorframes hall entrance. The bottom of the numbers shall be at 1525 mm from floor. At the main floor, a star shall be supply in addition to the identification requested.
- .6 Provide all other inscriptions required by authorities.
- .7 All engraving shall be in French & English language.
- .8 All inscriptions should be engraved to a minimum depth of 0.25 mm on the metal surfaces of the fixtures.

## **2.50 KEYS**

- .1 Provide a minimum of 6 sets of keys clearly identified for the operation of the emergency recall and special emergency service key switches.
- .2 The various switches and keys shall meet the requirements of the Elevator Code.
- .3 Any item referring to locks / keys " FIRE OPERATION " for "fire recall" phase I and II: These locks / keys group 3 must be provided by the contractor and will be of the universal model recognized as the "FEO-K1" .

## **Part 3 Execution**

### **3.1 MANUFACTURER'S INSTRUCTIONS**

- .1 Compliance: comply with manufacturer's written data, including product technical bulletins, product catalog installation instructions, product carton installation instructions, and data sheet.

### **3.2 INSTALLATION**

- .1 Install hoistway, machine room, and other elevator materials and components in accordance with ASTM A17.1-2010/CSA B44-2010, local codes, regulations and manufacturer's written instructions.

### **3.3 FIELD QUALITY CONTROL**

- .1 Verification requirements include:
  - .1 Materials and resources.
  - .2 Storage and collection of recyclables.
  - .3 Construction waste management.
  - .4 Resource reuse.
  - .5 Recycled content.
  - .6 Local/regional materials.
  - .7 Certified wood.
  - .8 Low-emitting materials.

### **3.4 SITE TESTS**

- .1 Perform and meet tests required by ASTM A17.1-2010/CSA B44-2010.
-



- .1 Submit test data forms in accordance with Section 01 91 13 16 - Commissioning Forms before requesting an inspection by the Departmental Representative.
- .2 Perform real time testing of Emergency Operation (Emergency Recall Operation - Phase I & Emergency In-car Operation - Phase II) and emergency power operation with Departmental Representative.
- .2 Supply instruments and execute specific tests.
- .3 Furnish test and approval certificates issued by jurisdictional authorities.
- .4 At agreed time during twelve month warranty period, and with building normally occupied using normal building traffic, conduct tests to verify performance. Furnish event recording of hall call registrations, time initiated, and response time throughout entire normal working day.

### **3.5 CLEANING**

- .1 Remove protective coverings from finished surfaces and components.
- .2 Clean surfaces and components ready for inspection.

### **3.6 ADJUSTMENTS**

- .1 Adjust door opening and closing times to suit handicapped users in accordance with Departmental Representative instructions.
- .2 Adjust control system to cause elevators to answer hall calls during working day within performance criteria specified.
- .3 Adjust for smooth acceleration and deceleration of car as so not to cause passenger discomfort.
- .4 Adjust automatic floor levelling feature at each floor.

### **3.7 SCHEDULE OF WORK**

- .1 The work shall be coordinated with Departmental Representative.

### **3.8 SEQUENCE OF WORK**

- .1 Schedule the modernization sequence in accordance with Section 01 14 00 - Work restrictions.
- .2 Schedule a maximum of 6 weeks per elevator for modernization works.
- .3 The final sequence of work must be submitted before the start of work for approval by Departmental Representative.

### **3.9 DISMANTLEMENT**

- .1 Coordinate equipment dismantlement with Departmental Representative.
  - .2 Machine Room: Dismantle the machine, the control cabinets, wiring, and any other replaced or no longer needed equipment.
-

- .3 Hoistway: Dismantle cab finish, mobile and fixed wiring, hoistway switches, landing door equipment, and any other replaced or no longer needed equipment.
- .4 Following dismantlement, dispose of equipment in accordance with Section 01 74 19.

### **3.10 INSERTING AND REMOVING EQUIPMENT**

- .1 The Contractor is responsible for the insertion and removal of the equipment described in this section.
- .2 The contractor is responsible for providing all equipment necessary for insertion, handling and installation of the equipment in the machine room or in the hoistway.
- .3 Access to the machine room is from the corridors and stairways of the building.
- .4 The Contractor is responsible to verify the paths and provide equipment to meet the dimensions of access constraints.
- .5 No new opening will be made in the machine room.

### **3.11 WELDING WORK**

- .1 If welding works are required on the site, obtain all necessary approvals by Departmental Representative before performing the works.
- .2 All site welds must be made by a qualified welder and identified with his identification mark.

### **3.12 TOUCH UP WORK**

- .1 Ensure that all exposed metal surfaces are painted.
- .2 At the end of the work, retouch and repair all finished surfaces assembled at the factory, where the finish is altered or damaged.
- .3 Repair or replace any damaged item, without charge, before the substantial completion of work.

### **3.13 LIFTING WORKS**

- .1 If the car finishes are altered for the purposes of lifting work, they shall be repaired at the end of the work at the expense of the contractor.
- .2 Supply and install a temporary hoist beam suitable for car loads.
  - .1 Temporary hoist beam can be installed either on top of the car rails (once cut to the right height), bolted into the side of the rail or any other recognized method.
  - .2 Provide a drawing, sealed by engineer, showing the installation of the beam.

**END OF SECTION**

---