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PART 1 - GENERAL

1.1 - SCOPE OF WORK

1. The Work described herein includes for all labour and material, including overtime required to meet the project schedule, to modernize three (3) traction elevators located at 10 Barter's Hill, St. John's NFLD, including permanent magnet overhead traction machines. Provide all work required for a completed project, accepted by the Authority Having Jurisdiction including:
 2. New Permanent Magnet AC gearless machines.
 3. New, regenerative, motor drives.
 4. New non-proprietary, microprocessor-based solid state electrical controllers.
 5. New overspeed and uncontrolled speed protection for cars and counterweights.
 6. New car door operator, door locks, relating system, door closers and related hardware.
 7. New car cabs including cab interior.
 8. New signals including car direction, hall position indicators in car and at the main floor.
 9. New speed governors.
10. Provision of automatic emergency recall and in-car emergency service.
11. Full parts, labour and all associated code required preventive maintenance which shall include all system shut down call backs on all elevator components including all components of the monitoring system listed in Section 14-90-00 for a subsequent twenty-four (24) month period after the final inspection certificate has been signed by PWGSC.
12. Remote monitoring and command system including all interconnections.
13. Provide required demolition and removal of existing elevator system including machine room, hoistway, hall fixtures and entrances.
14. Provide required engineering and co-ordination of various elements and suppliers to provide a complete code compliant project and in particular considering the highly custom nature of this project.

15. Above is a brief description only. The following specifications detail the Work.

1.2 RELATED WORK -
INCLUDED AS ELEVATOR
CONTRACTOR'S
RESPONSIBILITY

Include subcontracts and all coordination and supervision of related work usually covered off by others trades to accomplish a working elevator system, accepted by provincial authorities and suitable for intended use including:

- .1 Electrical:
- .1 Install new fire signals to the elevator controllers. This includes signal for main fire alarm, signal for a fire alarm emanating from the elevator machine room and/or elevator hoistway and thirdly a signal for a fire alarm emanating from the ground floor - used to drive the elevator to the recall floor. Include for new fire sensing devices in front of the elevator at each floor's lobby. Provide for this work being done by a certified fire alarm technician and provide required commissioning and testing of modifications to the fire alarm panel.
 - .2 Provide new three-phase disconnect switches to accommodate elevator motor power with properly sized new fusing and including for any required auxiliary contacts.
 - .3 Provide new 120 V 15 amp disconnect switch to accommodate elevator cab lighting.
 - .4 Existing machine room lighting can be retained if adequate but if required by new equipment layout provide new lighting in the elevator machine room, operated by new switch. Lighting to provide 200 Lux ambient at the machine room floor level employing a minimum of two, dual 48" T8 fluorescent fixtures at 4100 k. Provide mechanical guarding of the lights.
 - .5 Provide a minimum of one 15 amp GFI convenience receptacle at the control room, pit, car top and overhead of each elevator.
 - .6 Arrange for connection to owner's emergency cab communication system to the new telephone provided in the elevator cab. Include for any required assistance by communications contractor to make system functional.
 - .7 Provide new Vapour Proof guarded fluorescent lighting in the pit, halfway point of the hoistway and top of hoist way. Guard with substantial, rust proof metal cages over polycarbonate lens. Lighting to provide 100 Lux ambient at the pit floor level employing a minimum of dual 24" T8 fluorescent tubes at 4100 k. Provide instant start, ballast factor greater than 0.9 and 85% reflector. All lighting to be activated by any of the switches to be located also at each of these three locations.

- .8 Engage fire alarm subcontractor to disable fire detectors as required during course of work - respecting Owner's fire regulations.
 - .9 Include electrician subcontract to accomplish all required conductor and conduit runs. Run new grounds as required.
 - .10 Provide new switches and conductors for all lighting and new pit stop buttons.
 - .11 Engage security subcontract to remove, reinstall and as required reprogram existing security system.
- .2 Structural:
- .1 Engage engineer registered in the province and specializing in structural engineering to assess adequacy of existing structure including machine room slab. Provide new engineered system complete with stamped drawings of structural bearing including beams and plates to accommodate new elevator.
 - .2 Include any required scanning of structure to locate hidden steel.
- .3 General:
- .1 Include complete removal of redundant elevator components while working in an occupied building. As a minimum this will require plywood hoarding within the elevator hoistway and hoarding outside each elevator entrance to provide a working area while keeping the adjacent corridor free for tenant movement.
 - .2 Include for exterior storage container - site storage is limited.
 - .3 Include for required protection of work area - signage, dust control and barricades - to accomplish elevator modernization in an occupied building.
 - .4 Carry out all noisy and disruptive work after hours (after 6 PM and before 7 AM) including any work audible at more than 30 dB over ambient measured 1 meter on the tenant's side of barricades.
 - .5 Supply any required garbage dumpster. Keep building cleared of rubbish.
 - .6 Provide required cutting, patching and making good of new fixtures.
 - .7 Provide new pit ladder, including retractable with electrical switch, if required by new equipment arrangement.
 - .8 Provide any required alterations to existing overhead, to accommodate new elevators. Include for required cutting, patching, and all required removing and reinstallation of roofing supports, electrical, mechanical, heating and ventilation system components and include required engineering and waterproofing.
 - .9 Provide any required hoistway repairs including patching of holes, fire stopping and bevelling of ledges or setbacks 100 mm or greater.

- .10 Provide all required supervision, coordination, safety meeting as required by multiple trades on site. The Division 14 contract will be the General Contractor. Include for required municipal and provincial work permits.
- .11 Modify elevator machine room door as required to make self closing and self locking.
- .12 Provide new pit steel and pit ladder to Code. If required to maintain clearances include retractable ladder with safety circuit connection.
- .13 Include for work to relocate existing roof drains in the machine room, and provide appropriate leak drip pans, so that vertical clearance above the new machines meets provincial standards.
- .14 To accomplish associated Monitoring work (see specification 14 90 00) include all related connections and data sources including conductors, conduit, modems, installation fees, license fees, system activation and other work and services as required or as reasonably directed by the departmental representative to accomplish a working system without any costs extra to those of this division.

1.3 REFERENCE
STANDARDS

- .1 Perform work to the following minimum standards:
 - .1 CAN/CSA-B44-2013 Safety Code for Elevators including updates
 - .2 CSA C22. No.77 Motors with Inherent Overheating Protection.
 - .3 CSA C22.2 No. 141 Unit Equipment for Emergency Lighting.
 - .4 Provincial Elevator Act and Regulations.
 - .5 C22.1 Canadian Electrical Code, particularly Section 38.
 - .6 National Building Code.
 - .7 CAN/CSA B651 Barrier Free Design
 - .8 CAN/CSA Z320 Building Commissioning Standards.
 - .9 Addendum to ANSI/ASHRAE/IESNA Standard 90.1-2007, Energy Standard for Buildings (cab lighting systems to have efficacy of not less than 35 lumens per watt, cab ventilation fans shall not consume over .33 watts/cfm at maximum speed and when stopped and unoccupied with doors closed for over 15 minutes, cab interior lighting and ventilation shall be de-energized until required for operation).
- .2 In case of discrepancy, the above standards take precedence over details elsewhere in this specification.

1.4 POWER SUPPLY

- .1 Make all necessary modifications to the electrical services relating to the elevator such as

supplementary disconnect devices and connections to the controller.

- .2 Design equipment to operate using the existing 3 phase power supply.
- .3 Provide necessary grounding, shielding, or bonding required to accommodate the new elevator equipment.
- .4 Carry out any electrical modifications outside of the hoistway and machine room by a Licensed Electrician and arrange and pay for inspection by hydro utility as required. Provide a copy of utility permit to Departmental Representative.

1.5 PERMITS AND INSPECTIONS

- .1 Complete Design Submission and related research necessary for regulatory approval of Work. Make submission to Province within 2 weeks of approved General Arrangement Drawings.
- .2 Obtain and pay for necessary Municipal or Provincial inspections and permits and make such tests as are called for by the regulations of such authorities. Make tests in the presence of the authorized representatives of authorities.
- .3 Provide the Departmental Representative with copies of inspection reports the same day they are received from authorities.

1.6 TAXES

- .1 Pay all taxes properly levied by law including Federal, Provincial and Municipal. HST to be invoiced as an identified extra.

1.7 MEASUREMENTS

- .1 Before the execution of the work, verify all dimensions with the actual site conditions.

1.8 QUALITY OF WORK

- .1 Perform Work by mechanics skilled in the installation of elevators and with a minimum of five (5) years documented experience in installing the control system to be used.
- .2 Comply with all applicable provisions of all federal, provincial and local labour laws.

1.9 SAMPLES

- .1 Submit to the Departmental Representative for approval, upon request, samples of any visible

elevator finishes including:

1. Cab wall finishes;
2. Cab ceilings;
3. Buttons;
4. Fixture faceplates.

1.10 GENERAL
ARRANGEMENT DRAWINGS,
SHOP DRAWINGS AND
PRODUCT DATA

- .1 Before beginning work, prepare all drawings to show the general arrangement of the elevator equipment and other data which is called for and are to be submitted for review. Provide these drawings within five (5) weeks of notification of award of contract. For each day past the five week deadline, \$500 will be deducted from the contract value.
- .2 Drawing review is for the sole purpose of ascertaining conformance with the general design concept and does not mean approval of the design details inherent in the shop drawings, responsibility for which shall remain with the Contractor. Such review shall not relieve the Contractor of responsibility for errors or omissions in the shop drawings or of his responsibility for meeting all requirements of the Contract including this specification.
- .3 Use metric units of measurement.
- .4 Provide soft version in AutoCAD format and submit five (5) copies of each shop drawing for review. Format for printing as 280mm x 432 mm (11" x 17").
- .5 Indicate to scale on general arrangement drawings, stamped by a Professional Engineer registered in the province:
 - .1 Plan view of driving machine, controller, governor and all other components in machine room.
 - .2 Plan view of car, counterweight, sheaves, supporting beams, guide rails, buffers and other components in hoistway.
 - .3 Section view of the hoistway including elevation of each floor served, pit depth and overhead.
 - .4 Location of circuit breaker, switchboard panel or disconnect switch, light switch and feeder extension points in machine room.
 - .5 Location in hoistway or machine room for connection of travelling cables for car light and communication system.
 - .6 Signal and operating fixtures.
 - .7 Locations and size of trap doors and access doors and load on hoist beam and location of trolley beams.
 - .8 Heat dissipation of elevator equipment in machine room.

- .6 Indicate on shop drawings:
 - .1 Detailed drawing showing all fixtures, position indicators, push buttons, car operating stations, corridor control panels, and any other special fixtures pertaining to the project.
 - .2 Include catalogue illustrations of operating and signal fixtures.
- .7 Provide detailed elevator cab interior drawings.
- .8 Do not commence manufacture or order materials before shop drawings are approved as well as stamped by a Professional Engineer in the province of work and submitted to the provincial safety authority.

1.11 PROJECT RECORD
DOCUMENTS

- .1 Before final acceptance of equipment, provide three (3) sets of reproducible as-built wiring diagrams as well as three (3) sets of all final issue shop drawings including General Arrangement Drawings - machine room plan, hoistway plan and hoistway section. All drawings to be laminated or enclosed in plastic protectors and marked "as-built". Provide all drawings stamped as "as built" by a Professional Engineer registered in the province.
- .2 Provide one soft copy of the above information in AutoCAD format. Insert as-builts into building architectural and structural drawings, as provided by PWSGC.
- .3 Mark up all field changes or additions to original wiring diagrams in red.
- .4 Submit drawings and data in accordance with General Requirements specification, if distributed with this tender.

1.12 OPERATION AND
MAINTENANCE DATA

- .1 Provide three (3) copies of manufacturer's instructions and operation and maintenance manuals.
- .2 Include the following maintenance data:
 - .1 Description of elevator system's method of operation and control including motor control system, door operation, emergency recall operation and special or non-standard features provided.
 - .2 Replacement parts list.
 - .3 Include all wiring diagrams for all equipment on controllers.
 - .4 Maintenance: Use clear drawings, diagrams or manufacturers' literature which detail the following:

- lubrication products and schedules
 - trouble shooting procedures
 - adjustment techniques
 - operational checks.
 - .5 Spare Parts:
 - List recommended spares to be maintained on site to ensure optimum efficiency
 - List all special tools and appropriate unique applications.
 - Detail manufacturer and supplier names and addresses.
 - .3 Include in the manuals a copy of the registered design submission and safety authority inspection reports.
 - .4 For at least the warranty period following acceptance of Work, provide further information that is required for the safe and efficient maintenance of the elevator equipment, including any solid state equipment or devices supplied under these specifications.
- 1.13 MAINTENANCE
SERVICE - INTERIM AND
WARRANTY
- .1 Include at no extra cost Interim maintenance of existing equipment covered under this project from the day of contract award and continue maintenance for an additional period of twenty-four (24) months from the date of the Final Certificate of Completion of the project.
 - .2 Carry out maintenance inspections and tests in accordance with provincial regulations, Section 8.6 of the ASME 17.1/CSA B44-13 Safety Code for Elevators and Escalators, CSA Standard B44.2-10 Maintenance Requirements and Intervals for Elevators, Escalators, Dumbwaiters and the PWGSC standard Elevating Devices Maintenance Specification distributed with this tender, as a minimum.
 - .3 Systematically clean, lubricate and adjust all of the equipment as required.
 - .4 Repair or replace electrical and mechanical parts of any equipment as required, whether due to defect or normal wear and tear.
 - .5 Use only genuine standard parts of manufacturer of equipment.
 - .6 Perform work by competent personnel under supervision and in direct employ of manufacturer,

or manufacturer's licensed agent.

- .7 Schedule work during regular Elevator Trade working hours with Departmental Representative.
- .8 Maintain locally an adequate stock of parts for replacement or emergency purposes and have qualified staff available to ensure fulfilment of parts requirements in a timely fashion.
- .9 Include 24 hour call-back service required by equipment stoppage or malfunction at all times at no additional cost. Provide staffing to ensure 30 minute response to emergency calls throughout interim and warranty maintenance. Provide full coverage of monitoring system including modem and internet elements with 48 hour deadline to restore system to full operation.
- .10 Ensure no unit is out of service longer than 12 hours - keep Departmental Representative completely informed of equipment malfunctions on a continuing basis.
- .11 Remove garbage monthly.

1.14 LAYOUT

- .1 Design equipment to suit existing space or space as modified by this division's work, including hoistway cross-sections, overhead, pit depth, machine room dimensions and machine room location.
- .2 In the event that design changes are proposed by the Contractor with respect to any of the above-noted dimensions, required either for convenience or by physical necessity, notify Departmental Representative in writing without delay.

1.15 WARRANTY

- .1 Provide a warranty that the materials and workmanship of the apparatus installed under these specifications are first-class in every respect and make good any defects, not due to improper use or care, which may develop within two (2) years from the date of acceptance.
- .2 Commence warranty at date of certification of Final Completion, as certified by the Departmental Representative.

1.16 DEPARTMENTAL REPRESENTATIVE'S

- .1 The Departmental Representative will approve and review components only after it has been installed.

APPROVAL OF WORK
QUALITY

- .2 Approval may be withheld for, whether or not approved by others, for any of the following:
 - .1 Defective work or deficiencies not corrected.
 - .2 Failure of Contractor to make payments properly to Sub-contractor(s) or for material and labour.
 - .3 Failure to work to schedule.
 - .4 Damage to the building or another contractor.
 - .5 Failure to meet specifications or performance criteria.

1.17 USE OF ELEVATOR BY
PERSONS WITH PHYSICAL
DISABILITIES

- .1 Arrange all controls and fixtures to be easily reached and operated by disabled persons. Meet requirements of Appendix E of the CAN/CSA-B44 Safety Code for Elevators, including:
 - .2 Provide car direction indication with stainless steel faceplates, lexan covers, LED illuminated bulbs and new electronic chimes to sound once for UP direction and twice for DOWN. Chime volume to be adjustable.
 - .3 Provide voice annunciation indication of each floor, when served and of car direction. Provide volume control adjustable from behind car station. Provide high- power speakers, minimum of two (2) per car so no distortion is readily noticeable to passengers. Provide sample of annunciations, to be in French and English languages and in a feminine voice, with shop drawings.
 - .4 Provide all new metal hall braille/tactile plates.

1.18 ELEVATOR
PERFORMANCE

- .1 With equipment adjusted to the required parameters, operate elevator with smooth acceleration and provide a comfortable and agreeable ride to the passengers.
- .2 Meet required parameters in conjunction with dependable, consistent elevator operation and without undue wear or excessive maintenance over the life of the elevator installation.
- .3 Provide brake to brake time required to travel 3400 mm floor not to exceed 4.4 seconds.
- .4 Set 1066 mm wide, centre open, one speed doors to safely close in 2.4 seconds and open in 1.7 seconds.
- .5 Provide adjustable dwell times and independent dwell

settings for car and hall calls.

- a. Set the dwell times to 4 seconds for car, and 6 seconds for hall initially.

- .6 Maintain floor levelling accuracy of 5 mm or better.
- .7 Set door detector interrupt and nudging time to 20 seconds.
- .8 Limit cab noise levels to 60 dB when moving and 68 dB during a door operation cycle, as measured by a sound meter located in the centre of the cab and set on the "A" scale with an "F" response.
- .9 Limit horizontal vibrations in both the post-to-post and front-to-back axis to 20 milli-g in the 2 - 10 hz range.
- .10 Limit vertical vibrations to 20 milli-g.
- .11 Adjust typical acceleration rate to 0.10 g.
- .12 Limit jerk rate (change in rate of acceleration) to 2.44 m/s².
- .13 Provide car speed to within 5% of contract speed in both directions.

PART 2 - PRODUCTS

2.1 DESCRIPTION OF ELEVATOR

- .1 Modernize existing traction gearless elevators to traction permanent magnet gearless equipment.
- .2 Class: Passenger
- .3 Capacity: 1588 Kg (3,500 lbs)
- .4 Speed: 2.54 m/s (500 fpm).
- .5 Control: Triplex, selective collective Elev. 1 to have keyed switch to/from Simplex/Group service
- .6 Doors: 1066 mm (42") wide, 1 speed centre open
- .7 Travel: Per existing site conditions. Floors 1-12 to front side Elev. 1 serves B4 additionally.
- .8 Overhead: Per existing site conditions

.9 Pit Depth: Per existing site conditions

Special Features: Independent service operation;
FEO operation, phase 1 and phase 2;
Emergency power operation;
Monitoring and command feature at
remote computer.

Signals: Dupar US 91 buttons;
Car position indicator;
Hall position indicator at main landing
and at level B4;
New hall lanterns at all floors but
with new electronic chime and LED
illumination;
New remote fire panel in CACF room
including all conductors and conduit;
Full compliance with Appendix "E" of
CAN/CSA-B44 Safety Code for Elevators
All signals to be LED-illuminated

2.2 COMPONENTS

- .1 Use major elevator components from proven and tested product lines of major manufacturers unless otherwise approved in writing or unless product is specifically named in this document.
- .2 Use components only which have performed satisfactorily together under conditions of normal use in not less than three (3) other elevator installations of similar design and for a period of at least two (2) years. Furnish names and addresses of owners or managers of buildings, in which proposed combination of major components has so performed.
- .3 Major components are defined to include motors, motor drives, controllers and machines.
- .4 Furnish materials and equipment new, the best of their respective kinds and installed in a neat, accurate, workmanlike manner.
- .5 Provide only system designs field tested for the application, with adequate capacity to meet all performance criteria and to provide long term, reliable operation.
- .6 Provide stainless steel to ASTM A480M, type 304, no. 4 satin finish.
- .7 Use paint with CGSB 1-GP-104Ma, alkyd enamel semi-gloss, for machinery, colour to be selected by Architect.

2.3 ELECTRICAL
COMPONENTS

- .1 Furnish and install all new insulated wiring to connect all parts of the equipment including travelling cable, all wiring in hoistway, new components on car top and new wiring from disconnect switch to controllers and motors.
- .2 Use steel set screw type fittings where electrical metallic tubing is used.
- .3 Provide a communication system junction box on the outside of the controller appropriately identified. Provide shielded wiring from the assistance button in car and the speaker in the car to a junction box located at controller in machine room.
- .4 Provide a separately-identified box for the fire alarm connection.
- .5 Include at least 10% spare conductors in each cable. Tape and legibly identify all spare wires.
- .6 In travelling cable and terminating at controller and car station, include at least six (6) pairs of 18 gage twisted/shielded wires for audio or other electronic equipment. Include one (1) co-ax RG-59 for video signal.
- .7 Do not parallel conductors to increase current carrying capacity unless individually fused.
- .8 Install a separate green bond wire in all raceway, including EMT and flexible conduit.
- .9 Provide additional disconnect switches and wiring if required by Code, to suit new machine room layout.
- .10 Include wiring, and connections to elevator devices remote from hoistway and between elevator machine rooms.
- .11 Connect all wiring where required to building fire alarm system.
- .12 Limit use of flexible conduit on car top to items that require movement or periodic adjustment.
- .13 Provide insulated wiring having a flame retarding and moisture resisting outer cover. Wiring shall be run in metal conduit, metallic tubing or wire ducts.
- .14 When using conduits or troughs through floor, extend conduit or trough at least 100 mm above floor.

- .15 Do not run conduit or wiring along the pit floor. Install all conduit and wiring a minimum of 150 mm above pit floor.
- .16 Existing trough or conduit may be retained where is serviceable condition.
- .17 Use type ETT travelling cables.
- .18 Suitably suspend the travelling cables to relieve strain in the individual conductors.
- .19 Run 600 volt wiring in electrical metallic tubing or other galvanized steel raceway. Include a covered ground wire same size as feeders in the raceway.
- .20 Fabricate wiring that is run in conduit or tubing to Table 6 of CEC Part 1.

2.4 SOUND ISOLATION

- .1 Include resilient pads to effectively isolate machine from machine beams or flooring. Design for Transmisivity of less than 10% at full speed and full load. Use a minimum of 37 mm thick pads. Do not use built-up pads.
- .2 Prevent lateral displacement of machine.

2.5 CAR AND COUNTERWEIGHT GUIDES

- .1 Equip passenger car and counterweight with roller guides, individually spring loaded, mounted on top and bottom of car and counterweight frames. Provide minimum diameter 200 mm (8") for car, 100 mm (4") for counterweight.
- .2 Provide each guide with durable, oil resistant and resilient tired ball bearing rollers to run on three finished rail surfaces.
- .3 Do not lubricate guide rails. Maintain each roller on its respective guide in uniform contact with rail surface at all times by means of substantial adjustable springs or by resilient mountings.
- .4 Provide guide operation, which is inaudible to passengers in car or outside hoistway with car operating at rated speed and car fan turned off.
- .5 Use roller tire material which will not develop flat spots after standing idle for 72 hours under average environmental conditions.

2.6 GUIDE RAILS AND
BRACKETS

- .1 Prove new T rail for car and counterweight - 15 lbs/ft and counterweight rails of 8 lbs/ft minimum or alternatively re use existing if compatible and if refurbished to the standards of this section.
- .2 Align and file all joints.
- .3 Erect guide rails plumb and parallel within maximum deviation of 1.6 mm per any 6,000 mm section and 0.1 mm per any 25 mm section.
- .4 Use metal shims only and provide lockwashers under nuts and tapped bolts.
- .5 Compensate for expansion and contraction of guide rails.
- .6 Use splice plates and guide rails with contact surfaces accurately machined to form smooth joints.
- .7 Provide planed steel tees, erected plumb and fasten to hoistway by heavy steel brackets.
- .8 Use "T" shape tongue and groove rails, connect with steel splice plates.
- .9 Extend rails to approximately 150 mm from underside of overhead machine beams.
- .10 Bolt or weld brackets directly to steel. Do not use clips.
- .11 In concrete structures, provide inserts in concrete formwork or self-drilling expansion shell bolt anchors for support of brackets. Where Departmental Representative considers any concrete fastener improperly installed either replace fastener or demonstrate stability of fastener by performing on site test under which fastener is subjected to four times manufacturer's safe pull out or working load. Use self-drilling expansion shell bolt.
- .12 Do not burn out fastening holes.
- .13 Where pits are waterproofed, anchor guide rails in pit so as not to reduce effectiveness of waterproofing.
- .14 Include steel reinforcement for car and counterweight guide rails where necessary.

2.7 ROPES

- .1 Provide new hoist ropes, 2:1 system, with steel core from same factory production run in

accordance with good practice and the CSA Elevator Code.

- .2 Provide springs on the counterweight end of hoist ropes.
- .3 Use approved type wedge clamp type sockets.
- .4 Secure the returned end of the wire ropes with two retaining clips. Set first clip approximately 50 mm (2") above top of wedge clamp, and second clip 100 mm (4") above first clip. Tape end of the wire rope. Existing car top hitch system is not code complaint and is not suitable for re use.
- .5 Provide system engineered for expected hoist rope life of 8 years minimum based on four trips to the lobby per day per building occupant and considering information: car weight, car capacity, car speed, type of car guide, percent counter weight, roping ratio, angle of wrap, drive sheave diameter, undercut profile and angle, deflector sheaves, number of reverse bends, number of ropes, rope diameter, rope grade, lay direction, rope type/construction and bending length. Provide this calculation and the above data with shop drawing submission.
- .6 Provide new wire-rope compensation system with new tension frame. Design compensation to design compensation to equalize motor horsepower draw to within 10% regardless of position of car in hoistway.

2.8 BUFFERS

- .1 Provide new buffers, stands and associated pit steel. Use non standard reduced stroke buffers and emergency terminal stopping devices where pit depth or overhead height does not permit installation of normal stroke buffers.
- .2 Include buffer extensions where necessary to suit pit depth.
- .3 Provide a switch on each floor mounted car buffer to prevent operation of the elevator towards buffer if buffer does not return to normal position.
- .4 Mount any conduit approximately 300 mm (12") above pit floor. Suitably support this conduit.

2.9 COUNTERWEIGHT

- .1 Provide counterweight of structural or formed metal frame type with metal or concrete filler weights equal to mass of complete car plus 40% to 42.5% of rated load. Provide rods through weights

and frame.

- .2 Paint in contrasting colour the maximum run-by sign on guard.
- .3 Provide blocking under counterweight, where required.

2.10 SAFETIES AND GOVERNOR

- .1 Provide new type B car safeties.
- .2 Provide new governor, governor rope and governor tension sheaves.

2.11 MACHINE

- .1 Provide new AC Permanent Magnet Gearless machine. Include engineered designed to accomplish proper rope drop to car and counterweight. Account for existing low headroom in machine room.
- .2 Design brake to be spring applied electromagnetically released and quietly operated by direct current.
- .3 Manufacture traction sheave thick enough to permit at least one re-machining of traction grooves.
- .4 Provide durable heavy-duty design including do not exceed 85% of maximum machine sheave shaft load.
- .5 Provide Bridge Bearing Neoprene Pads or Mason "Super W" pads to manufacturer's recommendations and engineered for this duty to effectively isolate new machine and motor drive from machine room floor. Do not use built-up pads. Design for Transmissivity of less than 10% at full speed and full load.

2.12 AC MOTOR

- .1 Include AC reversible type motor designed for elevator service and recommended by manufacturer of drive, as follows:
 - .2 Provide Class F or H insulation system.
 - .3 Provide 60 minute duty based on 180 stops per hour.
 - .4 Provide less than 3% slip at full load.
 - .5 Thermally protect motor.
 - .6 Provide high tensile, 724 mPa (105,000 psi) or better steel shaft with 32 micro finish or better.

- .7 Impregnate windings with insulation and bake to prevent absorption of moisture and oil.
- .8 Provide not less than one megohm insulation resistance between motor windings and motor frame.
- .9 Provide sealed bearings. Do not use motor bearings as thrust for worm shaft.
- .10 Provide 28 poles for smooth, quiet operation.
- .11 Design so that surface temperature of machine does not exceed 38 degrees C during heavy operation.

2.13 ASCENDING CAR
OVERSPEED AND
UNINTENDED CAR MOVEMENT
PROTECTION

- .1 Equip elevator with a safety device to provide UP direction car overspeed protection.
- .2 Equip elevators with protection against unintended movement outside of door zone.
- .3 Arrange device to be reset from a single button so-indicated in the controller.

2.14 MOTOR DRIVE

- .1 Provide regenerative Variable Voltage Variable Frequency AC flux vector drive system. Design equipment to operate unaffected under minor levels of voltage fluctuations and harmonics generated from within and outside the building.
- .2 Make drive system capable of producing full torque at zero speed and utilize a shaft mounted position transducer to accurately monitor the rotating frequency.
- .3 Take power for system from existing building 3 phase power supply.
- .4 Change AC voltage to DC, and a power transistor inverter circuit will change the DC voltage to AC to power the elevator motor.
- .5 Control motor speed and torque by varying the frequency and amplitude of AC voltage.
- .6 Eliminate surges on the AC line which might cause blowing of the DC line fuses or which might cause trouble in other equipment connected to AC line. Filter DC if necessary.
- .7 Modify frequencies emanating from rectifier drive which are objectionable to personnel or which

interact with any building equipment.

- .8 Produce no voltage distortion or notches in excess of the limits suggested in IEEE 519. Limit EMI through the use of shielding, efficient power conductor run and filters.
- .9 Provide stepless acceleration and deceleration and smooth operation at all speeds.
- .10 Limit machine room noise level, with all elevators operating, to 70 dBA as measured from the centre of the machine room on an "S" response.
- .11 Include braking of motor during deceleration by feeding power generated by motor, back to ac power lines. Failure of the drive's system to remove regenerated power shall cause the drive's output to be removed from the hoist motor.
- .12 Provide closed loop tachometer feedback control. Continuously monitor the elevator speed signal from the velocity transducer and compare it with the intended signal to verify proper and safe operation of the elevator and to correct the actual elevator speed to match the intended speed.
- .13 Automatically re-start equipment which has stopped due to ac power failure.
- .14 Limit Voltage Total Harmonic Distortion to 2%, and limit any individual harmonics to 0.5%.
- .15 Limit Current Total Harmonic Distortion to 5%, and limit any individual harmonics to 3%.

2.15 SHEAVES AND
SUPPORTING BEAMS

- .1 Provide deflector sheaves, idler sheaves and overhead sheaves, including bearings and beams, necessary for roping arrangement. Existing deflector sheaves and car top sheaves are not suitable for re use.
- .2 Provide sheaves of cast iron, accurately machined and grooved for the diameter of ropes used.
- .3 Provide all sheaves sufficiently larger than that required by Code, in pitch diameter and thickness, to permit at least one regrooving of sheave.

2.16 CONTROLLER AND

- .1 Provide non-proprietary controller with flux vector drive.

CABINET

- .2 Enclose the controller in enamelled, ventilated, sheet steel cabinet, with swing-type doors at front.
- .3 Provide relays and contactors particularly designed for elevator duty.
 - a. .1 Provide battery back-up for all circuits containing volatile memory.
- .4 Provide a suitable communication system junction box on the outside of the controller and identify it accordingly. Provide a separate identified box for the fire alarm connection and emergency power signal.
- .5 Cord all field wiring and insulate from metal contact.
- .6 Permanently identify all switches and relays.
- .7 Provide protection against reverse and open phasing of main feeders.
- .8 Include properly sized primary and secondary fuses for each transformer used in the controller. Provide a solid state controller equipped with programable logic microprocessor controls and self-diagnostic features.
- .9 Provide permanently marked junction studs in a designated area in the controller connecting all field wiring.
- .10 Include properly sized primary and secondary fuses for each transformer used in the controller.
- .11 Govern car motion control by means of real position of car in hoistway. Do not employ stepper relays.
- .12 Provide fully non-proprietary version of all control equipment including:
 - .1 All required diagnostic are "on board".
 - .2 All programming and diagrams required for long-term maintenance are provided. All elements required for unrestricted access to all parameters, levels of adjustment, monitoring and flags necessary for long-term maintenance are provided. This includes suspension belt monitoring devices.
 - .3 The controller will not shut down or alter its functionality in any way after a pre-determined increment of time or use.
 - .4 Parts including circuit boards shall be available for direct purchase from the factory in quantities and not on an one-for-one "exchange only" basis. Parts to be stocked to allow for overnight shipment.

.5 All circuit boards shall be available for purchase at reasonable costing as demonstrated by a parts list supplied with shop drawings.

.6 Manufacturer offers engineering support and technician training directly to any service contractor at reasonable prices. Manufacturer offers a support telephone hotline.

.7 Replacement of documentation, manuals, wiring diagrams and any diagnostic elements are available for purchase at reasonable cost.

2.17 CONTROL AND PERFORMANCE

- .1 Provide microprocessor-based group supervisory control optimized to minimize passenger waiting times.
- .2 When lifting rated load, do not permit car speed to vary from rated speed by more than 3%.
- .3 Arrange each car so that momentary pressure of one or more of its car buttons causes car to start.
- .4 Do not start car unless the car door is in the closed position and all hoistway doors are locked in the closed position.
- .5 Programmable options and parameters shall be stored in nonvolatile memory. As a minimum, there shall be a 32-character alphanumeric display to be used for programming and diagnostics. The programmable parameters and options shall include, but not be limited to, the following:
 - Number of Stops/Openings Served (Each Car)
 - Programmable Fire Code Options
 - Fire Floors (Main, Alternates)
 - Floor Encoding (Absolute PI)
 - Digital PIs/Single Wire PIs
 - Programmable Door Times
 - Programmable Motor Limit Timer
 - Nudging
 - Emergency Power
 - Parking Floors
 - Door Pre-Opening
 - Hall or Car Gong Selection
 - Attendant Service
 - Anti-nuisance - Light Load Weighing and Photo Eye
- .6 The controller shall have field programmable outputs to activate different functions based on customer needs. These functions can be outputs such as those listed below.
 - Fire Phase I Return Complete Signal
 - Fire Phase II Output Signal
 - Hall Call Reject Signal
 - Emergency Power Return

- .7 The controller shall have a serial port for communication with any data or computer terminal such as a CRT terminal, modem, etc.
- .8 The controller shall have an RFI Filter to help reduce EMI and RFI noise.

2.18 EMERGENCY POWER OPERATION

- .1 Provide operation of elevators on building emergency power system.
- .2 Include for 1, 2 or all 3 elevators operating concurrently on emergency power depending on available load as will be finalized with elevator shop drawing submissions, including cover costs for selector switch if required.
- .3 At resumption of normal power, restore elevators to normal operation automatically.

2.19 PHASE I EMERGENCY RECALL OPERATION

- .1 Provide emergency recall service which will be initiated automatically or manually by any recall switch. When recall has been initiated:
 - .1 The elevator controlled by the recall switch and on automatic operation, including independent service operation, shall return directly to the recall level where the doors shall open and remain open. The elevator shall not respond to the landing or car call buttons. Travelling to a terminal landing first and then reversing to travel to the recall level is not acceptable.
 - .2 The elevator that is stopped with the doors closed, or is travelling towards the recall level, shall proceed non-stop to the recall level.
 - .3 The elevator travelling away from the recall level shall reverse at or before the next available landing without opening its doors.
 - .4 A car stopped at a landing shall have its emergency stop switch rendered inoperative as soon as the doors are closed and the car starts to move. A moving car shall have its emergency stop switch rendered inoperative.
 - .5 All call registered lights and directional lanterns shall be extinguished and remain inoperative. Position indicators, in the car and at the recall level, should remain in service.
 - .6 The car shall be provided with a visual and audible signal system which shall be activated to

alert passengers that the car is on the emergency recall operation and at least the visual signal shall remain operative until the car reaches the recall level.

- .7 An elevator stopped at a floor other than the recall level with doors open shall close its doors and proceed non-stop to the recall level.
- .8 Door re-opening devices that may be affected by smoke or hot gases shall be rendered inoperative.
- .9 If the elevator is on inspection operation, a signal shall warn the inspector to return the car to the recall level. The elevator shall remain under the control of the inspector.
- .10 The recall operation shall be terminated when both switches at the main control panel and lobby panel are in the "RESET" or "OFF" position, as is appropriate.
- .11 Include for connecting the fire alarm signal through the recall switch.

2.20 PHASE II EMERGENCY .1
IN-CAR OPERATION

Provide in-car emergency service for each elevator initiated by a key switch located in the car. The switch shall be marked "OFF - HOLD - ON" and the key shall be removable in the OFF and HOLD positions. The switch shall become effective in initiating in-car emergency operation when in the "ON" position, provided the emergency recall operation is in effect and the car has returned to the recall level. During emergency in-car operation, the elevator shall operate as follows:

- .1 The elevator shall be operable only by a person in the elevator.
- .2 The elevator shall not respond to elevator landing calls.
- .3 The opening of power-operated doors shall be controlled only by continuous pressure on the "DOOR OPEN" button. If the "DOOR OPEN" button is released during the "OPEN" motion, the door shall reclose immediately. When doors are fully open, they shall remain open until closed.
- .4 Door re-opening devices for power-operated doors shall be rendered inoperative.
- .5 The doors shall be closed and the car started by registering a car call and constant pressure on the "DOOR CLOSE" button or on any car call button.

- .6 Momentary operation of the in-car emergency service switch to the "HOLD" position shall cancel registered car calls.
- .7 When the car is at a landing and the key switch in the car is turned to the "HOLD" position, the doors shall remain open and car calls cannot be registered.
- .8 When the car is at a landing and the key switch in the car is turned to the "OFF" position, the car shall automatically return to the recall level as on emergency recall operation regardless of the position of the emergency recall switch.
- .9 The elevator shall be returned from In-car operation only when the car is at the recall level and the in-car switch is in the "OFF" position.

2.21 INDEPENDENT SERVICE

- .1 Include independent service by means of key-operated switch in car service panel to allow removal of a car from group service and to operate independently in response to car calls only and as follows:
 - .1 Render the hall lanterns and/or car riding lanterns inoperative.
- .2 Cause the car to park with the doors open. Arrange the controls so that the car responds to any car calls registered if a button is held until the doors are closed and the interlocks made-up.
- .3 Cause the doors to reopen if the button is released at any time up to the point at which the elevator starts to move. Render inoperative the normal door protective devices.
- .4 Cancel all registered car calls when the direction reverses or a car

2.22 LOAD WEIGHING

- .1 Provide load weighing with means to measure the load in the car within 5% of the elevator capacity.
- .2 Adjust the load weighing device to ensure that it will operate over the required range of settings.
- .3 Verify that the load weighing device has a long term stability such that the settings do not require re-adjustment more frequently than every two years.

- .4 Use load weighing to pre-torque elevator and prevent movement in reverse direction when leaving a floor.

2.23 ACCESS TO PIT,
HOISTWAY AND TOP OF
CAR INSPECTION

- .1 At the top landings, provide keyed-access to car top.
 - .1 Provide between car crosshead and hoistway door, a single operating fixture containing the following: 120 volt GFI Fixture, an emergency stop switch, continuous pressure buttons for operating the car and a switch for making the buttons on top of the car operable. Operation from top of the car shall be obtained by simultaneous, continuous pressure of the appropriate direction button and a safety operating button after these buttons have been made effective.
 - .2 Operation from top of the car shall not be possible unless all electric door contacts are closed.
 - .3 Means shall also be provided so that when the car is to be operated from the top of the car, automatic levelling, power door operation and the normal operating devices car and landing are made ineffective.
 - .4 Arrange circuits to prevent car moving away, when on top of car operation, by any other means.
 - .5 Limit the speed of the elevator shall be not more than .76 m/s and not less than 0.25 m/s.
- .2 At all landings provide a hoistway door unlocking device. Provide a stainless steel collar for holes.
- .3 Provide a car top railings on all non-access sides of the elevator car top except where the distance to a rear wall does not exceed 356 mm. Include for an intermediate rail and toe board. Paint the railing yellow.

2.24 WORK LIGHTS AND
RECEPTACLES

- .1 Provide suitable protected light fixtures.
- .2 Provide two (2) protected light fixtures on car top. One light to be a moveable unit to be used as a hand-held light.

2.25 EMERGENCY
LIGHTING

- .1 Include emergency lighting in the car, with a minimum of two (2) fixtures.
- .2 Use battery operated emergency lighting equipment to CSA C22.2 No. 141, to provide general

illumination and 10 Lx minimum illumination at car operating panel.

- .3 Include means for convenient manual operation and testing of the unit from within car. Testing means to be spring loaded or self-centring key switch.
- .4 Design battery unit of sufficient strength to support 90 KG person without causing malfunction or damage.
- .5 Include means of containing any leakage or spillage of electrolyte.
- .6 Arrange battery unit as a source of power for alarm bell during power failure.

2.26 CAR PLATFORM AND FRAME

- .1 Provide nickel-silver threshold to accept ceramic flooring thickness chosen by Departmental Representative.
- .2 Existing car frame and steel platform may be retained may be retained and refurbished if compatible to specified new equipment and refurbished including the correction of all deficiencies such as broken welds.
- .3 Provide isolation pads. Vulcanize steel plates to top and bottom of pads. Arrange for fastening top plate to platform and bottom plate to isolation frame.
- .4 Provide rubber isolation of car enclosure to sides of uprights.
- .5 Install a sub floor made of plywood as required for class of loading.

2.27 CAR INTERIOR

- .1 Fabricate ceiling with sheet steel, minimum of 12 gauge, smooth and free from defects. Emergency exit to be of same fabrication and finish.
- .2 Ventilate by an exhaust air handling unit through roof and through concealed perforations at base. Limit total fan noise to 55 dBA, measured on an "S" response scale, measured 0.9 m above floor with fan on high speed. Include two speed operation of ventilation system.
- .3 Provide new emergency exit on top of the car of suitable size, equipped with an electrical device which will prevent operation of the elevator if the exit cover is open more than 50 mm and designed to comply with elevator code.

- .4 Provide flush mounted, hands-free, auto-dial telephone. Program telephone to number provided by owner.
- .5 Re-skin all existing stainless steel in cab, including entire front wall, jambs, header, ceiling and partitions between mirror with new brushed stainless steel. Provide new cab doors finished in matching stainless steel.
- .6 Provide new flooring to Departmental Representative's choice from ceramic tile or single-sheet vinyl tile, including choice of colour and pattern.
- .7 Provide new handrails on three walls to Departmental Representative's choice of cylindrical stainless steel to match existing, or 1/4" thick and 6" high stainless steel.
- .8 Provide car-cab interior dimensions to attached concept layout.
- .9 Replace all existing mirror with appropriately rated smoked glass safety mirror.
- .10 Provide new led lighting system to replace existing including quantity and power of fixtures required to illuminate to 200 lux at the car sill, measured with door closed.
- .11 Provide new stainless steel licence holders in cabs sized to fit standard Provincial licenses as issued at time of project completion.
- .12 Take possession of existing cab signage and reinstall in a permanent and aesthetically pleasing manner in completed elevator.
- .13 Provide cab hooks and a complete set of durable, fire resistant, cab curtains for elevator 1.

2.28 CAR DOORS

- .1 Provide flush, steel clad in stainless steel, horizontal-slide, doors.
- .2 Provide two (2) steel pins per door panel extending from the door into the centre of the threshold grooves to prevent the door swinging into the hoistway, should the lower guides become dislodged.

2.29 HOISTWAY DOOR
HANGERS, LOCKS, TRACKS
AND CLOSING DEVICES

- .1 Existing hangars and tracks (but not locks and closers) may be retained and refurbished including provision of new hangar rollers and cleaning of tracks. Use self-lubricating ball or roller bearings sealed to retain grease lubrication and wipers to maintain rollers and track in clean condition. Provide new relating cable sheaves, air cord and sheave guards.
- .2 Provide spring-type, sill-mounted closing devices or alternatively heavy-duty spirator devices.
- .3 Provide positive electric interlocks and door closing devices. Include for complete new double lock system per floor. Provide new wiring to door locks including a separate green ground wire back to controller.
- .4 Provide new low-friction lower guides. Provide door safety retainers to prevent door panel displacement should the replaceable primary guiding means fail.
- .5 Dowel all hoistway door pick-up roller assemblies after final adjustments have been made.
- .6 Provide all new astragals. Adjust any loose site guards.

2.30 CAR AND HOISTWAY
DOOR OPERATOR

- .1 Provide a heavy-duty door operator to open and close the car and hoistway doors quietly and smoothly. Provide high speed, electric door operator, with solid state feedback (closed loop) control. Use only ECI/GAL VFE2500 H (heavy duty), ½ HP or approved equal. Provide door open speed of at least 0.61 m/s .
- .2 Operate the car door and hoistway doors simultaneously.
- .3 Provide new car door restrictor system.
- .4 Provide electrical cushioning at each end of travel.
- .5 Provide two (2) gate switches per center parting car door opening, operated by a roller attached to the door panel.

2.31 CAR DOOR

- .1 Provide a three-dimensional sensing, solid state door reversal device on the leading edge(s) of car

PROTECTIVE DEVICES

door panel(s). The device shall contain systems specifically designed for the application and enclosed in an insulated chassis. Arrange the device to:

.1 Provide long term reliable operation, include no moving parts;

.2 Upon failure of the device, shut the car down at the next available floor, with doors in the fully open position;

.3 Provide totally silent operation;

.4 Include visible diagnostics on the device to permit verification that the unit is functioning;

.5 Have all components installed behind the door jamb, so as to provide a clear opening and present a clean architectural appearance.

.2 Design the device to provide a zone of detection a minimum of 75 mm in advance of the leading edge of each car door and arrange the operation as follows:

.1 Trigger the protection system when any object is located in the entrance and cause the door to reopen without engaging the object;

.2 Permit the protection system to be active over the full travel of the doors;

.3 After elapse of the normal door open dwell time, provide a limited door reversal operation. Arrange the operation so that the door retracts sufficiently to permit only the immediate entering passenger to pass. Continue closing of the door after the passenger leaves detection zone.

2.32 FIRE RATED
ELEVATOR ENTRANCES

.1 Entrance frames and doors may be retained and refurbished if compatible to specified new equipment. Examine existing entrances and repair defects.

.1 Electrostatically paint doors and frames presently with paint finish. Colour to Departmental Representative's choice. All painting to be conducted outside of regular working hours.

.2 Provide new brushed stainless steel skin for complete entrances, doors and frames, at the main floor.

.3 Prepare all exposed existing metal surfaces for painting by removing all scrapes, scratches, checks and blisters with wet and dry emery paper down to existing metal.

.4 Provide one coat of Alkyd metal primer followed by two coats of electrostatically applied alkyd enamel (satin finish).

.2 Install 50 mm high stainless steel arabic numerals on both sides of entrance frame and provide appropriate braille markings. Centre-line of

numerals to be 1500 mm above finished floor.

2.33 FLUSH TYPE
HOISTWAY DOORS

- .1 Examine existing entrances and repair defects.
- .2 Install new lower guides on all hoistway doors. Two guides per door panel.
- .3 Adjust all hoistway doors for smooth and quiet operation.
- .4 Adjust all hoistway doors to fully clear the elevator entrance when fully opened.
- .5 Cushion opening doors and closing doors with rubber bumpers.
- .6 Replace all sight guards at all floors with steel-type sight guards. Finish to match hall doors. Provide a resilient gasket between the sight guard and hoistway side of the hall doors Use self-tapping screws.

2.34 HALL SILLS

- .1 Examine existing hall sills and repair defects.

2.35 FASCIAS AND
TOEGUARDS

- .1 Provide fascia and extended toe-guard to full width of entrance plus overlap.
- .2 Reinforce to walls where necessary to prevent deflection of fascia and securely fasten to entrance arrangement.
- .3 Provide final coat of paint on unfinished steel. Paint floor characters 100 mm on fascias approximately 150 mm below landing sill.

2.36 IDENTIFICATION

- .1 Provide 100 mm (4") numerals corresponding to floor level on hoistway side to fascia plates and locate numerals as required by Code.
- .2 Provide all bilingual engraving on faceplates as required by the Departmental Representative in Helvetica medium, upper and lower case.
- .3 Provide 50 mm (2") numerals on all elevator equipment.
- .4 Identify all elevators at recall level. Use formed metal or aluminum-coloured plastic numerals 75 mm in height and 10 mm thick. Final location and form to

be confirmed at time of shop drawing review.

- .5 Provide six (6) keys of each type used with key rings and engraved gravoply discs, identifying use of key.

2.37 CAR DIRECTION
SIGNAL

- .1 Provide new hall lanterns above each hoistway entrance.
- .2 Provide lexan diffusers and LED illuminated bulbs.
- .3 Provide new electronic chimes to sound with the illumination of direction arrows. Chime to sound once to indicate UP direction and twice for DOWN. Provide clear tone at 30 dBA approximately 8 feet from fixture. Chime volume to be adjustable.
- .4 Provide new green illumination for up and red for down by LED.
- .5 Provide new faceplates in stainless steel to match adjacent finishes.

2.38 HALL BUTTON
FIXTURES

- .1 Provide new DUPAR US 91 buttons including providing LED illumination. Provide two risers per floor.
- .2 Illuminate each button in the hall fixture when pressed to indicate a call has been registered and maintain illumination until the call has been answered.
- .3 Provide at height compliant with Appendix E of CSA B44.
- .4 Provide new faceplates as stainless steel to match adjacent finishes.
- .5 Provide a hidden riser set in the frames of elevator 1 to control hall access when this elevator is swung out of group service and to Simplex service
- .6 Include out of service pilot light at level B4 hall station to illuminate when elevator is not available for response to hall calls.

2.39 POSITION
INDICATORS AND VOICE

- .1 Install a new digital display position indicator in car. Locate at existing faceplates - over car entrance.

ANNUNCIATION

- .2 Use characters at least 40 mm high. Provide LED illumination.
- .3 Provide a matching new digital display hall position indicators at main floor.
 - .1 Locate new position indicators in location approved by Departmental Representative.
- .4 Provide voice annunciation indication of each floor, when served and of car direction. Provide volume control adjustable from behind car station. Provide high- power speakers, minimum of two (2) per car so no distortion is readily noticeable to passengers. Provide sample of annunciations, to be in English, and French with shop drawings.

2.40 CAR OPERATING STATION

- .1 Provide two (2) new car operating stations per cab. Incorporate a lockable service cabinet into car operating station. Service panel to be at top of car operating panel. Provide in the service cabinet key operated switches for lighting, fan, emergency light test and independent service. Provide one spare key switch.
- .2 Provide new stainless steel faceplate.
- .3 Engrave all characters on plate and fill with enamel.
- .4 Provide DUPAR US91 or equivalent to Departmental Representative LED illuminated stainless steel floor buttons, one for each floor served. Provide flush mounted tactile identification at side of button.
- .5 Locate top floor button to be no more than 1220 mm above floor.
- .6 Provide a key operated stop switch, an alarm button, door open and close buttons, three position key switch for in-car emergency service, indicator light and buzzer for emergency recall.
- .7 Make all identification engraved in upper or lower case, Helvetica medium, minimum 10 mm filled with red or black enamel, as required.
- .8 Engrave the maximum capacity in kilograms and persons and Provincial Installation number on the car station.
- .9 Engrave the elevator number (ex. "2") on the car station, number to be 25 mm high.

- .10 Use international symbols wherever possible.
- .11 Provide a speaker and grill in the car-operating station complete with Assistance button. Provide an auto-dial telephone behind the return panel and all associated wiring back to the controller-mounted junction box. Program the telephone to dial the number provided by the Departmental Representative.

2.41 TERMINAL STOPPING DEVICES

- .1 Provide an automatic stopping device, arranged to bring car to a stop at the terminal landings independent of the regular operating device in the car.
- .2 Dowel final limits to main rails.

2.42 SIGNAL ILLUMINATION

- .1 Illuminate signal fixtures with intensity which produces distinct and well defined indications.

2.43 FIXTURE FASTENING

- .1 Fasten all fixture faceplates, including car-operating station, with tamper-proof screws.

2.44 BILINGUAL MARKINGS

- .1 Engrave identification and instructions at least 0.03 mm deep on operating panels and on all signal equipment in both official languages except where design is such that inference is obvious and readily understood. Submit markings and designs for approval.

2.45 OCCUPATIONAL HEALTH AND SAFETY ACT

- .1 Meet Occupational Health and Safety Act - finished elevator installations are to have appropriate guards and be Health-and-Safety-regulation compliant with respect to physical and electrical hazards to persons in the elevator machine rooms).
- .2 Provide light-weight railing at the car top perimeter conforming to CSA B44 2.10.
 - .1 Construct substantially of metal and include top rail set at 1070 mm and toeboard protecting the lowest 100 mm.
 - .2 Finish and paint entire railing with two coats of "safety yellow" epoxy.

PART 3 - EXECUTION

3.1 PROCEDURE

- .1 Obtain Departmental Representative's approval before removing elevator from group operation.
- .2 Undertake work on elevators consecutively and not concurrently. No more than one elevator to be out of service at a time including as a minimum arrange for fire testing, button switchover and any other aspect of the project requiring more than one elevator out of service to be done in building off hours, costs included by this division.
- .3 Make allowances for the existing building access limitations including very narrow stair to the elevator machine room.

3.2 INSPECTION

- .1 Before fabrication of equipment, survey hoistway, pit and machine room.
- .2 Confirm electrical power is available and of correct characteristics.
- .3 Report defects in writing to Departmental Representative.

3.3 WELDING

- .1 Where welding is used prepare joints and weld in approved manner using welders fully qualified to the requirements of CSA Standard W47.1.
- .2 Identify field welds with welder's identification stamp.

3.4 INSTALLATION

- .1 Provide all necessary fastenings, bearing plates and transfer arrangement to accomplish appropriate tie-down of machines to the machine room layout.
- .2 Arrange equipment in machine room so functioning equipment and other equipment can be removed for repairs or replacement without dismantling or removing other equipment components. Arrange for

clear passage to access door.

- .3 Erect guide rails using metal shims with lockwashers under nuts and threaded bolts. Compensate for expansion and contraction of guide rails.
- .4 Use splice plates and guide rails with contact surfaces accurately machined to form smooth joints.
- .5 Provide inserts for placement in concrete form work or self drilling expansion shell bolt anchors that will perform to four times rated pull-out load.
- .6 Mount copy of master schematic wiring diagrams in framed glass or plastic enclosure on machine room wall. If number of wiring drawings exceeds five (5), then mount drawings protected with clear plastic on rack permanently attached to machine room wall.
- .7 Cut existing surfaces as required to accommodate new work. patch and make good surface cuts, damaged or disturbed, to Departmental Representative's reasonable approval. Match existing material, colour, finish and texture.

3.5 STORAGE

- .1 Co-ordinate delivery and storage of materials with Departmental Representative's site representative.

3.6 OCCUPIED BUILDING

- .1 Make allowances for the Work being carried out in an occupied building.
- .2 Take proper care to avoid unnecessary noise, clutter or obstruction in the corridors and arrange for storage of materials and tools where they will cause minimum inconvenience.
- .3 Do not use solvents or other products in quantity that is objectionable to building tenants.
- .4 Where excessive noise, odour or obstruction as determined by Departmental Representative is unavoidable, undertake that portion of the Work after hours and at a time coordinated with the Departmental Representative.
- .5 Normal working hours to be 8:00 AM - 4:00 PM each Monday through Friday other than International Union of Elevator Constructors holidays. Staff the Work with a minimum of two employees each day for the duration of the project, except as explicitly

directed otherwise by these Specifications or by the Departmental Representative.

- .6 Provide dust tight screens or partitions to localize dust generating activities and for protection of workers, finished areas of work and public.
 - .1 Maintain and relocate protection until such work is completed.
 - .2 Protect Owner's property adjacent to work area with low fire spread tarps or screens during construction. Remove protection during non-construction hours and leave premises in clean, unencumbered and safe manner for normal daytime function.

- .7 Comply with Canadian Code for Construction Safety and the Provincial Construction Safety Act.
 - .1 Erect hoarding at each floor where there is an unlocked elevator hoistway door. Install plywood hoarding at landing entranceways from floor to ceiling. Plywood to be a minimum of 13 mm thick. Hoarded work space to be at least as wide as the elevator entrance opening and should create a work space inside hoardings of at least 1220 mm deep. Securely fasten hoarding to wall.
 - .2 Upon removal of hoardings and partition make good all damage to surfaces of walls, floors and ceilings.
 - .3 Use hoarded entranceways, and not the in-service elevator, for movement of equipment or garbage.
 - .4 Protect existing floors by covering with 13 mm plywood and tarpaulins as a minimum, when removing or delivering materials.
 - .5 Do not remove partition or hoarding until Work is complete and approval is given by the Departmental Representative.
 - .6 Confirm that any existing structural beams are safe and suitable before lifting loads.

3.7 FIELD QUALITY CONTROL

- .1 Perform and meet tests required by CAN/CSA-B44-13 Safety Code for Elevators Section 8.10.2.2 providing a check-off list with name of qualified inspector and date completed for each applicable item. Supply instruments and carry out these and other tests specified herein.

- .2 Provide 2 days written notice to Departmental Representative of date and time of tests.

- .3 Have a copy of the Specifications on site and available to the installation mechanic.

- .4 Provide Departmental Representative with copy of all speeds and current readings taken at the time of the provincially-mandated inspection.

3.8 CLEANING

- .1 Completely remove protective coverings from finished surfaces and components.
- .2 Clean surfaces and components before project completion.
- .3 Provide complete cleaning of all retained components including hoistway interiors.

3.9 PAINTING AND PATCHING

- .1 Thoroughly clean and paint the following equipment:
 - .1 Car tops and crossheads.
 - .2 Rails and strut angles and fascia plates.
 - .3 Machine room floors and walls.
 - .4 Pit floor and walls to the level of the lowest entrance sill.
- .2 Use paint materials listed on the CGSB qualified products list only.
- .3 Provide professional patching and refinishing of any visible services where equipment is removed, including redundant hoistway access switches at the second floor.
- .4 Paint materials for each coating formulae to be products of a single manufacturer.
- .5 Prepare masonry, stucco and concrete surfaces to CGSB 85-GP-31M.
- .6 Prepare concrete floors to CGSB 85-GP-32M.
- .7 For concrete block and poured concrete walls and ceilings apply:
 - .1 One coat primer-sealer CGSB 1-GP-119M-Amdt-Sep-80.
 - .2 Two coats semi-gloss enamel CGSB 1-GP-57M.
- .8 For concrete floors apply:
 - .1 One coat enamel CGSB 1-GP-66M reduced by addition of 1 part CGSB 1- GP-70M thinner to eight parts enamel.
 - .2 One coat enamel CGSB 1-GP-66M.

3.10 HOISTWAY
PROJECTIONS AND
FASCIA

- .1 Provide bevelling for projections or recesses in hoistway.
- .2 Provide required fascia above and below passed floors or alternatively car door interlock to the requirements of the Provincial Authority having jurisdiction.

3.11 BURNING TORCHES

- .1 Do not employ burning torches in the work. Work with burnt-out holes will be rejected.

3.12 CONSULTANT

- .1 The Consultant will carry out one (1) Final Inspection. Other inspections required due to the Elevator Contractors' failure to completely correct deficiencies the responsibility of the Elevator Contractor may be deducted from the contract value.
- .2 Furnish competent and co-operative mechanics for inspections and acceptance tests as the Consultant reasonably requires. Allow up to 8 hours of on-site assistance. Expect to have work briefly interrupted during progress inspections by the Consultant.
- .3 The Consultant is retained for the convenience of the Owner and/or the Architect and the work of the Consultant shall not relieve the Contractor of any of his duties or responsibilities.

3.13 NOTIFICATION TO
DEPARTMENTAL
REPRESENTATIVE

Notify the Departmental Representative as follows:

- .1 One week prior to commencement of work.
- .2 On delivery of materials to site.
- .3 On placing of machine and controllers.
- .4 On establishment of a moving platform.
- .5 On booking of each Provincial inspection.
- .6 On completion of all deficiencies.

3.14 DEMONSTRATION OF
OPERATION

- .1 In the presence of the Departmental Representative, during silent hours of the building, prepare site specific procedures to properly demonstrate and train site O&M personnel and PWGSC departmental personnel:
 - .1 Independent Service Operation.
 - .2 Emergency power operation;
 - .3 Emergency recall and in-car emergency service;
 - .4 Audio Equipment;
 - .5 Dispatching features.
 - .6 Monitoring and Control features.
- .2 Train Owner's forces on operation of system in two (2) half-day sessions, conducted by a trainer himself/herself fully trained in all user interfaces to the elevator system.

3.15
COMMISSIONING

- .1 Designate one staff person as Contractor's commissioning manager for the project. Manager to be of Adjuster, Supervisor or Manager level or higher. Attend at job site meetings pertaining to the Work.
- .2 Undertake commissioning to CSA Z320-11, Building Commissioning Standards, as a minimum. Prepare, fill out all required commissioning related checklists as directed by PWGSC Departmental Representative. Provide documentation to Departmental Representative when requested.
- .3 After Provincial inspection of each elevator and before turn-over for customer use, test elevators in continuous simulated automatic operation without passenger access.
 - .1 Test for at least (1) hour with no load operating from floor to floor, with or without door operation.
 - .2 Test for at least (1) hour with 100% load operating from floor to floor, with or without door operation.
 - .3 Test for two (2) consecutive hours operating from floor to floor with door operation. Provide barricades and signage to indicate that an elevator test is in progress.
- .4 Before turn-over for customer use, test elevators as following:
 - .1 Running current in up direction with 42% car load.
 - .2 Running current in down direction with 42% car load.
 - .3 Governor overspeed setting.
 - .4 Safety trip setting.
 - .5 Door timings and dwell settings.
 - .6 Operating speed up.

- .7 Operating speed down.
- .8 Door close force.
- .9 Door time-out.

- .5 During warranty maintenance period closely monitor equipment for malfunctions and track reliability. Achieve a target rate of no more than 0.5 malfunction per elevator per month. Not achieving a reliability rate of 1.0 malfunction per elevator per month during the three month period preceding the expiration of the warranty maintenance period will extend the warranty maintenance, including full parts and labour, on the malfunctioning elevator(s) only until the (moving window) 90 day reliability target has been achieved.

Table 1 - Commissioning Data to Be Submitted by Contractor - per car

PARAMETER	Elev. 1	Elev. 2	Elev. 3
Car speed UP 125% load (fpm)			
Car speed DOWN empty (fpm)			
Brake to Brake UP (sec)			
Brake to Brake DOWN (sec)			
Running current UP 42% car load (amps)			
Running current DOWN 42% car load (amps)			
Door open (sec)			
Door close (sec)			
Car call dwell (sec)			
Hall call dwell (sec)			

Governor pull through (pounds)			
Governor overspeed switch, electrical (fpm)			
Safety trip speed (fpm)			
Door stall force (pounds)			
Door timeout (sec)			