

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 two (2) traction passenger elevators designated as Provincial numbers 0264 and 0265 located Postal Station A, 126 Prince William Street, Saint John, New Brunswick. Provide all work required for a completed projected, accepted by the Authority Having Jurisdiction including:
 - .2 New permanent-magnet AC machines to replace existing geared overhead traction machines.
 - .3 New AC hoist motors.
 - .4 New, regenerative, motor drives for closed loop speed control.
 - .5 New GAL brand microprocessor-based solid state electrical controllers.
 - .6 New overspeed and uncontrolled speed protection for cars and counterweights - existing rope grippers not to be re used.
 - .7 New car door operators, hoistway door locks, door closers and related hardware.
 - .8 New position indicators in car and at two levels per car, including rear entrances (6 hall position indicators in total).
 - .9 Refurbishment of car cab interiors.
 - .10 Full parts and labour preventive maintenance on existing equipment from award, throughout modernization period and on new equipment for a subsequent 24 month period.
 - .11 Refurbish car safety devices. New speed governors.
 - .12 Provision of automatic emergency recall and in-car emergency service.
 - .13 Battery cab movement to prevent trapping passengers at time of utility power loss.
 - .14 All associated electrical work as outlined herein.
 - .15 Remote monitoring and command system.
 - .16 Components from elevators may be retained and refurbished at the contractor's option only if specifically permitted in the relevant specification section and where compatible with the new elevator equipment, applicable codes and regulations.
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- .17 Above is a brief description only. The following specifications detail the Work.

1.2 Related Work

- .1 Provide related work not normally completed by the elevator trade i.e THIS WORK TO BE INCLUDED IN ELEVATOR PRICE :
- .1 Provide new main-line disconnect switches and if required by new equipment layout auxiliary disconnect switches.
 - .2 Provide updated crosshead data plates on car tops complete with all pertinent information required by Code.
 - .3 Patch all redundant holes in machine room floor and landing walls.
 - .4 Make all necessary modifications to existing fire alarm panel to bring recall signal to elevator machine room. Accommodate existing fire sensors in the machine rooms and hoistways. Utilize a Certified Fire Alarm Technician for all required modifications.
 - .5 Provide new code-compliant pit stop switches, positively actuated and red in colour.
- .2 The following work to be provided by others.
- .1 Provision of new machine room cooling to ensure machine room temperatures under 34 degrees C.

1.3 Reference Standards

- .1 Perform work to the following minimum standards:
- .1 CAN/CSA-B44-10 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
- .2 In case of discrepancy, the above standards take precedence over details elsewhere in this specification.
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1.4 **Power Supply**

- .1 Make all necessary modifications to the electrical services relating to the elevators such as supplementary disconnect devices and connections to the controllers.
- .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 Engineer.

1.5 **Permits and Inspections**

- .1 Complete Design Submission and related research necessary for regulatory approval of Work.
- .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 Engineer 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. Provide adequate supervision.
 - .2 Comply with all applicable provisions of all federal, provincial and local labour laws.
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1.9 Samples

- .1 Submit to the Architect or Engineer for approval, upon request, samples of any visible elevator finishes including:
 - .1 Cab wall finishes;
 - .2 Cab ceilings;
 - .3 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 two (2) weeks of notification of award of contract.
- .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 11" x 17".
- .5 Indicate to scale on general arrangement drawings, stamped by a Professional Engineer himself/herself with documented experience in designing elevator systems and 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 the elevators, 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 with documented experience in systems engineering of elevators.
- .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 a fifteen (15) year 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. Fee for parts, is agreed to be manufacturing cost plus 40%.

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 B44-10 Safety Code for Elevators and Escalators, CSA Standard B44.2-10 Maintenance Requirements and Intervals for Elevators 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.
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- .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.
- .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 including hoistway cross-sections, overhead dimensions, pit depths, 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 Engineer 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 one (1) year from the date of acceptance.
- .2 Commence warranty at date of certification of Final Completion, as certified by the Engineer.

1.16 **Engineer's Certification of Payment**

- .1 The Engineer will certify progress payments for work only after it has been installed.
- .2 Progress payments may be withheld for, whether or not certified by the Engineer, 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 Elevators by Handicapped

- .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 lanterns with electronic chime to sound once for Up direction, and twice for Down. Provide new LED illumination of lanterns.
 - .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.

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 flight time required to travel between typical floors not to exceed 9.3 seconds. Measure from the time the elevator doors begin to close until they are 3/4 open at the next floor.
 - .4 Set the passenger car and hoistway 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.
 - .1 Set the dwell times to 2 seconds for car, and 3 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.
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- .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 0.08 g.
 - .12 Limit jerk rate (change in rate of acceleration) to 2.44 m/s².
 - .13 Provide car speed to within 3% of contract speed in both directions.
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PART 2 - PRODUCTS

2.1 Description of Elevators

- .1 The elevator system consists of two (2) geared traction elevators
- .2 Class: Passenger
- .3 Capacity: Retain existing 3,500 pounds
- .4 Speed: Retain existing 350 fpm
- .5 Control: Duplex Selective Collective Automatic
- .6 Doors: Retain existing center opening
Elev. 1: 54" wide two speed
Elev. 2: 44" wide one speed
- .7 Travel: Per existing site conditions - serve floors
0, 1 - 5
- .8 Overhead: Per existing site conditions
Approx. 16' 8"
- .9 Pit Depth: Per existing site conditions
Approx. 5' 7"
- Special Features: Independent service operation;
FEO operation, phase 1 and phase 2;
Battery cab movement to prevent trapping passengers at time
of utility power loss.
Monitoring and command feature at remote computer
- Signals: Dupar US 91 buttons
Car position indicators;
Hall position indicator at two main floors;
New car-riding lanterns with new electronic chime and LED
illumination
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 standard product line of one manufacturer 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
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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.
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- .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. Use a minimum of 37 mm thick pads. Do not use built-up pads.
- .2 Prevent lateral displacement of machine.

2.5 Car 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 150 mm (6") for car, 75 mm (3") 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.
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- .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 Existing car and counterweight rails may be retained and refurbished if aligned to below noted standards. For new, provide car guide rails of 15 lbs/ft and counterweight rails of 8 lbs/ft minimum.
 - .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 Engineer 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.
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2.7 Hoist Rope

- .1 Provide new hoist ropes with fibre 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.
- .5 Provide system engineered for expected hoist rope life of 10 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.

2.8 Oil Buffers

- .1 Provide new oil buffers.
- .2 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 Existing counterweight frame and weights may be retained and refurbished including repairs and any adjustments needed to correct deficiencies and provide smooth quiet operation.
 - .2 Provide counterweight of structural or formed metal frame type with metal or concrete filler weights equal to mass of complete car plus 42.5% of rated load. Provide rods through weights and frame.
 - .3 Paint in contrasting colour the maximum run-by sign on guard.
 - .4 Provide blocking under counterweight, where required.
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2.10 **Safeties and Governor**

- .1 Existing safeties, may be retained and if refurbished including testing to standards of Code.
- .2 Provide new governors, governor ropes and governor tension sheaves.

2.11 **Machine**

- .1 Provide new AC Permanent Magnet Gearless machines. Include engineered design to adapt mounting to existing machine beams and to accomplish proper rope drop to car and counterweight.
- .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. Design sheave to be removable for serviceability and not permanently integrated with machine.

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 (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.
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2.13 Ascending Car Overspeed and Unintended Car Movement Protection

- .1 Equip elevators with a safety device to provide UP direction car overspeed protection.
- .2 Equip elevators with protection against unintended movement outside of door zone.
- .3 Locate devices in the elevator machine room. Provide all hardware required to fasten safety device to machine room floor or machine bed plate including raising of machine bedplate if required. Use a fastenings and support design approved by a Professional Engineer authorized to practice in the province.
- .4 Use only a Hollister Whitney Rope Gripper - do not re use existing.
- .5 Design safety device to be capable of setting repeatedly without damaging itself of the elevator machine or ropes.
- .6 Arrange device to be reset from a single button so-indicated in the controller.
- .7 Employ spring-powered activation, pressurized fluid retraction.

2.14 VVVF Motor Drive

- .1 Provide 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.
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- .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 Existing deflector sheaves and beams may be retained and refurbished including new bearings and provided smooth quiet operating is achieved and no tracking of sheave is evident at time of project substantial completion. Otherwise provide deflector sheaves, idler sheaves and overhead sheaves, including bearings and beams, necessary for roping arrangement.
- .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 Cabinet

- .1 Provide new controllers by GAL.
- .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.
 - .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 programmable 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.

2.17 Control and Performance

- .1 Provide microprocessor based selective collective automatic operation to fully integrate and coordinate the movement of the elevators. Provide duplex control logic.
- .2 When lifting rated load, do not permit car speed to vary from rated speed by more than 5%.
- .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 Allow only one car to stop in response to any one landing call.
- .6 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/Opening 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

- .7 Each elevator shall have its own computer and dispatching algorithm. Should one computer lose power or become inoperative in any way, the other computer shall be capable of accepting and answering all hall calls. When both computers are in operation, only one shall assume the role of dispatching the hall calls to both elevators.
- .8 The dispatching algorithm for assigning hall calls shall be real time, based on estimated time of arrival (ETA). In calculating the estimated time of arrival for each elevator, the dispatcher shall consider, but is not limited to, location of each elevator, direction of travel, existing hall call and car call demands, door time, flight time, lobby removal time penalty and coincidence calls.
- .9 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

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

2.18 Power Loss Operation

- .1 Provide battery operated system to level elevators with a floor and drive door open in case of power loss.
- .2 Include deep cycle battery recharged from normal power source.

2.19 Phase I Emergency Recall Operation

- .1 Provide for all cars 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 In-Car Operation

- .1 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 as in point 5.
- .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 landing for all elevators, 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 in door.

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 cars, 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

- .1 Existing steel platform may be retained and refurbished including the correction of all deficiencies such as broken welds.

2.27 Car Frame

- .1 Existing car frame may be retained and refurbished including the correction of all deficiencies such as broken welds.

2.28 Passenger Car

- .1 Provide new cab fans. Provide blowers or fans of the exhaust type. Do not exceed 55 decibels on the A scale of General Radio Sound Level meter type 1551A from a reading approximately 3 feet (0.75 m) above the floor with doors closed and fan on high speed. Provide 2-speed operation, approximately 700/300 cfm (330/165 dm³/S).
 - .2 Provide new nickel-silver car sills. Provide new Amtico single-sheet flooring to Engineer's selection of colour. Provide any new sub-floor as required to accept flooring.
 - .3 Provide new LED lighting system set in a stainless steel pan. Design for light level 200 Lux at car operating panel.
 - .4 Reskin entire cab fronts in brushed stainless steel including returns, headers and jambs. Provide new cab door finished in matching stainless steel. Finish all cab reveals in brushed stainless steel.
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- .5 Provide plastic laminate applied panels on side walls to Engineer's choice of colour from Formica standard range. Provide cab hooks and curtains for front and rear serving cab.
- .6 Provide flat stainless steel handrails and for front and rear serving cab, bumper rails, 50 mm wide, on all non access walls. Set handrails 900 mm from floor and bumper rails at 330 mm from floor.
- .7 Retain existing cab interior dimensions.

2.29 Car Doors

- .1 Provide all new car doors with (2) new lower guides on each car door panel. Hangers, tracks and car doors may be retained. Provide new hangar rollers. Provide new air cords and steel hanger rollers with nylon inserts.

2.30 Fire Rated Elevator Entrances

- .1 Examine existing entrances and repair minor defects. Report major defects in writing.

2.31 Flush Type Hoistway Doors

- .1 Retain and refurbish landing doors to smooth and quiet operation.

2.32 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. Supply all new air cord, door cable shaves and sheave guards.
 - .2 Provide spring-type, sill-mounted closing devices.
 - .3 Provide positive electric interlocks and door closing devices. 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.
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2.33 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 G.A.L. MOVFR. Provide door open speed of at least 2 fps.
- .2 Operate the car door and hoistway doors simultaneously.
- .3 Provide electrical cushioning at each end of travel.
- .4 Provide two (2) gate switches per center parting car door opening, operated by a roller attached to the door panel.
- .5 Door operators for Elev. 1 and 2 can be retained if refurbished to as new operation.

2.34 Car Door Protective Devices

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

2.35 Hall Sills

- .1 Retain and refurbish sills as required to provide smooth and quiet door operation.

2.36 Fascias and Toeguards

- .1 Existing fascia may be retained and refurbished including thorough cleaning and re-fastening of any loose connections .
- .2 Provide new extended toeguards, 1219 mm in length, made of rust resistant material or alternatively painted with two-coats of rust-resistant paint.

2.37 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 Engineer 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.

2.38 Car Direction Signal

- .1 Replace existing car-direction system - lanterns on both sides of car entrance.
 - .1 Provide new lexan covers and new electronic chimes.
 - .2 Modify to sound once for UP arriving car, and twice for DOWN. Provide clear tone at 30 dBA approximately 8 feet from fixture.
 - .3 Provide new green illumination for up and red for down by LED.

2.39 Hall Button Fixtures

- .1 Provide new DUPAR US91 buttons including providing LED illumination. Mount at existing location- due not use surface mount or extended plates.
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- .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 second riser for rear entrances.

2.40 Position Indicators and Voice Annunciation

- .1 Install a new digital display position indicator in each car. Locate at existing faceplates.
- .2 Use characters at least 40 mm high. Provide LED illumination.
- .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 English, and French with shop drawings.

2.41 Car Operating Station

- .1 Provide new car operating stations in place of existing. 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 Use stainless steel, No. 4 satin finish cover.
 - .3 Engrave all characters on plate and fill with enamel.
 - .4 Provide DUPAR US91 or equivalent to Engineer 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.
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- .10 Use international symbols wherever possible.
- .11 Provide new hands-free autodial telephones. Provide an auto-dial hands-free telephone complete with wiring back to machine space. Provide telephone compliant with B44 2.27.1.1. Include readily accessible communication fixture. Provide conductors and pulled as required between the elevators and the communications fixture mounted in the hall.
- .12 Provide new keyed switch lockouts for all rear floors and floor 0. Key per existing.

2.42 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.

2.43 Signal Illumination

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

2.44 Fixture Fastening

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

2.45 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.

2.46 Monitoring Control and Diagnostics

- .1 Refer to related section 14 90 00. Equip control system with system for monitoring, control and diagnostics from the building engineer's office. Provide all conductors including run external to hoistway.
 - .2 Provide connections and modem for remote dial-up CRT visual display of interactive elevator functions.
 - .3 Equip controller with necessary interface software logic program to monitor elevator functions and record events to storage.
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- .4 include allowance for \$3000 for computer equipment and/or Ipad and I Phone loaded with required monitoring software.
- .5 Overall System Requirements - an interactive system to monitor and manage the elevator, escalator and moving walkway equipment shall be provided . The system shall be capable of mixing all manufacturers serial and hardware linked equipment on a single screen using individual status point blocks and fault event lists specifically tailored for each type of equipment. Status point and fault lists pertaining to any monitored equipment shall be configurable on-site by the installing technician. The system shall be modular and the addition of future banks of equipment shall a simple process which can be accomplished by a field technician on site.

2.47 **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 Include car top guard rails to standard of CSA B44, including intermediate rail and 120 mm high kick plate. Provide collapsible rails with appropriate switches and circuitry if required.

PART 3 - EXECUTION

3.1 Procedure

- .1 Obtain Engineer's approval before removing an elevator from group operation.
- .2 Modernize the elevators sequentially and not concurrently. Accommodate Project Schedule.
- .3 In the instance that one elevator stops operating normally during the modernization of other elevator, utilize the on-site service crew to immediately assist any trapped persons and restore one of the elevators to operation.
- .4 Provide a maximum response time of 40 minutes, 24 hours a day and seven days a week, to occurrences in which the only operating elevator malfunctions. Be responsible for all overtime labour costs.
- .5 Allow for a "run-in" period of three (3) days after the first modernized car is returned to service before removing the second car from service.
- .6 Schedule Work so as to not remove two elevators from service at one time. If necessary, obtain Engineer's written approval for the time this will be undertaken. Be responsible for all overtime labour costs.

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 Engineer.

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 Place machines directly above hoistway in existing machine rooms.
 - .2 Provide all necessary fastenings, bearing plates and transfer arrangement to accomplish appropriate tie-down of machines to the machine room layout.
 - .3 Arrange equipment in machine room so functioning equipment and other
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equipment can be removed for repairs or replacement without dismantling or removing other equipment components. Arrange for clear passage to access door.

- .4 Erect guide rails using metal shims with lockwashers under nuts and threaded bolts. Compensate for expansion and contraction of guide rails.
- .5 Use splice plates and guide rails with contact surfaces accurately machined to form smooth joints.
- .6 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.
- .7 Install hoistway door sills, frames and headers in hoistway walls. Grout sills in place. Set entrances in vertical alignment with car openings and aligned with plumb hoistway lines.
- .8 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.
- .9 Cut existing surfaces as required to accommodate new work. patch and make good surface cuts, damaged or disturbed, to Engineer's reasonable approval. Match existing material, colour, finish and texture.

3.5 **Storage**

- .1 Co-ordinate delivery and storage of materials with Engineer'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 or obstruction is unavoidable, make arrangements with the Engineer to complete that portion of the Work at a mutually agreed time.
- .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 Engineer.

- .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 Provide a solid partition in the hoistway between the elevators during the course of the Work. Partition to be securely fastened in place to prevent movement as elevators travel in the hoistway. Partition to run from top to bottom of hoistway and front to rear of hoistway.
 - .2 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.
 - .3 Upon removal of hoardings and partition make good all damage to surfaces of walls, floors and ceilings.
 - .4 Use hoarded entranceways, and not the in-service elevator, for movement of equipment or garbage.
 - .5 Protect existing floors by covering with 13 mm plywood and tarpaulins as a minimum, when removing or delivering materials.
 - .6 Do not remove partition or hoarding until Work is complete and approval is given by the Engineer.
 - .7 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 Safety Code for Elevators. Supply instruments and carry out these and other tests specified herein.
- .2 Provide 2 days written notice to Engineer of date and time of tests.

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

- .1 Paint any bare steel:
 - .1 Car tops and crossheads.
 - .2 Rails and strut angles and fascia plates.
 - .3 Machine room floors and walls.
 - .2 Use paint materials listed on the CGSB qualified products list only.
 - .3 Paint materials for each coating formulae to be products of a single manufacturer.
 - .4 Prepare masonry, stucco and concrete surfaces to CGSB 85-GP-31M.
 - .5 Prepare concrete floors to CGSB 85-GP-32M.
 - .6 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.
 - .7 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.
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3.10 **Hoistway Projections and Fascia**

- .1 Provide bevelling for projections or recesses.

3.11 **Burning Torches**

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

3.12 **Elevator Engineer**

- .1 The Engineer 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 Engineer reasonably requires. Allow up to 8 hours of on site assistance. Expect to have work briefly interrupted during progress inspections by the Engineer.
- .3 The Engineer is retained for the convenience of the Owner and/or the Architect and the work of the Engineer shall not relieve the Contractor of any of his duties or responsibilities. The Engineer may be authorized by the Owner to have general supervision and direction of the work. He may be authorized to stop the work whenever the stoppage is necessary to ensure the proper execution of the contract.

3.13 **Notification to Engineer**

Notify the Engineer 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 Engineer, during silent hours of the building, demonstrate:
-

- .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. Provide additional two (2) half-day sessions dedicated to the monitoring system, 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.
- .2 Attend at job site meetings pertaining to the Work.
- .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.
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Table 1 - Commissioning Data to Be Submitted by Contractor - per car

PARAMETER	Elev. 1	Elev. 2
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, mechanical (fpm)		
Governor overspeed switch, electrical (fpm)		
Safety trip speed (fpm)		
Door stall force (pounds)		
Door timeout (sec)		

- end of section -

1.1 SCOPE OF WORK

The work described herein includes for all labour and material, including all overtime required to meet the Project Schedule, to provide a non-proprietary elevator monitoring system to monitor and control the new/modernized elevators of this project. Work shall include but not be limited to.

- .1 Controller interface with all necessary input/output devices.
- .2 Provide a master monitoring display within the elevator controller or alternatively at a PC mounted adjacent to the elevator controller.
- .3 Provide addressable device so that the master station can be monitored remotely by Internet Protocol. This function will allow monitoring and report functions but not control functions. Supply Windows 8 based Ultra book computer fully loaded with required software to connect to elevator monitoring screen over any internet connection, either by web site or through software resident on the remote computer.
- .4 Provide paging function using e-mails sent by system to programmable e-mail addresses for various events.
- .5 All interconnecting wiring between elevator controllers in accordance with monitoring system manufacturer's requirements.
- .6 All network engineering including system final testing and client training by monitoring system's technical personnel.
- .7 Initial job survey of two days and training of PWGSC staff of an additional three days by monitoring system's technical personnel.

This is a brief description only; complete details are outlined in the specifications.

1.2 RELATED WORK TO BE PERFORMED BY ELEVATOR CONTRACTOR

- .1 Provide all inter-connecting wiring.
- .2 Provide data jacks in the machine rooms as required.

1.3 CONTROLLER PROVISIONS

- .1 Provide a monitoring system interface per controller or elevator group to provide the required input/output devices.
- .2 The elevator controller interface shall provide a terminal strip connected to dry contacts representing the following:
 - .1 Operation normal
 - .2 Fire Service Main
 - .3 Fire Service Alternate
 - .4 Fire Service Phase 2
 - .5 Main Power Lost
 - .6 Running on Emergency Power
 - .7 Fault - shut down
 - .8 Inspection
 - .9 Independent service

- .10 Governor
 - .11 Up direction indication
 - .12 Down direction indication
 - .13 One contact for each position in the hoist way (PI)
 - .14 Front Door Open
 - .15 Front Door Closed
 - .16 Rear Door Open (where available)
 - .17 Rear Door Closed (where available)
 - .18 One contact for each car call (On when registered)
 - .19 One contact for each hall call (On when registered) (note, most floors will have both UP and Down call capability)
- .3 The following inputs shall be available on a terminal strip provided by the contractor, which will allow the monitoring system to control the operation remotely. They shall be operated by closing a dry contact. The terminal strip may provide either a single common point for all inputs or separate common points as required for various inputs.
- a. One contact to register each car call remotely
 - b. One contact to register each available hall call remotely
 - c. One contact to secure each car call
 - d. One contact to secure each hall call button.
- .4 Provide a labelled interface system junction box on the outside of the controller with all wiring be identified as such. Terminate cables in the junction box on terminal strip, clearly identify all contacts for monitoring system use.
- .5 Install wiring runs neatly. Terminate wiring at studs or terminal strips, using connections that assure substantial electrical and mechanical integrity. Identify all major components exactly as they are indicated on wiring diagrams. Use engraved lamicaid or metal tag mounted immediately adjacent to the component.
- .6 The Junction box shall be an enamelled, ventilated, sheet steel cabinet, with swing-type lockable doors at front.
- .7 The Contractor shall be responsible for coordinating the installation of the monitoring system as well as coordinating the interfacing and connection requirements to ensure a workable system.

1.4 MONITORING SYSTEM GENERAL REQUIREMENTS

- .1 The monitoring system shall be an interactive Microsoft Windows based software system that runs on an IBM compatible Personal Computer (PC). Software includes a "un-install" utility and is certified 100% Windows compatible. Software installation includes:
- .2 Provide all documentation, manuals, system set-up & start-up. Include training as specified.
- .3 While connected to the elevator system, the Elevator Management Control System downloads and collects available data, which is organized in a database. This software provides easy-to-use pull-down menus, using the Microsoft Windows based operating system, allowing the user to monitor and review the elevator performance database in different formats.
- .4 Provide all software licenses to a minimum of 10 years.

1.5 MONITORING AND DIAGNOSTIC CONTROL SYSTEM

- .1 Modify existing elevator control systems system for monitoring, diagnostics and control. Equip controllers with necessary interface software logic program to monitor elevator functions and record events to storage.
- .2 Use menu driven system with password protection. Connect all wiring to terminal blocks mounted on the panel
- .3 The system will be capable of displaying reports by keyboard entries including all statistics of the preceding one-hundred eighty (180) days, as a minimum. All car and hall register times and all fault reports are to be displayed. Provide a means, and any software required, to copy this data to an output file.
- .4 Supply and run all necessary interconnecting wiring between elevator controllers. Tape and legibly identify all wires and terminal boxes.

1.6 EVENT DISPLAY AND RECORDING

- .1 Provide computers, loaded with licensed software, with the following capabilities.
- .2 Real-time display screens.
- .3 Online Help to provide a complete content-sensitive help program shall be provided to give the users hints and explanations of the current task.
- .4 Summary to give a brief description of the system, including the job number, job name, number of cars, number of landings, number of openings per landing for each car, car labels, and landing labels.
- .5 Individual Flags - This screen shall display a list of the selected elevator's internally generated computer flags for diagnostics.
- .6 Graphic Hoistway Display - The Central Monitoring System shall display the elevator system hoistway. That is, users shall be able to view a graphical representation of the elevator hoistway. Including : Simulated Hoistway and Car Configuration
 - a. Individual Elevator Position
 - b. Individual Elevator Car Calls
 - c. Individual Elevator Direction
 - d. Individual Elevator Door Position
 - e. Individual Elevator Status of Operation (Emergency
 - f. Recall, Emergency Power, Independent Service etc.)
 - g. Individual Elevator Communication Status
 - h. Registered Up and Down Hall Calls
 - i. Controller Real-Time Clock Date and Time
- .7 Emergency Notification - in case of unit shutdown, the system shall have the ability to page designated personnel to notify them of an emergency event.
- .8 Reporting ability including malfunction events, Average Wait Time for elevators and total availability time for all units.
- .9 The system shall provide a multiple level of password protection for the usage of the system.
- .10 Monitor system parameters including calls per floor, calls per elevator, average waiting time and % calls answered in 30, 60, 90 and 120 seconds. Allow for graphical analysis of any parameter for any chosen time interval from the previous 180 day period.

1.7 ACCESS CONTROL

- .1 The system shall provide multiple levels of password protection for the usage of the system. All password selections are set up and maintained by the Owner.
- .2 The system provides access control, featuring comprehensive programming of the access level for the entire elevator call system. Each hall call, as well as each car call is individually programmable for access.
- .3 When using access control, every floor has its own unique access schedule which is completely independent of the access schedule for any other floor in the building. The program also allows the programming of many other functions such as groups of calls by floor, special events, holidays, levels of access and so forth.
- .4 Levels of Access Control
 - a. Locked - Passengers in any elevator car serving a locked floor are not able to register car calls to that locked floor. Likewise, anyone in the elevator lobby on a locked floor is not able to register a hall call (up or down) to bring an elevator car to that locked floor. Any hall or car calls registered for a floor when it becomes locked is immediately canceled.
 - b. Unsecured - Passengers are able to access any unsecured floor from any car or hall call without restriction.
 - c. Secured - Only passengers with a proper passenger access code or floor access code are able to register a car call to a secured floor.
- .5 Hall Call Control
 - a. Hall calls on each floor can be set to either locked or unsecured. If a hall call for a particular floor, direction (up or down), side (front or rear) and for a particular hallway pushbutton riser (main or auxiliary) is set to locked, then no one is able to register that hall call. If a hall call is set to unsecured, that hall call is registered without restriction.
- .6 Car Call Control
 - a. Car calls can be set to one of three states: locked, secured, or unsecured. If a car call for a particular floor and a particular side (front or rear) is set to lock, then no one is able to register that car call.
 - b. If a car call is set to secure, then only passengers with a proper passenger access code or floor access code are able to register that car call. The system is capable of being programmed for either passenger access or floor access.
 - c. If a car call is set to unsecured, that car call is registered without restriction.
- .7 Access Control Resolution
 - a. At highest resolution, the user is able to control access on a per button basis. This means that every single call button in the system is programmable and has its own unique access schedule. The system also includes the flexibility to allow the user the option of combining or grouping calls together, which allows access control at a lower resolution and makes the job of programming and maintenance more manageable. Additionally, the user can combine every single car call and hall call in the system into a single combined call. When that combined call is locked, all calls in the whole system are locked. When that call is unsecured, all calls are accepted without restriction.
- .8 Access Control Programming
 - a. The access control programming feature allows the user to program the level of access to be in effect on specific days of the week, holidays, or other user defined days. As an example, a user may wish to lock certain floors on weekends and holidays, while other floors may be unsecured on weekends and locked only on certain holidays. The event program shall provide full flexibility to meet all of these needs. A user is able to program access for a one-time event or for events which occur on a weekly, bi-weekly, monthly, yearly, or other periodic basis. Furthermore, the user is able to program events days,

months, even years in advance of the actual date. When the time of the event occurs, the event program automatically secures the building in the manner desired.

.9 Car Station Card Access

- a. The system provides car call access by using the card swipe station that is installed in the car operating panel. The access card allows authorized passengers to swipe their card and register their floor access. When the access system is activated, card access must be used to register calls to any floor that has been designated in the system as a secured floor.

.10 Passenger Access Control

- a. The passenger access security feature provides car call security for each elevator in the system to any secured floor on an individual passenger basis by using unique individual passenger access swipe card. The passenger uses the card swipe available in each car to register the appropriate passenger access code required to go to a floor.
- b. Each passenger has their own unique passenger access code, and may be authorized to have access to a single floor or many different floors by assigning an accessible floor number(s) in the individual's data file. Time restrictions may also be assigned to an individual passenger to restrict access during certain time periods.
- c. The passenger code includes a passenger ID (name), unique personal access code (number), authorized floor destinations and authorized time window(s).

.11 Floor Access Control

- a. The floor access security feature provides car call security for each elevator in the system to any secured floor on a per floor basis by using unique floor access codes.
- b. The floor access code is a per floor access code giving every floor a different access code, or if desired, the system allows a single access code to be assigned to more than one floor.
- c. Any passenger authorized to have a floor access code is permitted to register a car call for that floor. The passenger uses the car call buttons in each car to register the appropriate floor access code. All passengers going to that floor(s) use the floor access code assigned to a floor.

.12 User Interface:

- a. The user may have limited system access through a machine room CRT terminal or any remote extension of the machine room CRT terminal. The user may be able to fully access the system through an IBM compatible computer(s) running the monitoring software program.
- b. The building manager or other authorized personnel with the appropriate system security password is able to program the system, view building access configurations (past, current and future), print reports and so forth.

.13 Report Generation:

- a. A list of passengers who registered secured car calls is available on the CRT and is sorted by time and date. The system stores all events associated with the use of any individual passenger access code. Reports are generated by computers running the monitoring software.
- b. Users with monitoring software are able to select and sort the list of car calls to secured floors by date, time, source floor, destination floor, car number, and passenger ID.
- c. The user interface lets the user see and print a report listing the time and date at which individual passengers accessed secured floors.

.14 Software Switch:

- a. The software switch is a logical switch accessed through a computer running monitoring software or from a machine room CRT. When the software switch is on, the building elevator access system is activated and when off, the system will be deactivated.

.15 Special Operations:

- a. The access system is overridden in case of fire service operation. In the case of independent service and other special operations, as an option the system may or may not be overridden.

1.8 **ARRANGEMENT OF EQUIPMENT**

- .1 Arrange equipment in machine room for clear passage to machine room door.
- .2 Do not locate monitoring PC's near hoist motors, transformers or any sources of high EMF.

1.9 **REMOTE ACCESS**

- .1 All required functions of the controller/machine room mounted system will be available remotely by internet protocol with appropriate password and login.
- .2 Include Ultra book (tablet/laptop combination) operating Windows 8 Pro configured for the remote monitoring with 10.6" screen, 4 GB RAM, 126 GB hard drive and Intel i5 processor.

1.10 **FACTORY REPRESENTATION**

- .1 Provide the services of a technical factory representative to perform the initial project survey including a minimum of eight (8) hours on site.
 - .2 Provide the services of a technical factory representative trained in presentation skills to perform training for PWGSC. Include a minimum of sixteen (16) hours on site.
 - .3 Provide when requested by the Departmental Representative a hard copy of a condensed version of the elevator monitoring operational features.
 - .4 The Elevator Contractor is to provide all information to the Departmental Representative that is required for the safe and efficient maintenance of the elevator equipment, including any solid state equipment or devices supplied under these specifications. The supplier is not to refuse any information, or the supply of parts, at fair market value, that is required by the Owner's Maintenance Contractor.
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