300 Conacher Drive

Kingston, Ontario

specifications
elevator

Elevator Modernization

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KJA CONSULTANTS INC
2020-03

Section 14200 General

1 General

1.1 Scope

.1 Provide labour, materials, products and services necessary for the following work at 300 Conacher Drive, Kingston, Ontario:

.1 Modernization of one overhead geared traction passenger elevator in accordance with Section 14210.

.2 Modernization of one hydraulic passenger elevator in accordance with Section 14220.

1.2 Maintenance: interim and first year

.1 Provide full maintenance of the equipment in accordance with the Kingston & Frontenac Housing Corporation Maintenance Agreement.

.2 The maintenance will start from the date of award of the contract and terminate one year after Substantial Completion.

.3 Include the cost of this maintenance in the project costs.

1.3 Definitions of terms

.1 The term "Owner", as used herein, refers to Kingston & Frontenac Housing Corporation.

.2 The term "Inspecting Authorities", as used herein, refers to authorized agents of governments and of insurance groups that are charged with the responsibility of carrying out periodic inspections and tests on vertical transportation equipment.

.3 The term "Consultant", as used herein, means KJA Consultants Inc. or such other entity selected by the Owner to fulfill the role of Consultant.

.4 The term "provide", as used herein, means to supply and install new equipment.

.5 The term "arrange", as used herein, means to provide the required features.

.6 The term "unit", as used herein, means any Elevator, Escalator, Dumbwaiter, Moving Walk, Material Lift or similar device mentioned in this Specification.

.7 The term "Code", as used herein, refers to the latest adopted edition of the CAN/CSA-B44 Safety Code for Elevators and Escalators with updates and including Nonmandatory Appendices (which are deemed mandatory herein).

.8 The terms in the Specifications that are not otherwise defined shall have the definitions as given in the Code.

1.4 Operation and maintenance manual

.1 Supply to the Consultant and Owner prior to the Substantial Performance inspection, operation and maintenance manuals.

.2 The project shall not be deemed to have reached Substantial Performance until the complete operation and maintenance manuals have been approved by the Consultant or Owner.

.3 Upon acceptance by the Consultant or Owner, provide three copies of the operation and maintenance manuals per group in one of the following formats, as selected by the Owner.

.1 Print and bind hard copies of which two will be given to the Owner and one will be placed in the respective machine room; OR

.2 Provide an electronic copy in PDF format on an unprotected digital storage device (such as a USB).

.4 The operation and maintenance manual shall incorporate, at a minimum:

.1 A cover page including project title, address;

.2 An index;

.3 Contact details for the respective parties;

.4 A warranty letter signed by a representative of the contractor having authority to bind the company;

.5 Controller and drive manuals, including:

.1 A description of the controller user interface;

.2 The installation and user's manuals;

.3 A list of fault and error codes, including an explanation of meanings and corrective actions;

.4 Troubleshooting and diagnostic procedures, methods of use and the adjustment of programmable parameters together with their settings at the time of final adjustment.

.6 As-built wiring diagrams;

.7 The operation of the equipment including special features, dispatching sequences, and such items as intercom systems and security systems;

.8 Step-by-step instructions for the operation for special features such as Firefighters' Emergency Operation, Independent service and Emergency Power service;

.9 As-built diagrams and drawings of operating panels (e.g. car panels, central control consoles) with descriptions of the function of switches and indicators;

.10 A copy of the final submission to the Authority Having Jurisdiction;

.11 A copy of the final inspection report from the Authority Having Jurisdiction;

.12 Operation and maintenance manuals for other major components where applicable, including:

.1 Door operator;

.2 Emergency brake;

.3 Communication system;

.4 Safeties & governor;

.5 Hoist machine & motor;

.6 Cylinders;

.7 Hydraulic pump machine and internal components;

.8 Hall kiosks, including step-by-step instructions for re-programming;

.9 In-car monitors, position indicators and display screens, including step-by-step instructions for re-programming;

.10 Hall kiosk special screen features and codes (i.e. to call a specific car to a floor, to call a specific car to a floor for cleaning or other maintenance functions, etc.).

.13 Supplier and part name for other parts (ex: travelling cable, restrictors, retainers, interlocks, car top inspection station, guide means, etc.), excluding minor or generic items such as screws, bolts, hinges, etc;

.14 Full instructions for any special maintenance procedure, repair protocol,

adjustment or test not addressed by Code (including the A17.2 and the Elevator Industry Field Employee's Safety Handbook);

.15 Manufacturer's recommended maintenance intervals for each major component.

.16 A copy of the Maintenance Control Program.

1.5 Coordination with other trades

.1 Where the work joins another trade, provide drawings showing the actual dimensions and the method of joining the work to the work of the other trade and information such as anchors, templates and details for cast-ins.

.2 Provide access and assistance as required, at no extra charge, in relation to work by other trades.

1.6 Vandal resistance

.1 Provide, unless otherwise indicated in the Specifications or Drawings, all signal fixtures, such as push buttons, position indicators, et cetera, of the vandal resistant type.

.2 Provide push buttons with metal targets matching the push buttons installed on the car station of Hydraulic Elevator #2.

.3 Provide push buttons having an enclosure rating of not less than IP54 (per EN 60529) or an approved equivalent upon approval by the Owner.

.4 Provide push buttons with a positive stop on the back of the button to prevent excessive force from transferring to the contact.

.5 Provide push buttons compliant with EN 81-71 Class 2.

.6 Provide a faceplate of 20 gauge stainless steel.

.7 Provide, unless otherwise indicated in the Specifications or Drawings, signal fixtures in an illumination colour selected by the Owner.

.8 Submit illustrations of those types available and provide at least one physical button sample of the type selected by the Owner for final approval.

.9 Install elevator door equipment (e.g. clutch and pick up rollers) to prevent easy access by the public.

.10 Do not use surface mount fixtures of any sort.

.11 All finishes, fixtures, fasteners and components accessible to the general public shall be of the vandal resistant type.

1.7 Finishes: stainless steel

.1 Provide, unless otherwise indicated in the Specifications or Drawings, stainless steel number four finish for visible natural metal finishes.

.2 Arrange, unless otherwise indicated in the Specifications or Drawings, that the brush or grain direction of finishes of visible natural metals be in the vertical direction (for horizontal sections the brush or grain shall be in the direction of the longer surface dimension).

.3 Remove all protective film prior to turnover of the unit to the Owner.

1.8 Progress payments

.1 Progress payments will be based on the following schedule (per building):

Description of Item	%
Contract award	10
Engineering drawing review	15
Material delivery to site	15
Progress installation (25% per elevator)	50
Provision of documentation & deficiencies resolution	10

.2 A 10% holdback will apply to payments, this holdback to be released within a period as set out in the applicable legislation.

1.9 Designated substances

.1 The Contractor is responsible to adhere to the designated substances and/or hazardous substances management programs in place at the site including, but not limited to, the presence of asbestos.

.2 In the event that designated substances or hazardous substances are discovered by the Contractor's personnel and not previously identified by the Owner, report such substances to the Owner.

.3 The Contractor shall not be responsible for abatement of designated substances or hazardous substances.

.4 The Contractor acknowledges that small amounts of designated substances or hazardous substances may be present in elevator components (such as asbestos in brake pads and mechanical gaskets, lead in paints and soldering, silica in

concrete and masonry, mercury in fluorescent light tubes, PCBs in transformers, etc.), and the Contractor shall ensure proper maintenance procedures are followed to safely complete maintenance, repair and replacement of such components.

.5 The Contractor shall provide personal protective equipment as necessary to comply with the management program for work in such environments including, but not limited to, disposable protective clothing (gloves, boot covers, coveralls) and fit-tested respirators.

1.10 Acceleration of the Work

.1 If the Work falls behind the schedule, take action as necessary to meet the schedule, including, but not limited to, extra personnel and overtime work.

.2 Pay any costs associated with this action unless the delay is caused by acts of government, riot, civil commotion, war, malicious mischief, act of God or any cause beyond the control of the contractor.

1.11 Acknowledgments

.1 The proposer acknowledges that the proposer has found no discrepancies nor any ambiguities in the specifications.

1.12 Assignments

.1 Do not assign nor sublet the contract without the written consent of the Owner.

.2 Do not assign any payment due or to become due as a result of this contract without the written consent of the Owner.

1.13 Certificates of inspection

.1 Obtain and pay for certificates of approval and all other necessary permits and inspections.

.2 Prior to Substantial Performance, arrange for and pay for a safety inspection of the equipment by a government authority or, if that is not available, by a recognized independent private professional inspection organization.

.3 As a minimum, ensure that this inspection includes:

.1 Full load overspeed car safety tests if car safeties are provided;

.2 Empty car overspeed counterweight safety tests if counterweight safeties are provided;

.3 Pressure tests for hydraulic elevators;

.4 Full load full speed car buffer tests if oil buffers are provided;

.5 Empty car full speed counterweight buffer tests if counterweight oil buffers are provided;

.6 Full load full speed down direction brake tests if a traction machine is provided;

.7 Electrical safety circuit check;

.8 Door pressure tests;

.9 Tests of any other safety devices.

.4 Submit, prior to Substantial Performance inspection, the approved safety inspection report.

.5 Should more than one inspection for a licence or approval be required due to deficient work by others give sufficient advance notice of such deficient work to allow the Work to be completed prior to the time of the subsequent inspection.

.6 If sufficient advance notice of such deficient work has not been given, assume the cost of the additional inspections.

1.14 Changes in Work

.1 The Owner, without invalidating the contract, may order extra work or make changes by altering, adding to, or deducting from the Work, the contract sum being adjusted as agreed.

.2 Execute all such work under the conditions of the original contract except that any claim for extension of time caused thereby shall be adjusted at the time of ordering such change.

.3 The Consultant shall have authority to make minor changes in the Work, not involving extra cost and not inconsistent with the purpose of the contract.

.4 Otherwise do no extra work nor make any change unless in pursuance of written order from the Owner.

1.15 Claims for extra cost

.1 Provide any claims for extra cost due to instructions or otherwise, to the Owner in writing within a reasonable time after the instructions and in any event before proceeding with the work.

.2 No such claim shall be valid unless so made and authorized in writing by the Owner.

1.16 Codes and ordinances

.1 Supply equipment and do work in accordance with building codes, by-laws, regulations and requirements of the local, provincial and federal authorities in effect at the time of the execution of the work.

.2 Supply equipment and do work in accordance with the Code, and any other code which may govern the requirements of the installation.

.3 Provide labour and material, whether or not specifically mentioned in this specification, that may be necessary to provide an installation conforming to the applicable codes and regulations.

.4 Comply with the requirements of the Occupational Health and Safety Act and Workplace Hazardous Materials Information System (WHMIS) regarding employee safety, use, handling, storage and disposal of hazardous materials.

.5 Prior to submission of the tender and throughout the duration of work, give prompt notification in writing of any regulations or requirements known to be in process which might affect the acceptability of the work.

.6 If changes in codes or regulations result in extra costs, those taking effect subsequent to the date of bid submission shall be treated as an extra to the contract.

1.17 Completion schedule

.1 Submit with the bid, a detailed schedule including specific dates for equipment delivery times, start of site work, completion of each unit and resolution of all noted deficiencies.

.2 During the modernization period give the following information to the Consultant:

.1 Revisions, if necessary, to the completion schedule;

.2 A progress report every month showing the progress being made and the percentage of the job completed;

.3 Two weeks advance notice for inspection by the Consultant.

.3 Schedule a job site meeting with the Owner every two weeks during the modernization period.

.4 Schedule the work in such a way that no more than one elevator is removed from regular service at any time.

1.18 Contract Documents

.1 The Contract Documents shall consist of general conditions, instructions to bidders, the Drawings, Specifications (including alternates and addenda) and completion schedules.

.2 Execute the work in accordance with the Owner's contract documents, any supplemental conditions and these specifications.

.3 Where there is a conflict between the documents the Owner's contract documents will take precedence over the other documents and any supplemental conditions will take precedence over these specifications.

1.19 Cutting and patching

.1 Cut and patch machine room floors and walls and around hall fixtures as required.

1.20 Defective work and non-performance

.1 The Owner reserves the right to correct any defective work and to charge the cost to the contractor.

.2 Should the contractor fail to execute any of the Work set out in the contract the Owner reserves the right to do the Work and to charge the cost to the contractor.

.3 The Owner reserves the right to withhold payment in the event of non-performance or to pay only for that portion of the Work that has been executed.

.4 The Owner will give reasonable notice in writing prior to taking such action unless the defective work or non-performance prejudice the safety of people or the installation.

1.21 Drawing and sample submittals

.1 Drawing and sample submittals are required for exposed finishes and fixtures.

.2 Submit for review samples of metals, glass, paint colours, plastic laminates and finishes, of 200 mm (8") by 300 mm (12") approximate size, properly identified as to project, location and material.

.3 Submit for review, as a minimum, the following:

.1 General arrangements;

.2 Details of areas where the work joins the work of other trades;

.3 Machine room layouts showing the location of the equipment;

.4 Hoistway layouts showing the location of the equipment, car platform dimensions, cab interior dimensions and net inside cab area;

.5 Hoistway sections showing overhead, pit equipment, car and frame and entrances;

.6 Cab details including the cab shell, platform, interior panels, ceiling, entrance, lighting and finishes;

.7 Details of control panels such as central control consoles or fire control panels showing the layout and detailing the design of switches and indicator lights;

.8 Details of intercom system station types detailing the controls;

.9 Details of any display devices complete with examples of proposed displays, symbols and layout;

.10 Fixture brochures.

.4 Show on the general arrangement or separately, details of frames, doors, sills and supports, lanterns and gongs, including views showing the relationship of hall stations, lanterns and entrances.

.5 Provide as built information at job completion prior to Substantial Performance.

.6 Reviews do not include the checking of measurements and do not imply approval of variations from the specifications.

1.22 Electrical diagrams

.1 Supply wiring diagrams and data as required for the execution of the Work including schematics for speed control, dispatching system, interfaces, printed circuit boards.

.2 Incorporate, as part of the schematic diagrams, a reference index ('road map') giving the location of electrical components and wiring interconnections for relay coils, relay contacts, field equipment, integrated circuits and other such devices, so that the position on the schematics of any of these items can be readily determined.

.3 Supply, prior to the Substantial Performance inspection, three prints and one reproducible of the wiring and schematic diagrams revised to show changes that have been made.

.4 Supply, prior to the Substantial Performance inspection, a set of plastic coated schematics mounted on a rack in the machine room so arranged that each sheet

is readily accessible for trouble-shooting purposes, revised to show changes that have been made.

.5 Supply, prior to the Substantial Performance inspection, a PDF copy of the wiring and schematic diagrams revised to show changes that have been made.

.6 If changes are subsequently made to the wiring or control, supply an additional two sets of marked-up prints, a marked-up set of plastic coated schematics mounted on a rack in the machine room and an additional PDF copy of marked-up prints of the schematics and field wiring diagrams showing the changes.

1.23 Environmental considerations

.1 Where practicable, recycle material replaced in the course of the work.

.2 Provide a list of materials to be removed from site and their proposed recycling or disposal location for approval prior to commencing work.

.3 Where practicable, provide new materials manufactured by methods that do not adversely affect the environment by, for example, generating residual deposits of heavy elements and greenhouse gases.

.4 Use materials on site, such as low VOC (Volatile Organic Compound) adhesives and paint, that will not negatively affect the in-building environment.

.5 Use only adhesives that comply with the requirements of SCAQMD Rule #1168.

1.24 Equipment insurance

.1 The Owner's insurance policy covers equipment actually in place in the building and accepted by the Owner.

.2 All other material and equipment is not included in the Owner's policy and such material and equipment is stored at the Contractor's own risk.

1.25 Equipment moving

.1 Provide floor protection and bracing so that equipment moving causes no damage to the building.

1.26 Existing conditions

.1 Provide additional material and labour necessary to modify the equipment to suit the existing site conditions, in order to complete the Work and to obtain licences and approvals.

1.27 Existing drawings

.1 The Owner will provide, if available, existing equipment layout drawings.

1.28 Existing equipment: refurbishing

.1 Refurbish the retained existing equipment; cleaning, reworking or replacing worn parts, refinishing and adjusting so that the appearance and performance of the equipment are as new and so that the completed modernization is the equivalent of a new installation.

1.29 Failure to perform

.1 If the contractor shall neglect to prosecute the work properly or fail to perform any provision of the contract, the Owner after ten days written notice to the contractor may, without prejudice to any other remedy the Owner may have, make good such deficiencies and may deduct the cost therefrom from payment due to the contractor.

1.30 Generic maintenance

.1 Arrange that the equipment can be maintained and adjusted by any competent elevator company without the use of proprietary tools, information or equipment or, if such tools, information or equipment are required, provide them (these shall become the property of the Owner).

.2 Do not incorporate any running time, cycle counters or trip counters that would cause the equipment to shut down or alter its operation in any way.

1.31 Hoistway protection

.1 Provide, maintain and, after the Work is complete, remove any partitions required in the hoistway.

.2 Provide, maintain and, after the Work is complete, remove protective hoarding required at openings into the hoistway.

.3 Submit the design and finish of the protective hoarding for review.

1.32 Inability to complete contract

.1 Should there be a reasonable doubt that the work can be completed within the scheduled time because of labour disputes or any other cause, the Owner reserves the right, at the Owner's option, to cancel the contract.

.2 In the event this option is exercised, the payments for the work shall be made on a pro rata basis for materials and labour supplied to the time of cancellation and such material and work performed shall become the property of the Owner.

.3 Prior to exercising this option, the Owner shall give two weeks notice in writing of intention to cancel.

1.33 Information with bid

.1 Provide the following information, where relevant, with the bid:

.1 The model and manufacturer of such items as solid state drives, fixtures, control systems, door operators and other purchased material (with the exception of miscellaneous minor items);

.2 The current rating of the solid state drives;

.3 The KVA rating of the transformers feeding the solid state drives;

.4 Certification from an independent testing laboratory detailing the line pollution generated by the solid state drives;

.5 Certification from an independent testing laboratory detailing the extent to which the control systems are protected against external electromagnetic radiation;

.6 Brochures, descriptions and manuals (where applicable) for the major items;

.7 Renderings or samples of the fixtures and exposed materials;

.8 Detailed completion schedule for the work;

.9 A copy of your health and safety policy as issued to your employees;

.10 Mechanic and team regular and overtime hourly rates.

1.34 Inspection and acceptance

.1 When completed, carry out an inspection, witnessed by the Consultant, to see that the work is in compliance with the Specifications.

.2 Furnish a team of competent personnel, for one working day per unit, to assist in making these inspections.

.3 If the results of these inspections do not meet the requirements of the Specifications, make the appropriate corrections, and provide, as set out above, for another inspection.

.4 Give sufficient advance notice in writing so that the Consultant can arrange for their representative to witness these inspections.

1.35 Key switches

.1 Where possible supply switches and keys compatible with the vertical transportation equipment portfolio of the Owner, unless otherwise noted herein.

.2 Engrave or mechanically fasten collar rings to clearly mark key-switch functions, positions and key required.

.3 Prior to placing any elevators into service for the public, provide to the Owner six copies of each key-switch key type defined in the Code as being Security Group 2, 3 and 4.

.4 Engrave they key number on each key provided to the Owner and group the keys by Security Group and key type.

1.36 Labour laws

.1 Comply with applicable provisions of federal, provincial and local labour laws and with applicable union regulations.

1.37 Liability insurance

.1 Provide, during the period this contract is in force, premises liability, including public liability insurance and property damage insurance in the amount of $5,000,000 inclusive, to be covered against any claims for damage to property or for personal injury, including death, which may arise from operation under this contract, whether such operation is by yourself or by any sub-contractor or anyone directly or indirectly employed by you.

.2 Upon completion of the contract, have in force a completed operations and products liability insurance, in the amount of $5,000,000 inclusive, to be covered against any claims for damages to property or for personal injury, including death, which may arise after the premises liability is terminated.

.3 Maintain the insurance in force for a minimum period of two years after completion of the contract.

.4 List the Owner as an additional insured.

.5 The certificates shall state that the insurance will not become ineffective without sufficient written notice to the Owner.

.6 Submit certificates of such insurance with the Owner before work is begun.

1.38 Liens and affidavits

.1 The final payment and any part of the retained percentage shall not become due until a complete release of liens arising out of this contract or receipts in full in lieu thereof have been delivered to the Owner.

.2 Furnish an affidavit to the Owner that the release or receipts include labour and materials for which a lien could be filed.

.3 If any lien remains unsatisfied after all payments are made, refund to the Owner monies that the Owner may be compelled to pay in discharging such a lien, including costs and reasonable legal fees.

1.39 Maintenance tasks

.1 Perform and bring all routine maintenance tasks required by the Inspecting Authorities up to date (i.e. monthly, quarterly, semi-annual, annual, 5-year, Category 1, Category 3, Category 5 requirements, etc.) prior to turning over the elevator for public use.

.2 Arrange for Category 5 test bench marking with the Henning alternative testing tool or approved equivalent tools.

.3 Complete the Category 5 test bench marking at the same time that full speed and full load testing is performed.

.4 Provide electronic records confirming the successful completion of the tests.

1.40 Materials and workmanship

.1 Provide all new materials and equipment.

.2 Install equipment in a neat, accurate, workmanlike manner.

1.41 Materials validity check

.1 Perform a general materials validity check of components and fastenings that under failure might create a dangerous situation, including, but not limited to, sheave bolts, welds, car slings, gears, worm shafts, sheave shafts, brakes, safeties, guide rails, car platform and any other retained component.

1.42 Measurements

.1 In the execution of the work, verify all dimensions with the actual conditions in order to do a perfect job.

1.43 Modernization completion and maintenance turnover

.1 At the completion of the modernization and prior to turning over the elevator for public use:

.1 So as to ensure a smooth and harmonious turnover, arrange with the existing elevator maintenance provider a walkthrough of the modernized installation, this walkthrough to be carried out jointly by your modernization supervisor and the existing elevator maintenance provider's maintenance supervisor.

.2 Provide to the Owner and Consultant the Test Data Forms signed by both your modernization supervisor and the existing elevator maintenance provider's supervisor together with a signed confirmation that the modernization work has been checked by both parties and both parties are in agreement that the modernization has been completed satisfactorily and poses no problems for ongoing maintenance.

1.44 Information and communications technology infrastructure requirements

.1 Provide equipment compatible with the Owner’s planned, or existing, information and communications technology infrastructure equipment and systems.

.2 Install cables in a neat and organized manner.

.3 Secure cables every 1.2-1.8 m (4-6 ft.) maximum using velcro hook and loop straps.

.4 Do not secure cables with zip-ties.

.5 Provide cable strain relief grips where cables exit cabinets and provide cable support every 15 m (50 ft.) for vertical cable runs.

.6 Terminate and boost the signal for information and communications technology wiring (e.g. ethernet cabling) every 100 m (328 ft.).

.7 Provide powered ventilation fans, with protective grilles and filters, for enclosed cabinets.

.8 Connect information and communications technology infrastructure wiring directly to patch panels within a server cabinet and label the wires for easy identification.

.9 Provide an uninterruptible power supply capable of powering the information and

communications technology infrastructure equipment for a minimum of 4 hours.

.10 Provide information and communications technology infrastructure in accordance with:

.1 Latest edition of Owner-electrical consultant network construction requirements.

.2 C22.1 Canadian Electrical Code, Part 1, Safety Standards for Electrical Installations, latest edition, including nonmandatory appendices (which are deemed mandatory herein);

.3 ANSI/BICSI 006, Distributed Antenna System (DAS) Design and Implementation Best Practices, latest edition, including nonmandatory appendices (which are deemed mandatory herein);

.4 ANSI/BICSI 007, Information Communication Technology Design and Implementation Practices for Intelligent Buildings and Premises, latest edition, including nonmandatory appendices (which are deemed mandatory herein);

.5 ANSI/BICSI 008, Wireless Local Area Network (WLAN) Systems Design and Implementation Best Practices, latest edition, including nonmandatory appendices (which are deemed mandatory herein);

.6 ANSI/BICSI N1, Installation Practices for Telecommunications and ICT Cabling and Related cabling Infrastructure, latest edition, including nonmandatory appendices (which are deemed mandatory herein);

.7 ANSI/BICSI N2, Practices for the Installation of Telecommunications and ICT Cabling Intended to Support Remote Power Applications, latest edition, including nonmandatory appendices (which are deemed mandatory herein);

.8 ANSI/BICSI N3, Planning and Installation Methods for the Bonding and Grounding of Telecommunications and ICT Systems and Infrastructure, latest edition, including nonmandatory appendices (which are deemed mandatory herein);

.9 Any other ANSI/BICSI standard applicable to the installation and premises.

.11 Provide any incidental elevator material and elevator work necessary to obtain a complete functioning information and communications technology system.

.12 Supply wiring and devices as necessary to connect the information and communications technology infrastructure to the elevator system.

.13 If the connecting wiring requires conduit external to the elevator hoistways and

machine rooms coordinate with and assist as necessary the trades executing this work (these other trades are responsible for the provision of the conduit and the pulling of the wiring supplied by the elevator contractor).

.14 Submit for review, information and communications technology infrastructure details, proposed hardware, network diagrams and location drawings.

1.45 Occupied building

.1 This is an occupied building and normal building routine will have to carry on while this work is being done.

.2 Take proper care to avoid unnecessary noise, clutter or obstruction in pedestrian areas, and arrange for storage of materials and tools where they will cause minimum inconvenience.

.3 Where excessive noise or obstruction is in certain cases unavoidable, advise the Owner ahead of time and make suitable arrangements.

.4 The Owner will allow access to the building and to the work site at times designated by the Owner.

.5 The Owner will assign storage space, if available, for materials and tools.

.6 The Owner will allow the contractor's personnel to use designated washrooms.

.7 Perform work which interferes with tenant comfort or significantly impacts unit operation in overtime or at the times specified by the Owner.

1.46 Operation by persons with physical disabilities

.1 Ensure that controls and fixtures comply with Appendix E of the Code.

1.47 Operating environment

.1 Provide material and equipment to function normally within the requirements of the specifications when the ambient temperature is between 3.0 and 36.0 degrees Celsius (38 and 97 degrees Fahrenheit).

.2 Provide material and equipment to function normally and within the requirements of the specifications when the ambient relative humidity is between 25% and 100% non-condensing.

.3 Provide material and equipment to function normally and within the requirements of the specifications when the supply voltage is within minus 10% and plus 10% of the nominal voltage and the frequency is within 5% of the nominal frequency.

.4 Provide equipment needed to meet the specified voltage operating parameters (e.g. filters, isolation transformers, transient voltage surge suppression, etc.).

1.48 Organization chart

.1 Provide to the Owner an organization chart from the local supervisory level up.

.2 Provide to the Owner the names, positions and experience of the field and supervisory personnel associated with this project.

.3 During the course of the work when organization changes are made, provide the Owner with updated information.

1.49 Overtime premium

.1 In the event that the Owner, for whatever reason, pays for overtime worked to complete the work as set out in the Specifications, the Owner will pay the added cost of the overtime.

.2 The added cost shall be the difference between the overtime cost and straight time cost at contract rates.

.3 Obtain from the Owner prior written authorization for overtime to be worked and chargeable, as described above, to the Owner, this authorization to be for specific amounts and for specific times.

.4 Submit time sheets for such overtime worked for approval to the Owner or the designated representative of the Owner within 48 hours of the time that such overtime is worked.

.5 If the procedures as set out above are not followed, assume the costs of the time worked.

1.50 Overtime provisions

.1 Include overtime labour for work necessary to complete the job, such as emergency power testing, fire alarm testing, cutout, mounting and wiring of hall stations into dispatchers, tasks requiring two or more elevators in a group to be out of service and work that will cause a major disruption of service to the building.

1.51 Owner's General Terms and Conditions

.1 Abide by the Owner's General Terms and Conditions.

.2 Where there is a conflict between the Owner's General Terms and Conditions and these specifications the Owner's Terms and Conditions take precedence.

1.52 Parts

.1 Supply parts on request for a period of fifteen years subsequent to Substantial Performance of the project, at then prevailing prices.

.2 Where purchased components are used, ensure that the original manufacturer's name and component designation are clearly marked on the part or in the parts catalogue.

1.53 Patents

.1 Hold and save the Owner and its officers, agents, servants and employees harmless from liability due to patent or copyright infringement arising from the use of, in the performance of the work or in the completed installation, any invention, process, article, or appliance.

1.54 Payment withheld

.1 Approval for payment may be withheld to such extent as may be necessary on account of:

.1 Defective work not remedied;

.2 Claims filed or reasonable evidence indicating probable filing of claims;

.3 Failure of contractor to make payments properly to sub-contractors or for material and labour;

.4 Failure to work to schedule;

.5 A reasonable doubt that the contract can be completed for the balance then unpaid;

.6 Damage to the building or another contractor by the elevator contractor or one of their subcontractors.

.2 When the above grounds are removed, payment will be made for amount withheld.

1.55 Personnel

.1 Supervise your personnel so that they present a neat appearance and their movement in the building is within the requirements of their work.

.2 Provide uniforms and photo identification for personnel.

.3 The Owner reserves the right to reject or refuse access to personnel or contractors at its sole discretion.

.4 Assign and maintain a dedicated service representative to the work, this representative to be responsible for liaison with the Owner and the Consultant.

.5 Assign and maintain a dedicated service supervisor to the work, this supervisor to be responsible for technical communications with the Owner and the Consultant.

1.56 Pre-inspection check list

.1 Upon completion of each group, review each page of the specifications and initial each page at the bottom left to indicate that the work has been completed in compliance with the Specifications.

.2 Submit this initialled copy of the Specifications to the Consultant prior to requesting an inspection by the Consultant.

1.57 Preliminary information

.1 Submit, within 30 working days after awarding of contract, the information and details, including reactions, power requirements, ventilation requirements, cutouts, access requirements, light and outlet locations, quantity, location and size of external wires required to inter-connect the equipment, and all other information required to complete the work to be performed by others in conjunction with the installation of the equipment.

1.58 Protection of the Work and property

.1 Maintain protection of the Work and protect the Owner's property from injury or loss arising out of the execution of this contract.

.2 Make good any injury or loss caused by your agents or employees.

.3 Take all necessary precautions to ensure that the Work is done in a manner that does not endanger any person.

1.59 Regular hours of work

.1 Regular hours of work are from 08:00 to 17:00 Monday to Friday, excluding holidays.

.2 For residential buildings and hotels complete noisy and disruptive work during regular hours.

.3 For all other buildings, unless otherwise noted, complete noisy and disruptive work outside of regular hours.

1.60 Removal of existing equipment

.1 Remove and take possession of any existing equipment that is replaced in the course of the execution of the work.

.2 Remove equipment with prior permission of, and only at times specified by, the Owner.

.3 Remove and transfer to the Owner equipment that the Owner elects to retain for the Owner's use.

.4 Remove existing wiring that is no longer being used.

1.61 Removal of rubbish

.1 Remove rubbish, keep the building and premises clean during the progress of the work, and leave the premises at completion in perfect condition as far as the work under the specifications is concerned.

1.62 Request for payment

.1 Submit applications for payment with the necessary data, information, waivers and affidavits including certificates of compliance and appropriate statutory declaration.

1.63 Retained equipment

.1 In the event that retained equipment is in conflict with or incompatible with the new equipment, or is in conflict with alteration Code requirements, note this on the bid form.

.2 If no conflicts are noted on the bid form, pay for any changes or necessary equipment that may be required to complete the work.

1.64 Singular and plural

.1 In all cases singular and plural shall be interchangeable and shall be applied as required to meet the sense and intent of the Specifications.

.2 Where the singular is employed it shall be interpreted as necessary, unless otherwise indicated, to apply to all equipment and devices required to produce a complete installation.

1.65 Special tools and access codes

.1 If any special tools (i.e. tools that are not readily purchased from a hardware supplier) are used to maintain or adjust the equipment or are required for any aspect of the work on the equipment, list these tools with details on the bid form and provide such tools to the Owner prior to Substantial Performance.

.2 If any access codes are used to maintain or adjust the equipment or are required for any aspect of the work on the equipment (including the reading and resetting of error codes and logs) list these access codes with details on the bid form and provide such access codes to the Owner prior to Substantial Performance.

.3 Do not change the access codes without the written consent of the Owner and, when changed, provide to the Owner the new access codes.

1.66 Subcontractors

.1 Bind subcontractors to all applicable portions of the Specifications.

.2 The contractor shall be responsible for all actions and all work performed by its subcontractors to the same extent as the contractor is itself responsible under the Specifications.

1.67 Submission of bid

.1 Submission of a bid will be considered presumptive evidence that the proposer is conversant with local facilities and conditions, requirements of the Contract Documents and of pertinent provincial and local codes, state of labour and material markets, and in the bid has made due allowance for all contingencies.

1.68 Taxes

.1 Include applicable local, provincial and federal taxes or assessments in effect at the time of the signing of the contract.

.2 Show on the bid form the amount of each tax included.

.3 The Contractor is liable for the above mentioned taxes or assessments whether or not specifically mentioned in their bid or in the final contract document.

.4 In the event new taxes or assessments, to become due on completion of the contract, are imposed after the signing of the contract these are to be paid, in addition to the original contract amount, by the Owner to the Contractor, who in turn is to pay them to the proper authorities.

.5 In the event taxes or assessments in effect at the signing of the contract should be revoked before consummation of the contract rebate to the Owner the amount of

such taxes and assessments included in the original contract.

1.69 Technical seminar

.1 Before the time of Substantial Performance, arrange with the Owner to provide a seminar for the Owner's staff.

.2 Include in the seminar a complete review of the documentation, operation of the equipment and demonstration of any special features including programming of any display devices.

1.70 Trade marks

.1 Do not apply any new trade marks visible to the general public on any piece of equipment.

1.71 Unit inspection by the Consultant

.1 Advise the Consultant in writing two weeks prior to the completion of a unit so as to arrange an inspection by the Consultant at a mutually convenient time.

.2 Assist the Consultant in the performance of this inspection to verify that performance figures, workmanship and equipment furnished are in compliance with the Specifications.

.3 Provide the necessary test weights to carry out full load tests and a team of competent persons to assist the Consultant in making the necessary tests and inspections.

1.72 Warranty of work

.1 Warrant that the materials, performance and workmanship are in accordance with the industry standard in every respect.

.2 Make good defects not due to improper use which may develop within one year from the date of Substantial Performance of the project.

.3 Warrant that the equipment performs to the standards set out herein.

.4 Neither the final payment nor any provision of the Contract Documents diminishes the responsibility for negligence or faulty materials or workmanship within the extent and period provided by law.

.5 Upon written notice remedy defects and pay expenses for damage to others resulting from defects.

1.73 Withdrawal or rejection of bids

.1 The Owner reserves the right to reject any or all bids or to waive any conditions.

.2 Bids may not be withdrawn until sixty days after the scheduled date for the receipt of the bids.

1.74 Work by other trades

.1 In the event that work by other trades is required and work by others as set out herein is in conflict with or inadequate for your equipment or design, so state on the bid form with all necessary details.

.2 If no exceptions are noted on the bid form, pay the costs of all modifications necessary to suit your equipment and design.

1.75 Work site protection

.1 Provide, maintain and, after the work is complete, remove protective hoarding around the work site.

.2 Arrange the protective hoarding so as to prevent public access to the work site.

1.76 Work under division 09

.1 Work under division 09 is not part of the elevator contractor's scope of work.

.2 Work required in conjunction with the installation and included in Division 09 (Finishes) will consist of the following items:

.1 Cutting and patching of machine room walls and floors as needed.

.2 Cutting and patching of walls and floors around elevator entrances as needed.

1.77 Work under division 15

.1 Work under division 15 is not part of the elevator contractor's scope of work.

.2 Work required in conjunction with the installation and included in Division 15 (Mechanical) will consist of the following items:

.1 Heating and cooling by means of an HVAC system in order to maintain continuously (i.e. 24 hours a day) a temperature of greater than 13 degrees Celsius and less than 29 degrees Celsius based on the heat generated by the elevator equipment as follows:

Heat generated (per unit):	when active	
	kW	BTU/h
Traction Elevator #1	1.2	4,250
Hydraulic Elevator #2	3.1	10,500

.2 Review the heater in the Hydraulic Elevator #2 machine room. If not working it should be made functional.

.3 Do not locate ventilation equipment directly above elevator equipment and ensure air conditioning exhaust ducts do not direct conditioned air directly onto elevator wire ropes.

1.78 Work under division 16

.1 Work under division 16 is not part of the elevator contractor's scope of work.

.2 Work required in conjunction with the installation and included in Division 16 (Electrical) will consist of the following items:

.1 A grounded power supply sufficient to start and run the elevators at rated speed and capacity, including the following:

.1 A disconnect means located in view of the elevator controller near the access to the machine room or control space.

.2 Wiring between the disconnect and the elevator power input point (elevator transformer or controller).

.2 A lockable power supply, with an isolated ground, capable of supplying for each unit the following starting and running currents in amperes based on the power supply noted:

Full load up currents (per unit):	power supply (V)	starting amps	running amps
Traction Elevator #1	240	70	30
Hydraulic Elevator #2	240	245	100

.3 A grounding system for the elevator related electrical equipment for safety and performance.

.4 An auxiliary disconnect contact with wiring to the controller for the battery rescue device, to indicate if the disconnect is on or off.

.5 In the Hydraulic Elevator #2 machine room one 20A 120V single phase circuit breaker or disconnect located in view of the elevator controller near

the access to the machine room, to power the oil cooler.

.6 In the elevator machine room one 15A 120V single phase circuit breaker or disconnect per elevator, located adjacent to the lock side of the machine room door, to power cab ventilation and lighting equipment. The power from this circuit to be derived from the emergency power supply if available. This circuit is already in place and the electrical equipment should be reviewed to see if they can be retained.

.7 In the elevator machine room one 15A 120V single phase circuit breaker or disconnect per elevator located in view of the elevator controller near the access to the machine room, to power the cab interior duplex GFCI receptacle (if one is provided) and auxiliary equipment (e.g. camera).

.8 Replace existing duplex receptacles in the elevator machine room, hoistway and pit with GFCI receptacles.

.9 In the machine room, protected LED lights controlled by a switch located adjacent to the lock side of the machine room door, located at approximately 2500 mm (8') from floor level as required to give a minimum illumination of 200 lx at floor level and within the controller, the power for the lighting circuit being derived from the emergency power supply if available.

.10 In the elevator pit, protected LED lights, controlled by a light switch located adjacent to the pit entrance, located clear of elevator equipment to give a minimum illumination of 160 lux at pit level, the power for the lighting circuit being derived from the emergency power supply if available.

.11 For operation of Firefighters' Emergency Operation:

.1 Fire alarm initiating devices (FAIDs) on the recall floor.

.2 Fire alarm initiating devices (FAIDs) on all other floors.

.3 Fire alarm initiating devices (FAIDs) at the top of the hoistway.

.4 Fire alarm initiating devices (FAIDs) in the pit.

.5 Fire alarm initiating devices (FAIDs) in the machine space.

.6 Fire alarm initiating devices (FAIDs) in the control space.

.7 A connection from the fire alarm initiating devices (FAIDs) on the recall floor to the elevator controller.

.8 A connection from the fire alarm initiating devices (FAIDs) on all other floors to the elevator controller.

.9 A connection from the fire alarm initiating devices (FAIDs) at the top of the hoistway to the elevator controller.

.10 A connection from the fire alarm initiating devices (FAIDs) in the pit to the elevator controller.

.11 A connection from the fire alarm initiating devices (FAIDs) in the machine space to the elevator controller.

.12 A connection from the fire alarm initiating devices (FAIDs) in the control space to the elevator controller.

.12 An active telephone line run to each elevator machine room (this should already be in place).

.13 Do not mount auxiliary equipment such as security controllers or elevator telephone cabinets on elevator controller cabinets.

.14 Where needed, conduit and pulling of wire (wiring to be supplied by the Elevator Contractor) between the machine room, elevator hoistway, and any other remote equipment locations, to be terminated outside the elevator hoistway at a junction box (provided by the Elevator Contractor) at the basement level.

.15 Provision of a in-cab security camera system.

.16 Coordinate with the elevator contractor any interconnections needed for the closed circuit elevator security television system.

.17 Where required, provision of a card reader security system.

2 Separate prices

2.1 Separate price submission requirements

.1 Submit prices to provide the following:

2.2 Maintenance: five years

.1 Provide full maintenance of the equipment for a period of five years beginning at the end of the maintenance included in the contract.

.2 The services agreement will continue on a month-to-month basis at the expiration of the original term unless notice in writing is provided by either party, at least 60 days in advance of the expiration date, notifying the other party of their intent to not continue with the services agreement beyond the original term mandate or any

subsequent monthly mandates.

.3 Provide this service at a flat monthly price without escalation.

.4 Provide this service in conformity with the Maintenance Specifications.

2.3 Hydraulic: heat exchanger: Hydraulic Elevator #2

.1 Provide in the machine room a heat exchanger to ensure that the temperature of the hydraulic fluid in the reservoir, pump and control valve does not exceed 40 degrees C (106 degrees F).

.2 Provide a thermostat control in the elevator hydraulic machine reservoir to start and stop the heat exchanger pump and fan as necessary to maintain the oil at the required temperature.

.3 Provide a unit capable of removing a minimum of 18,000 kJ (17,000 BTU) per hour from the hydraulic fluid.

.4 Provide, as an integral part of the heat exchanger, a fan to transfer the heat to the machine room.

.5 Provide, as an integral part of the heat exchanger, a pump having a minimum capacity of 0.03 cubic metres at 5 bar (8 US gpm at 75 psi) driven by a single phase 560 W (3/4 hp) 110 volt 60 Hz motor.

.6 Provide a 10 micron filter in the hydraulic oil line together with a sight gauge to indicate when the filter needs to be changed.

.7 Mount the heat exchanger in the machine room in a suitable location.

.8 Provide piping and wiring as required for the heat exchanger (a 110 volt 60 Hz 20 amp supply will be provided by others).

3 Alternative prices

3.1 Alternative price submission requirements

.1 Submit with the bid, prices (extras or credits) for the following equipment in lieu of the equipment set out in the base bid.

3.2 Machine and motor: gearless: Traction Elevator #1

.1 Provide a gearless machine, consisting of an AC motor, directly connected to a traction sheave and brake drum.

.2 Provide a reversible motor with high starting torque and low starting current, especially designed to meet the severe loads encountered in elevator service.

.3 Provide anti-friction bearings equipped with suitable means for lubrication.

.4 Provide a spring applied, electrically released, brake designed to apply instantly and automatically in the event of interruption of power supply to the motor by any cause.

.5 Provide equipment which will deliver its rated output continuously with a temperature rise not to exceed 50 degrees Celsius (122 degrees Fahrenheit).

.6 Provide, as a minimum, Class B insulation.

.7 Submit with the bid the power and torque ratings of the elevator motor.

.8 Provide sound and vibration isolation pads or springs arranged so that there is no solid contact between the machine and the building structure.

4 Itemized prices

4.1 Itemized price submission requirements

.1 Submit with the bid the prices to provide the following (note that the equipment is already included in the base bid):

4.2 Re-activate floor 1R: Traction Elevator #1

.1 Provide all labour and materials necessary for the re-activation of floor 1R including, but not necessarily limited to, the following:

.1 Door operator

.1 Provide a heavy duty door operator to open and close the car and hoistway doors simultaneously.

.2 Mount the operator on the cab above the car doors.

.3 Provide either:

.1 An alternating current motor, either standard or linear induction type, with associated variable voltage and variable frequency solid state drive to control the speed and torque of

the door operator, or;

.2 A direct current motor with associated solid state drive to control the speed and torque of the door operator.

.4 Provide as a minimum a 375 W (0.5 HP) motor.

.5 Provide dual drive arms for centre-opening doors.

.6 Provide GAL MOVFR or approved equivalent.

.7 Provide a solid state door operator control incorporating negative feedback circuits for position, acceleration, velocity and torque.

.8 Provide event logging with non-volatile memory so as to retain the event log under power-off conditions.

.9 Provide fully automatic installation algorithm profiles that self-adjust the motion profile for the relevant parameters.

.10 Provide an output from the door control for a pre-start command to the elevator speed control system.

.11 Provide optical isolation for input and output signals.

.12 Provide signal line short circuit protection.

.13 Provide a serial input to the door control to allow adjustment of speed, acceleration, torque and pre-start point using a notebook computer or keypad.

.14 Provide the keypad or software for a standard notebook computer.

.15 Arrange that the settings for the door operator can be uploaded to the keypad or notebook computer and then downloaded to another identical operator.

.16 Provide an average door closing speed of 300 mm (12") per second, respecting the parameters for door force and door inertia as set out in the elevator code.

.17 Provide an average door opening speed of 700 mm (28") per second.

.18 Provide, either in the door operator control or in the main elevator control, means to automatically recycle the doors in the event that they stall during the opening or closing operations.

.19 Design the door operator and associated components for a minimum of noise.

.2 Door detector: multiple beams

.1 Provide a multiple infra-red beam door detector device.

.2 Design and locate the receivers and emitters so that the active area of the door opening, i.e. the full width and from within 25 mm (1") of the floor to a height of 1800 mm (6'), is protected, such that a person or object passing through the car entrance causes the doors to re-open.

.3 Position the receivers and emitters at least 25 mm (1") back from the leading edge of the door.

.4 Provide logic control to ensure that each receiver receives light from every emitter.

.5 Arrange that if the system fails to provide protection over the active area of the door opening, the elevator will park at the current floor with its doors open and the lights off, or the system will go over to nudging operation.

.6 Provide a signal on the unit or in the machine room to indicate that a failure has occurred.

.7 Should a door protective device be operated continuously for more than 20 seconds after the elapse of the normal door open time, cause the doors to go over to nudging operation.

.8 Arrange the nudging operation as follows:

.1 Cause the doors to close slowly under reduced power;

.2 Operate a buzzer in the car panel as a warning to the person obstructing the door;

.3 Cause the 20 seconds to be reduced to 6 seconds until a normal door cycle is performed.

.9 Supply a device, reliable and consistent in operation, not affected by dust or temperature changes, and having inherent long term reliability with minimum maintenance.

.3 Entrance floor markings

.1 Provide, on each hall entrance jamb, raised tactile and braille metallic markings to designate the floor.

.2 Provide markings as selected by the Owner.

.3 Provide samples for review.

.4 Floor marking: hoistway

.1 Identify each landing by means of markings on the inside of the hoistway.

.2 Place these markings so that people in a stalled elevator will be able to readily see the floor marking upon opening the car doors.

.3 Use a stencil to ensure that the floor markings are neat and uniform in appearance.

.4 Provide numerals and letters approximately 100 mm (4") high and of a clearly contrasting colour to the colour of the doors and fascias.

.5 Car door restrictor

.1 Provide a car door restrictor to mechanically prevent the opening of the car door from inside the cab unless the elevator is in the door unlocking zone.

.2 Provide a device that does not require electrical or electronic components to function.

.3 Provide vertically mounted car door steel angles arranged to interlock with steel angles vertically mounted on the hoistway front wall so arranged as to prevent the car door from opening unless the elevator is in the door unlocking zone.

.6 Car and hoistway door safety retainers

.1 Provide safety retainers at the top and bottom of horizontally sliding doors to retain the closed door panel in position if the primary guiding means fail.

.2 Provide retainers that will prevent the displacement of the door panel top and bottom by more than 20 mm (0.8") when the door panel is subjected to a force of 5 000 N (1130 lbf) applied towards the hoistway at right angles to the panel over an area of 300 mm by 300 mm (12" by 12") at the centre of the panel.

.3 Provide retainers that will withstand, without detachment or permanent deformation, a force of 1 000 N (225 lbf) applied upward at any point along the width of the door panel together with an additional concurrent force of 1 100 N (250 lbf) applied at right angles to the door at the centre of the panel over an area of 300 mm by 300 mm (12" by 12").

.4 Arrange that the retaining means are not involved in the guiding of the panel and are not subjected to wear or stress during normal door operation.

.7 Door equipment

.1 Replace hall door hanger rollers with plastic insert rollers.

.2 Check and replace gibs, rollers, hangers and all other door components.

.3 Provide new interlocks, GAL MO or approved equivalent.

.4 Provide a new car door gate switch.

.5 Provide new spirator door closers.

.6 Provide new clutches or vanes so that the master door operator can drive the hoistway doors.

.7 Provide new relating cables.

.8 Install sound absorbing materials so as to eliminate interlock noise.

.9 Provide new astragals (car and hall doors).

.10 Clean, lubricate and re-adjust car and hoistway door equipment.

.11 Adjust the doors so that with the door closing device disconnected, the doors can be started into motion, from any position, with a force of less than 25 Newtons per door panel applied horizontally at the mid-point of the door in line with the direction of movement of the door.

.12 Adjust the hoistway door rollers so as to obtain 6 mm (1/4") clearance from the car sill and on either side of the skate.

.13 Adjust the hoistway door roller pressure so that when engaged in the skate both rollers exert a firm pressure on the skate.

.14 Eliminate any rattles, loose connections or worn bearings that might cause noise.

.8 Car station

.1 Provide one main car operating panel.

.2 Provide in the panel the devices required for normal automatic operation, including the following:

.1 Floor push buttons;

.2 Door open button;

.3 Door close button;

.4 Alarm button;

.5 Emergency communication button inset into the car station with a protective surround.

.3 Number the car call buttons to correspond to the floor served.

.4 Provide in conjunction with the car buttons a call registered light for each button to be lighted when the button is pressed and extinguished when the car stops at the selected floor.

.5 Secure tactile markings using hidden fasteners.

.6 Provide a Firefighters' Emergency Operation cabinet on the main car station in accordance with the Code.

.7 Provide a locked service cabinet, its size and location to match the Firefighters' Emergency Operation cabinet, containing the following:

.1 Light key switch;

.2 Fan key switch;

.3 Independent service key switch;

.4 Inspection key-switch;

.5 Voice annunciation on/off key-switch;

.6 Emergency lighting test switch;

.7 GFCI duplex receptacle (Run the wires for this receptacle separately from the wires for the other car light and ventilation equipment and connect it to a separate breaker in the machine room).

.8 Provide, only when required by the prevailing codes, a stop switch located in the service cabinet, arranged to stop the elevator and to duplicate the functions of the alarm button.

.9 Engrave the car station with markings and signage such as car capacity, elevator number and other markings required by the prevailing codes and local regulations including remote location of device licenses where available.

.10 Ensure that engravings and button designations are easily read when viewed at an angle from any normal standing position in the elevator cab within arms reach of the car station.

.11 Hinge the car station faceplate so that it can be swung open towards the adjacent cab side wall to allow access for servicing of the inner components of the car station.

.12 Provide a hinge capable of supporting without distortion a test weight of minimum 11 kg resting on the panel non-hinged edge with the panel swung open.

.13 Secure the car station in the closed position using countersunk spanner head fasteners or approved equivalent.

.14 Arrange the car station so that it can be swung open without interference from the cab flooring, cab wall, cab handrails or other cab appurtenances.

.9 Car position annunciator

.1 Provide automatic verbal announcement to announce the floors and to provide floor passing tones.

.2 Provide a unit to meet the requirements of the Code.

.3 Provide means in the service cabinet to adjust the volume over a range from 55 and 70 decibels.

.4 Use a female voice for the announcements.

.10 Car position indicator: digital readout

.1 Provide a digital car position indicator mounted in each car operating panel.

.2 Arrange the indicator to display a number or symbol at least 50 mm (2") high.

.3 Indicate the position of the car at all times, corresponding to the landing through which the car is passing or at which it is stopped.

.4 Provide a segmented display using light emitting diodes with a minimum of 16 segments per character.

.5 Arrange the circuits so as to provide continuous indication of car position.

.6 Overlapping dual indication, when the elevator is between floors, is acceptable.

.11 Emergency lighting

.1 Provide a back-up battery power system for alarm bell operation and emergency cab lighting.

.2 Install the emergency lighting lamp at the top or upper reaches of the car station unless otherwise required by the site Architectural cab design.

.3 Provide a lighting level of at least 11 lux of illumination at the car operating panels for a minimum period of four hours, using at least four LED lamps of equal rating.

.4 Cause the lamps to be immediately energized in the event of a power failure or electrical fault de-energizing the normal elevator lighting circuit.

.5 Provide for the automatic disconnection of the lamps and the automatic recharging of the lighting unit when normal power is restored to the elevator lighting circuit.

.6 Provide a rechargeable battery of the hermetically sealed type, or of a type which provides a reserve of electrolyte, capable of operating unattended and requiring no addition of water or electrolyte for a period of not less than ten years, with provision for visual checking of the electrolyte level without opening the battery or removing caps or fittings.

.7 Arrange the battery charging to operate automatically upon restoration of normal power to the unit, to remain in operation until the battery is fully recharged and to maintain the battery at full rated capacity at all times when the unit is not in operation.

.8 Provide a pilot lamp to indicate that the normal power supply to the unit and battery charging is in operation.

.9 Arrange that the unit can be conveniently tested and operated manually.

.10 Install the unit as part of the car so that it is not readily removed.

.11 Do not provide portable equipment.

.12 Install the lamp fixture above the car station.

.13 Provide an emergency lighting test switch in the car service cabinet or behind the car swing return.

.12 Telephone: hands-free operation

.1 Provide a hands-free telephone with automatic dialer capable of initiating and receiving calls.

.2 Integrate the telephone into the car station.

.3 Provide a push button to initiate the telephone connection.

.4 Arrange that the telephone connection can be initiated by an external call.

.5 Provide an indicator light to confirm that communication has been established.

.6 Pierce the car station for the push button and indicator light with the indicator light mounted flush with the panel.

.7 Provide a speaker/microphone for communication.

.8 Pierce the car station in front of the speaker with multiple holes 3 mm (1/8") in diameter to allow passage of sound to and from the speaker.

.9 Identify the telephone and the button with a raised symbol and Braille.

.10 Provide wiring for the telephone from the cab to the machine room.

.11 Provide a communication station in the machine room.

.12 Connect the wiring on the car to a terminal block mounted in or adjacent to the telephone box.

.13 Terminate the wiring in the machine room at a separate enclosed external terminal block mounted on the controller.

.14 Provide the terminal block and its enclosure and locate it so that personnel other than elevator mechanics can easily run their conduit and wiring to these terminals without interfering with or touching the elevator wiring or controls.

.15 Where more than one controller is in a common machine room bring wiring to one common terminal block.

.16 Clearly mark the terminal block.

.17 Provide wiring of the twin conductor shielded type with grounded shields.

.18 Provide equipment and wiring compatible with and acceptable to the telephone company providing service to the project.

.19 Provide material and labour as necessary so as to ensure that the communication system meets the requirements of the Code.

.13 Security system: future

.1 Provide for the future installation of an elevator card reader security system.

.2 Provide accessible space, mounting supports and wiring for a security antenna in the cab main front return panel.

.3 Provide a free space 100 mm (4") in height, 175 mm (7") in width and 75 mm (3") in depth centred behind the car panel insert for the security antenna installation.

.4 Provide in front of the security antenna a translucent polycarbonate cover.

.5 Provide an elevator security interface box in the machine room mounted on the side of an elevator controller.

.6 Provide wiring from the car station card reader to the security interface box using standard connectors.

.7 Interface with the security system using serial data transfer.

.8 Provide a signal, unique for each car call, to the security system when a car call "request" (which could either be by means of a button or touch screen) is entered and enter the car call when a return signal is received from the security system validating the request.

.9 Arrange that the elevator system functions without restriction by the security system when Firefighters' Emergency Operation or independent service is operative.

.10 Until such time as the security system is installed, arrange that the elevator system functions without restriction by the security system.

.11 Provide any incidental elevator material and elevator work necessary to obtain a complete functioning elevator security system.

.12 Submit for review, interface box drawings, location drawings and electrical schematics.

.14 Hall push button stations

.1 Replace the existing hall push button stations with new hall push button stations.

.2 Provide at the intermediate floors, for each station, up and down push buttons located one above the other and call registered lights.

.3 Provide at the upper terminal and lower terminal, for each station, a single button and call registered light.

.4 Illuminate the call registered light only when there is an elevator in service to respond to the call.

.5 Install the stations substantially flush with the wall (i.e. do not use surface mount stations).

.6 Secure the hall push button stations to the wall using countersunk spanner head fasteners or approved equivalent.

.15 Hoistway entrance lunar key access

.1 Provide lunar key access for each hoistway entrance.

END OF SECTION

Section 14210 Traction Passenger Elevator

1 General

1.1 General requirements

.1 Conform to Section 14200.

1.2 Type

.1 Modernization of one overhead geared traction passenger elevator.

1.3 Data

Traction Elevator			
Item	Existing		Modernization
number of units	1		no change
designation	n/a		#1
licence number	24170		no change
application	passenger		no change
rated speed (m/s, fpm)	0.76	150	no change
capacity (kg, lb)	907	2,000	no change
motor power (kW, HP)	7.5 / 1.9	10 / 2.5	new
operation	simplex		no change
machine type	Northern 280 geared		new
machine location	overhead		no change
drive type	2-speed AC		new solid state
emergency brake	not provided		new
car governor	Northern No. 1		new
counterweight governor	not provided		no change
hoist ropes (#, diameter)	4 x ½" rope		new
roping ratio	1 : 1		no change
control system	Otis Gamma D		new microprocessor
front entrances	*1, 2, 3, 4, 5, 6		no change
rear entrances	none (floor 1R decommissioned)		re-activate floor 1R
car door type	single speed side opening		no change
hall door type	single speed side opening		no change
hoistway door fire resistance			no change
entrance width (mm, ")	914	36	no change
entrance height (mm, ")	2134	84	no change

Traction Elevator			
entrance markings	incomplete set and too low		new
cab width (mm, “)	1676	66	no change
cab depth (mm, “)	1219	48	no change
cab height to suspended ceiling (mm, “)	2591	102	no change
cab height to car top (mm, “)	2743	108	no change
car door restrictor	not provided		new, steel angles
door safety retainers	provided		new, where needed
door reopening device: front entrance	infrared multi-beam		no change
door reopeing device: rear entrance			new infrared
car door operator: front entrance	GAL MOVFR		no change
car door operator: rear entrance			new GAL MOVFR
hall door equipment: front entrance	GAL		no change
hall door equipment: rear entrance			new GAL
interlocks: front entrance	GAL MO		no change
interlocks: rear entrance			new GAL MO
hall door closer	sill mounted spring closer (floor 3 also has a spirator)		new spirator for all entrances
main car station	provided, applied		new applied
auxiliary car station	not provided		no change
verbal annunciation	not provided		new
car position indicator	provided – analogue above entrance and digital in car station		- remove analogue indicator above entrance and cover - new digital indicator in car station
cab emergency lighting	provided in car station		new in car station
cab communication	provided in car station		new in car station
car CCTV camera	not provided		new
car call security	not provided		provisions
hall call security	not provided		no change
hall stations (typical)	single riser, flush mount		new, flush mount
hall stations (main floor)	single riser, flush mount		new, flush mount
hoistway access switches	not provided		new
cab ventilation			new
cab finishes	texturized stainless steel		new cab handrails
hall door finish (typical)	painted		no change
hall door finish (main)	painted		no change
car door finish	texturized stainless steel		no change
in-cab LCD screen	not provided		no change

Traction Elevator		
hall lanterns	not provided	no change
in-car lanterns	not provided	new, flush mount
hall position indicator	analogue above entrance at floor 1	new digital, flush mount
lobby panel	not provided	no change
CACF panel	not provided	no change
central control monitor	not provided	no change
car top inspection station	provided, Dupar	no change
load weighing device	not provided	no change
car guiding	roller guides	retain and refurbish
counterweight guiding	roller guides	retain and refurbish
guide rails	provided	no change
compensation	not provided	no change
emergency recall	provided	new automatic
firefighter's operation	provided	new
emergency power	not provided	new, battery rescue device
car top railing	provided	no change
equipment guarding	global guarding	retain (new where needed)
operating time		13.0
acceleration rate		0.8 m/s/s

1.4 Dimensions

.1 Provide equipment to suit the existing machine room, hoistway, pit and overhead dimensions.

2 Products

2.1 Generic equipment

.1 Provide generic equipment that can be purchased, installed and maintained by any competent vertical transportation contractor.

.2 Provide equipment that has been installed within the province by at least four different vertical transportation contractors.

.3 Provide generic controls from GAL, Automatisation JRT or an approved equivalent.

.4 Provide proven components that have been used during the last two years as a minimum.

.5 Provide a written guarantee from the control manufacturer that over the life of the

installation software and firmware updates will be provided at no charge to the Owner.

2.2 Speed

.1 Arrange the elevators to run under any condition of loading, except the case of overload, within 1.5 percent of the rated speed.

2.3 Machine: new geared AC

.1 Provide a new machine of the single-wrap geared traction type including an AC motor, electromechanical brake, steel worm, bronze gear, steel sheave shaft and traction sheave mounted in proper alignment on a suitable bedplate.

.2 Provide a machine with a proven record, over a period of at least ten years, of satisfactory operation on other installations of the same speed, capacity and counterweighting.

.3 Provide equipment which will deliver its rated output continuously with a temperature rise not to exceed 50 degrees C (122 degrees F).

.4 Provide, as a minimum, Class B insulation.

.5 Submit the horsepower and torque ratings of the elevator motor.

.6 Provide a steel worm, accurately machined and ground, with a single-end, double-race, ball-bearing thrust.

.7 Machine the worm to a tolerance of 0.0025 mm (0.0001").

.8 Make the worm gear from a phosphor bronze rim, accurately cut, fitted and bolted to a cast iron spider.

.9 Make the traction sheave of malleable cast iron or similar material, properly grooved for the cables.

.10 Provide a brake actuated switch to indicate to the control system the state of the brake: that is, lifted or applied.

.11 Design and adjust the machine so that, when running at full speed, it vibrates no more than 0.025 mm (0.001")as measured at the motor end of the bed plate.

.12 Ensure that the total of back lash and end play does not exceed 0.125 mm (0.005") as measured at the circumference of the gear with balanced load plus 90 kg (200 pounds) and with balanced load minus 90 kg (200 pounds).

.13 Arrange that the worm end play does not exceed 0.037 mm (0.0015") as measured

with balanced load plus 90 kg (200 pounds) and balanced load minus 90 kg (200 pounds).

.14 Provide sound and vibration isolation pads or springs arranged so that there is no solid contact between the machine and the building structure.

.15 Provide hoist ropes of sufficient number, size and characteristics such that the addition of 50 per cent of the rated load to the car cab will cause no more than a 0.04 per cent elongation in the rope.

.16 Where ropes are used in parallel to share a load, ensure that the ropes are all from one manufacturing run.

.17 Provide means during and after installation to prevent the ropes turning; do not use swivel connections.

.18 Provide sufficient removable counterweight buffer blocking to allow adjustment for rope stretch without requiring cable shortening.

.19 Ensure that the number of rope twists do not exceed the manufacturer's recommendations.

.20 Adjust the rope tension of each rope to the average of the set plus or minus 5%.

.21 Use wedge type cable clamps.

.22 Provide wire ropes with a safety factor equal to or greater than the originally installed wire ropes.

2.4 Brake spring

.1 After the brake is adjusted for correct operation and prior to the performance of safety tests and checks by the inspecting authorities, seal it with a numbered seal so as to prevent un-authorized re-adjustment and record the date and seal number in the log book.

.2 Provide means to positively define the length of the brake spring to minimize the possibility of future incorrect adjustment using one of the following methods:

.1 Measure the length of the brake spring and mark this length on a tag permanently affixed to the machine;

.2 Measure the number of exposed threads on the brake spring rod and mark this number on a tag permanently affixed to the machine.

.3 Record the details of the brake setting on the test data sheet.

2.5 Deflector sheaves

.1 Replace or retain and refurbish the existing deflector sheaves.

.2 Perform the following duties if retained and refurbished:

.1 Check sheaves and shafts for soundness and wear, and replace if necessary;

.2 Check bearings for wear, scoring or damage and replace if necessary;

.3 Check sheave grooves for equal depth and contour and re-groove if necessary;

.4 If sheave grooves are excessively worn replace the sheave.

2.6 Solid state motor drive: non-regenerative

.1 Provide an alternating current solid state drive to control the speed of the elevator by varying the voltage and the frequency of the supply to the motor.

.2 Provide resistors to absorb power regenerated under negative load conditions.

.3 Arrange that the system in responding to a unit step function does not overshoot by more than 21 percent.

.4 Arrange that the error signal does not, in normal operation, exceed 2.5 percent.

.5 Provide means to shut down the unit in the event that the error signal exceeds 5.0 percent.

.6 Provide means to limit the increase in noise level during acceleration to less than 12 decibels (A scale) as measured in the centre of the machine room.

.7 Provide electronic feedback circuits to limit the current through the motor and the solid state power devices.

.8 Arrange that under low voltage conditions the unit does not exceed the current limits.

.9 Provide safety circuits to prevent runaway in the event of closed loop feedback circuit failure.

.10 Arrange these circuits so that:

.1 With a partial or complete loss of the feedback signal the elevator will come to a stop before the governor jaws are tripped;

.2 If the elevator is in the levelling zone with the door interlock circuit open, the elevator will come to a stop prior to leaving the levelling zone.

.11 Test these circuits by opening the feedback circuit while the elevator is running at contract speed no load up and while the elevator is levelling into the floor no load up.

.12 Provide means for dissipating the heat generated by solid state devices.

.13 Provide safety circuits to shut down the unit in the event of overheating.

.14 Design the equipment so that power loss or power fade (brownout) does not cause fuses to blow.

.15 Provide means to protect the solid state power devices against surge currents.

.16 Provide filters and circuits to reduce the line pollution so that the distortion generated by the solid state power device is within the following limits as measured at the disconnect switch:

.1 The 5th harmonic voltage does not exceed 6 percent;

.2 The 5th harmonic current does not exceed 20 percent;

.3 The total harmonic voltage does not exceed 10 percent;

.4 The total harmonic current does not exceed 25 percent;

.5 Line voltage notching of duration greater than 1 millisecond is less than three per cent of the peak sine wave voltage measured from zero reference;

.6 The notch depth is less than 10 per cent;

.7 The notch duration is less than 2 milliseconds.

.17 Provide filters and circuits to reduce the electromagnetic noise level at any frequency with the elevator running, to not more than 0.1 db above the ambient electromagnetic noise level (with the elevator stopped), as measured in the centre of the machine room using a calibrated radio frequency receiver designed in accordance with CSA Standard C108.1.1 together with a calibrated rod or loop antenna.

.18 Provide filters and circuits to reduce the electromagnetic noise level at 10 KHz with the elevator running, to not more than 0.01 db above the ambient electromagnetic noise level (with the elevator stopped), as measured in the centre of the machine room using a calibrated radio frequency receiver designed in accordance with CSA

Standard C108.1.1 together with a calibrated rod or loop antenna.

.19 Arrange the equipment so that any vibration generated is not transmitted directly to the building structure.

2.7 Solid-state hardware

.1 Mount solid-state devices, except for high power silicon controlled rectifiers, on removable printed circuit boards.

.2 Gold plate the contact points of edge connectors.

.3 Use G10 glass epoxy with minimum equivalent 57 gram (2 ounce) copper.

.4 Coat the circuits with tin-lead.

.5 Provide a solder resist screen.

.6 Provide plated through holes for double sided boards.

.7 Make all connections to the printed circuits on the printed circuit boards by means of properly dimensioned pads.

.8 Do not provide "patched" connections.

.9 Design solid-state devices for a high level of noise immunity.

.10 Incorporate electrical noise suppression devices in the power supplies and the inputs and outputs associated with the solid-state circuits.

.11 Provide filters and circuits to limit the generated electromagnetic noise level at any frequency to not more than 0.1 db above the ambient electromagnetic noise level, as measured in the centre of the machine room using a calibrated radio frequency receiver designed in accordance with CSA Standard C108.1.1 together with a calibrated rod or loop antenna.

.12 Provide filters and circuits to limit the generated electromagnetic noise level at 10 KHz to not more than 0.01 db above the ambient electromagnetic noise level, as measured in the centre of the machine room using a calibrated radio frequency receiver designed in accordance with CSA Standard C108.1.1 together with a calibrated rod or loop antenna.

2.8 Auxiliary slowdown devices

.1 Provide auxiliary slowdown devices compatible with the solid state speed control and so arranged that, if the normal slowdown devices fail to operate correctly, the elevator will be brought to a controlled stop at the terminal landing with an acceleration not exceeding 0.3 g.

.2 Arrange the control circuits so that, if the auxiliary slowdown devices were required to act to stop the elevator, the elevator parks at the terminal landing until the system is checked by a maintenance technician.

2.9 Position transducer

.1 Provide a position transducer device to transmit to the control system the position of the elevator.

.2 Arrange that the device transmit a minimum of 10 counts per 25 mm (1") of travel.

.3 Provide a device having an overall precision within ±1.0 mm (±0.04").

.4 Arrange the elevator controls so that the output from this device is read at least every 5 ms.

.5 Transmit the signal from this device either in serial format using a standard protocol (e.g, CAN) or in parallel format using low impedance (less than 10 kilohms) inputs.

.6 If the transducer is a relative (pulse counter) type rather than an absolute encoder type:

.1 Provide gray encoding so as to indicate the direction of movement of the car and to offset 'false' counts caused by vibration;

.2 In the event of a counter error reset the position with an accuracy within ±2.5 mm (±0.1") by returning the car at low speed to a fixed point in the hoistway.

2.10 Emergency brake

.1 Provide an emergency braking device to prevent uncontrolled movement of the elevator.

.2 Mount the emergency brake directly on the machine beams in accordance with the instructions of the manufacturer of the device or, if some other mounting arrangement is used, provide a certificate from a structural engineer confirming that the mounting arrangement is satisfactory.

.3 Provide a device separate from and independent of the normal elevator stopping devices.

.4 Provide a device that applies to the elevator lift cables.

.5 Arrange that the braking device applies if:

.1 The elevator overspeeds;

.2 The elevator moves away from the floor with the doors open.

.6 Restrict the deceleration effected by the emergency braking device to between 25% and 75% of gravity.

.7 Arrange the device to restrict the distance the elevator is allowed to move away from the floor with the doors open to less than 400 mm (16").

.8 Arrange the device so that it is actuated at a sufficient distance from the buffer — relative to the speed of the elevator — so as to prevent the counterweight striking the buffer at a velocity in excess of the rated velocity of the buffer.

.9 Provide a manually reset electrical switch arranged to disconnect power to the elevator motor and brake when the emergency braking device is actuated.

.10 Provide a device capable of being applied for test purposes without damage to the device or to the other elevator equipment.

.11 Arrange the device so that it can be reset and the elevator put back into service only from the elevator machine room.

.12 Arrange that the device and its component parts are readily accessible for maintenance.

.13 After correctly adjusting the device, seal it with a numbered seal so as to prevent un-authorized re-adjustment.

.14 If necessary, provide a structure with isolation pads to lift the machine for the installation of the emergency braking device.

2.11 Governor

.1 Provide a governor with sealed bearings, complete with movement transducers, switches and other devices as may be necessary to interface with the elevator speed control system.

.2 Provide a governor rope suitable for use with the governor.

2.12 Controller

.1 Provide a micro-processor based controller designed to give the required operation as herein specified.

.2 Mount panels securely on substantial, self supporting steel frames designed for floor or wall mounting.

.3 Provide completely enclosed controllers with covers.

.4 Do not mount equipment on the covers unless:

.1 Its wiring is designed to support bending caused by opening and closing the cover;

.2 Its wiring is protected against damage;

.3 If damages happen to the equipment mounted on the cover or the wiring of this equipment, the unit will continue to operate normally.

.5 Where relays are used, provide those having a design electrical life and mechanical life equivalent to thirty years operation in the given application, with their contacts designed for maximum conductivity and wiping action.

.6 Provide electronic time delay devices which employ stable capacitors or crystals as the time base.

.7 Install wiring on the controller, whether control or field wiring, in a neat workmanlike order and make connections to studs and terminals by means of solder or solderless lugs, or similar connecting devices.

.8 Mark relays, contactors, fuses, printed circuit boards and other components clearly and permanently with designations as shown on the schematics.

.9 Mount the designations for plug in components on the controller adjacent to the component; do not mount the designation on the plug in component.

.10 Provide a written guarantee from the control manufacturer that over the life of the installation software and firmware updates will be provided at no charge to the Owner.

.11 Install the controller in a dedicated control room and not within the hoistway.

2.13 Computing devices

.1 Where computing devices are used, such as micro-processors or mini-computers, along with associated devices, design to the following requirements:

.1 Isolate the inputs from external devices (such as push-buttons) and isolate the outputs to external devices (such as indicators) by means of relays or optical devices;

.2 Provide the control program on read-only-memory with spare capacity to allow for future programming modifications and extensions;

.3 Provide crystal regulation of frequency;

.4 Provide for separate regulated power supplies to serve each micro-processor system.

2.14 Speed control: non-regenerative

.1 Provide a closed loop negative feedback control system.

.2 Include in the system the following features:

.1 A pattern generator to give a velocity input signal modified by position with constant peak acceleration and constant peak change of acceleration;

.2 A digital or analog tachometer generator to provide a velocity feedback signal;

.3 A digital transducer to provide a position feedback signal;

.4 A current transformer to provide a current feedback signal.

.3 Provide the following safety devices:

.1 Means to stop the elevator in the event the error exceeds five percent of the signal;

.2 Means to stop the elevator in the event the acceleration exceeds the normal acceleration by more than fifteen percent;

.3 A circuit to cut off power in the event of excessive power module switching time;

.4 Means to cut off power in the event of overheating of the solid state components;

.5 A circuit to initiate a slowdown and stop at the next floor in the event of a disagreement between the position as derived from the digital transducer and the position as derived from the integration of the velocity feedback signal.

.4 Arrange the response of the system so that the elapsed time between the detection of a fault and the cut off of power does not exceed 100 milliseconds.

.5 Provide protective devices so arranged that any one fault will not cause risk of injury to the passengers.

.6 Arrange that, if a fault occurs such that a subsequent fault could cause an unsafe condition, the fault will be detected and the elevator shut down.

.7 Provide resistors to absorb power produced by the machine under negative loads.

2.15 Power interruption restart

.1 Provide means so that the elevator system will restart automatically in the event of power interruption.

.2 Where volatile memories are provided for position and other data necessary to the continuing operation of the elevators, provide means of preserving this data on power failure or fading ('brownout') for a minimum of four hours and means of automatic recovery upon restoration of normal power.

2.16 Control circuits grounding

.1 Arrange the control circuits so that one side of the control power supply for external circuits is grounded to facilitate testing and trouble shooting.

.2 An external circuit is defined as one wired outside micro-processors or solid-state devices, as for example, buttons, relays, lights, limits, locks and such similar devices.

.3 Arrange that accidental grounding in the control system will not defeat the safety circuits.

2.17 Main floor elevator markings

.1 Provide at the main floor, for each elevator designated as a Firefighter's Elevator, a suitable symbol such as a Firefighter's Hat.

.2 Provide at the main floor for each elevator a numeral indicating the number of the elevator.

.3 Provide markings as selected by the Owner.

.4 Provide samples for review.

2.18 Entrance floor markings

.1 Provide, on each hall entrance jamb, raised tactile and braille metallic markings to designate the floor.

.2 Provide markings as selected by the Owner.

.3 Provide samples for review.

2.19 Floor marking: hoistway

.1 Identify each landing by means of markings on the inside of the hoistway.

.2 Place these markings so that people in a stalled elevator will be able to readily see the floor marking upon opening the car doors.

.3 Use a stencil to ensure that the floor markings are neat and uniform in appearance.

.4 Provide numerals and letters approximately 100 mm (4") high and of a clearly contrasting colour to the colour of the doors and fascias.

2.20 Hoistway switches

.1 Provide new pit stop switches.

.2 Provide new hoistway switches.

2.21 Car door restrictor

.1 Provide a car door restrictor to mechanically prevent the opening of the car door from inside the cab unless the elevator is in the door unlocking zone.

.2 Provide a device that does not require electrical or electronic components to function.

.3 Provide vertically mounted car door steel angles arranged to interlock with steel angles vertically mounted on the hoistway front wall so arranged as to prevent the car door from opening unless the elevator is in the door unlocking zone.

2.22 Car and hoistway door safety retainers

.1 Provide safety retainers at the top and bottom of horizontally sliding doors to retain the closed door panel in position if the primary guiding means fail.

.2 Provide retainers that will prevent the displacement of the door panel top and bottom by more than 20 mm (0.8") when the door panel is subjected to a force of 5 000 N (1130 lbf) applied towards the hoistway at right angles to the panel over an area of 300 mm by 300 mm (12" by 12") at the centre of the panel.

.3 Provide retainers that will withstand, without detachment or permanent deformation, a force of 1 000 N (225 lbf) applied upward at any point along the width of the door panel together with an additional concurrent force of 1 100 N (250 lbf) applied at right angles to the door at the centre of the panel over an area of 300 mm by 300 mm (12" by 12").

.4 Arrange that the retaining means are not involved in the guiding of the panel and are not subjected to wear or stress during normal door operation.

2.23 Hoistway entrance lunar key access

.1 Provide lunar key access for each hoistway entrance.

2.24 Door friction

.1 Adjust the doors so that with the door closing device disconnected, the doors can be started into motion, from any position, with a force of less than 25 newtons (six pounds) per door panel applied horizontally at the mid-point of the door in line with the direction of movement of the door.

2.25 Door detector: multiple beams: rear entrance

.1 Provide a multiple infra-red beam door detector device.

.2 Design and locate the receivers and emitters so that the active area of the door opening, i.e. the full width and from within 25 mm (1") of the floor to a height of 1800 mm (6'), is protected, such that a person or object passing through the car entrance causes the doors to re-open.

.3 Position the receivers and emitters at least 25 mm (1") back from the leading edge of the door.

.4 Provide logic control to ensure that each receiver receives light from every emitter.

.5 Arrange that if the system fails to provide protection over the active area of the door opening, the elevator will park at the current floor with its doors open and the lights off, or the system will go over to nudging operation.

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.6 Provide a signal on the unit or in the machine room to indicate that a failure has occurred.

.7 Should a door protective device be operated continuously for more than 20 seconds after the elapse of the normal door open time, cause the doors to go over to nudging operation.

.8 Arrange the nudging operation as follows:

.1 Cause the doors to close slowly under reduced power;

.2 Operate a buzzer in the car panel as a warning to the person obstructing the door;

.3 Cause the 20 seconds to be reduced to 6 seconds until a normal door cycle is performed.

.9 Supply a device, reliable and consistent in operation, not affected by dust or temperature changes, and having inherent long term reliability with minimum maintenance.

2.26 Door operator: rear entrance

.1 Provide a heavy duty door operator to open and close the car and hoistway doors simultaneously.

.2 Mount the operator on the cab above the car doors.

.3 Provide either:

.1 An alternating current motor, either standard or linear induction type, with associated variable voltage and variable frequency solid state drive to control the speed and torque of the door operator, or;

.2 A direct current motor with associated solid state drive to control the speed and torque of the door operator.

.4 Provide as a minimum a 375 W (0.5 HP) motor.

.5 Provide dual drive arms for centre-opening doors.

.6 Provide GAL MOVFE or approved equivalent.

.7 Provide a solid state door operator control incorporating negative feedback circuits for position, acceleration, velocity and torque.

.8 Provide event logging with non-volatile memory so as to retain the event log under power-off conditions.

.9 Provide fully automatic installation algorithm profiles that self-adjust the motion profile for the relevant parameters.

.10 Provide an output from the door control for a pre-start command to the elevator speed control system.

.11 Provide optical isolation for input and output signals.

.12 Provide signal line short circuit protection.

.13 Provide a serial input to the door control to allow adjustment of speed, acceleration, torque and pre-start point using a notebook computer or keypad.

.14 Provide the keypad or software for a standard notebook computer.

.15 Arrange that the settings for the door operator can be uploaded to the keypad or notebook computer and then downloaded to another identical operator.

.16 Provide an average door closing speed of 300 mm (12") per second, respecting the parameters for door force and door inertia as set out in the elevator code.

.17 Provide an average door opening speed of 700 mm (28") per second.

.18 Provide, either in the door operator control or in the main elevator control, means to automatically recycle the doors in the event that they stall during the opening or closing operations.

.19 Design the door operator and associated components for a minimum of noise.

2.27 Hoistway doors: refurbishing

.1 Replace existing hall door hanger rollers with plastic insert rollers and provide new plastic insert hall door hanger rollers for the rear entrance.

.2 Check and replace switches, interlocks, gibs, rollers, cables, hangers and all other door components that have more than 10 per cent wear for the front entrance.

.3 Replace gibs, rollers, hangers and all other door components for the rear entrance.

.4 Provide new interlocks for the rear entrance.

.5 Provide a new car door gate switch for the rear entrance.

.6 Provide new spirator door closers for each entrance.

.7 Provide new clutches or vanes so that the master door operator can drive the hoistway doors for the rear entrance.

.8 Provide new relating cables for the rear entrance.

.9 Install sound absorbing materials so as to eliminate interlock noise.

.10 Replace astragals (car and hall doors).

.11 Clean, lubricate and re-adjust car and hoistway door equipment.

.12 Adjust the doors so that with the door closing device disconnected, the doors can be started into motion, from any position, with a force of less than 25 Newtons per door panel applied horizontally at the mid-point of the door in line with the direction of movement of the door.

.13 Adjust the hoistway door rollers so as to obtain 6 mm (1/4") clearance from the car sill and on either side of the skate.

.14 Adjust the hoistway door roller pressure so that when engaged in the skate both rollers exert a firm pressure on the skate.

.15 Eliminate any rattles, loose connections or worn bearings that might cause noise.

2.28 Car station

.1 Provide one main car operating panel.

.2 Provide in the panel the devices required for normal automatic operation, including the following:

.1 Floor push buttons;

.2 Door open button;

.3 Door close button;

.4 Alarm button;

.5 Emergency communication button inset into the car station with a protective surround.

.3 Number the car call buttons to correspond to the floor served.

.4 Provide in conjunction with the car buttons a call registered light for each button to be lighted when the button is pressed and extinguished when the car stops at the

selected floor.

.5 Secure tactile markings using hidden fasteners.

.6 Provide a Firefighters' Emergency Operation cabinet on the main car station in accordance with the Code.

.7 Provide a locked service cabinet, its size and location to match the Firefighters' Emergency Operation cabinet, containing the following:

.1 Light key switch;

.2 Fan key switch;

.3 Independent service key switch;

.4 Inspection key-switch;

.5 Voice annunciation on/off key-switch;

.6 Emergency lighting test switch;

.7 GFCI duplex receptacle (Run the wires for this receptacle separately from the wires for the other car light and ventilation equipment and connect it to a separate breaker in the machine room).

.8 Provide, only when required by the prevailing codes, a stop switch located in the service cabinet, arranged to stop the elevator and to duplicate the functions of the alarm button.

.9 Engrave the car station with markings and signage such as car capacity, elevator number and other markings required by the prevailing codes and local regulations including remote location of device licenses where available.

.10 Ensure that engravings and button designations are easily read when viewed at an angle from any normal standing position in the elevator cab within arms reach of the car station.

.11 Hinge the car station faceplate so that it can be swung open towards the adjacent cab side wall to allow access for servicing of the inner components of the car station.

.12 Provide a hinge capable of supporting without distortion a test weight of minimum 11 kg resting on the panel non-hinged edge with the panel swung open.

.13 Secure the car station in the closed position using countersunk spanner head fasteners or approved equivalent.

.14 Arrange the car station so that it can be swung open without interference from the cab flooring, cab wall, cab handrails or other cab appurtenances.

2.29 Signal lights

.1 Provide LED position indicators and call registered lights having a minimum contrast ratio of 8:1 throughout a life expectancy greater than 100,000 hours.

.2 The contrast ratio is to be determined by subtracting the brightness of the indicator background from the brightness of the marking and then dividing the result by the brightness of the background.

.3 Arrange that the variation in intensity and contrast ratio between position indicators does not exceed 5 percent.

.4 Arrange that the variation in intensity and contrast ratio between call registered lights does not exceed 5 percent.

.5 All measurements are to be made in ambient lighting conditions meeting Code requirements.

2.30 Cab fan and light 'Green Control'

.1 Arrange that the cab lights and fan are turned off in five minutes when:

.1 The elevator is level at a floor;

.2 The elevator doors are closed;

.3 The elevator has not been selected to answer a call;

.4 The elevator is on automatic operation;

.5 The elevator safety circuit (including interlocks) is intact.

.2 Should any of the above conditions no longer obtain or when emergency communication devices are initiated, turn the car lights and fan on within 0.5 seconds.

2.31 Car position annunciator

.1 Provide automatic verbal announcement to announce the floors and to provide floor passing tones.

.2 Provide a unit to meet the requirements of the Code.

.3 Provide means in the service cabinet to adjust the volume over a range from 55 and 70 decibels.

.4 Use a female voice for the announcements.

2.32 Car position indicator: digital readout

.1 Provide a digital car position indicator mounted in each car operating panel.

.2 Arrange the indicator to display a number or symbol at least 50 mm (2") high.

.3 Indicate the position of the car at all times, corresponding to the landing through which the car is passing or at which it is stopped.

.4 Provide a segmented display using light emitting diodes with a minimum of 16 segments per character.

.5 Arrange the circuits so as to provide continuous indication of car position.

.6 Overlapping dual indication, when the elevator is between floors, is acceptable.

.7 Cover the opening for the existing analogue car position indicator above the entrance in a seamless manner, replacing, if necessary, the existing transom.

2.33 Emergency lighting

.1 Provide a back-up battery power system for alarm bell operation and emergency cab lighting.

.2 Install the emergency lighting lamp at the top or upper reaches of the car station unless otherwise required by the site Architectural cab design.

.3 Provide a lighting level of at least 11 lux of illumination at the car operating panels for a minimum period of four hours, using at least four LED lamps of equal rating.

.4 Cause the lamps to be immediately energized in the event of a power failure or electrical fault de-energizing the normal elevator lighting circuit.

.5 Provide for the automatic disconnection of the lamps and the automatic recharging of the lighting unit when normal power is restored to the elevator lighting circuit.

.6 Provide a rechargeable battery of the hermetically sealed type, or of a type which provides a reserve of electrolyte, capable of operating unattended and requiring no addition of water or electrolyte for a period of not less than ten years, with provision for visual checking of the electrolyte level without opening the battery or removing caps or fittings.

.7 Arrange the battery charging to operate automatically upon restoration of normal power to the unit, to remain in operation until the battery is fully recharged and to maintain the battery at full rated capacity at all times when the unit is not in operation.

.8 Provide a pilot lamp to indicate that the normal power supply to the unit and battery charging is in operation.

.9 Arrange that the unit can be conveniently tested and operated manually.

.10 Install the unit as part of the car so that it is not readily removed.

.11 Do not provide portable equipment.

.12 Install the lamp fixture above the car station.

.13 Provide an emergency lighting test switch in the car service cabinet or behind the car swing return.

2.34 Telephone: hands-free operation

.1 Provide a hands-free telephone with automatic dialer capable of initiating and receiving calls.

.2 Integrate the telephone into the car station.

.3 Provide a push button to initiate the telephone connection.

.4 Arrange that the telephone connection can be initiated by an external call.

.5 Provide an indicator light to confirm that communication has been established.

.6 Pierce the car station for the push button and indicator light with the indicator light mounted flush with the panel.

.7 Provide a speaker/microphone for communication.

.8 Pierce the car station in front of the speaker with multiple holes 3 mm (1/8") in diameter to allow passage of sound to and from the speaker.

.9 Identify the telephone and the button with a raised symbol and Braille.

.10 Provide wiring for the telephone from the cab to the machine room.

.11 Provide a communication station in the machine room.

.12 Connect the wiring on the car to a terminal block mounted in or adjacent to the

telephone box.

.13 Terminate the wiring in the machine room at a separate enclosed external terminal block mounted on the controller.

.14 Provide the terminal block and its enclosure and locate it so that personnel other than elevator mechanics can easily run their conduit and wiring to these terminals without interfering with or touching the elevator wiring or controls.

.15 Where more than one controller is in a common machine room bring wiring to one common terminal block.

.16 Clearly mark the terminal block.

.17 Provide wiring of the twin conductor shielded type with grounded shields.

.18 Provide equipment and wiring compatible with and acceptable to the telephone company providing service to the project.

.19 Provide material and labour as necessary so as to ensure that the communication system meets the requirements of the Code.

2.35 Security system

.1 Provide for the future installation of an elevator card reader security system.

.2 Provide accessible space, mounting supports and wiring for a security antenna in the cab main front return panel.

.3 Provide a free space 100 mm (4") in height, 175 mm (7") in width and 75 mm (3") in depth centred behind the car panel insert for the security antenna installation.

.4 Provide in front of the security antenna a translucent polycarbonate cover.

.5 Provide an elevator security interface box in the machine room mounted on the side of an elevator controller.

.6 Provide wiring from the car station card reader to the security interface box using standard connectors.

.7 Interface with the security system using serial data transfer.

.8 Provide a signal, unique for each car call, to the security system when a car call "request" (which could either be by means of a button or touch screen) is entered and enter the car call when a return signal is received from the security system validating the request.

.9 Arrange that the elevator system functions without restriction by the security system when Firefighters' Emergency Operation or independent service is operative.

.10 Until such time as the security system is installed, arrange that the elevator system functions without restriction by the security system.

.11 Provide any incidental elevator material and elevator work necessary to obtain a complete functioning elevator security system.

.12 Submit for review, interface box drawings, location drawings and electrical schematics.

2.36 Closed circuit camera security system

.1 A closed circuit camera (CCTV) will be installed in the cab by others.

.2 Provide wiring from the camera in the cab to a designated point in the machine room as follows.

.3 Provide one RG6/U stranded centre conductor coaxial cable and one pair 18 gauge stranded conductor cable within an overall braided shield or such other interconnections as may be required by the CCTV contractor.

.4 Run the interconnecting wiring from the elevator security interface box in the machine room to the top of the elevator cab.

.5 Provide an excess loop of 3050 mm (10') of cable at either end.

.6 Provide a cable access hole in the top of the cab at the camera location.

.7 Provide a 110 vac power source on the cab to power the camera.

.8 Provide assistance to the CCTV contractor for the installation of the camera.

2.37 Hall push button stations

.1 Replace the existing hall push button stations with new hall push button stations.

.2 Provide at the intermediate floors, for each station, up and down push buttons located one above the other and call registered lights.

.3 Provide at the upper terminal and lower terminal, for each station, a single button and call registered light.

.4 Illuminate the call registered light only when there is an elevator in service to respond to the call.

.5 Install the stations substantially flush with the wall (i.e. do not use surface mount stations).

.6 Secure the hall push button stations to the wall using countersunk spanner head fasteners or approved equivalent.

2.38 Hoistway access switch

.1 Provide hoistway access switches in accordance with the Code.

.2 Locate the switches in the entrance frame or in the sight guard in an inconspicuous place.

2.39 Cab ventilation

.1 Provide an exhaust fan capable of developing 30 pascals (0.1" H_2O) static pressure differential with a minimum capacity of 165 litres per second (350 cfm).

.2 Provide a two speed motor for the fan with the speed control located in the car operating panel.

.3 Arrange that the increase in noise level caused by the fan, measured in the car with the fan running at maximum speed, does not exceed 3 decibels.

2.40 Cab handrails

.1 Provide 50 mm (2") diameter tubular stainless steel handrails on non-access walls of the cab at barrier free height with tapers at the ends.

.2 Fasten the handrails to a rigid structure behind the car panels.

2.41 In car lanterns and gongs: applied

.1 Provide in car lanterns complete with electronic gongs at each side of the elevator cab entrance to indicate the future direction of the elevator.

.2 Mount the lanterns on the car entrance columns.

.3 Arrange the lanterns and circuits so that as the car doors start to open in response to a call, the lanterns illuminate and the gong strikes.

.4 Sound the gong once to indicate the up direction and twice to indicate the down direction.

.5 Maintain the lantern illuminated until the car has stopped and the door open time has elapsed.

.6 Do not illuminate the lantern on a door re-open unless the re-open is caused by a reversal of direction of travel of the car.

.7 Arrange the operation of the lanterns and gongs to comply with requirements for persons with physical disabilities.

.8 Provide LEDs for illumination.

.9 Design the fixture so that the lamps may be readily changed. Do not mount any equipment to the covers; arrange that the covers can be removed completely without disturbing the electric wiring.

2.42 Hall position indicator: digital

.1 Replace the existing hall position indicator with a new digital position indicator.

.2 Arrange the indicator to display a number or symbol at least 50 mm (2") high.

.3 Indicate the position of the car at all times, corresponding to the landing through which the car is passing or at which it is stopped.

.4 Provide a segmented display using light emitting diodes with a minimum of 16 segments per character.

.5 Arrange the circuits so as to provide continuous indication of car position.

.6 Overlapping dual indication, when the elevator is between floors, is acceptable.

.7 Cover the opening for the existing position indicator in a seamless manner, replacing, if necessary, the existing transom.

2.43 Roller guides: retain

.1 Retain the existing roller guides.

.2 Replace any worn or deformed rollers with new rollers true and free from deformations of the surface and with a tolerance on the circumference of 0.05 mm (0.002") total indicator reading.

.3 Replace worn or noisy bearings.

.4 Adjust the roller to secure good contact with the rail.

2.44 Guide rails: retain

.1 Retain the existing guide rails and brackets.

.2 Ensure that the guide rail system is of structural strength and rigidity sufficient to limit the horizontal deflection of the guide at any point to less than 0.6 mm (0.025") under normal conditions of operation.

.3 Align guide rails with a variation of not more than 1.6 mm (0.06") over any 6 m (20') section and with a maximum variation of not more than 0.8 mm (0.03") in 30 mm (1").

.4 Ensure that the guide rails and brackets are installed in a strong and substantial manner.

.5 Extend rails to within less than 300 mm (12") and more than 150 mm (6") of the pit floor and to within less than 300 mm (12") and more than 150 mm (6") of the underside of the overhead slab.

2.45 Machine room equipment guarding: global: retain

.1 Retain the existing machine room equipment guarding.

.2 Where required, provide new machine room equipment guarding or modify the existing machine room equipment guarding as follows:

.1 Provide, in accordance with the Ontario Ministry of Labour and TSSA requirements, complete guards for the machine room equipment to protect against potential hazards.

.2 Provide global guards consisting of protective wire mesh screen barricades.

.3 Provide drawings of the guarding under the seal of a Professional Engineer.

.4 Where expanded metal screens are used for guards construct them of minimum 2.2 mm thick metal so supported and braced as to deflect not more than 15 mm when subjected to a force of 450 N applied horizontally to the screen at any point.

.5 Arrange the guards so as to prevent hands, arms, or any other part of a worker’s body from coming in contact with moving parts

.6 Affix the guards in a strong and substantial manner so that they cannot be accidentally removed.

.7 Construct the guards of durable materials that can withstand the workplace conditions.

.8 Ensure that the guards do not themselves create a hazard (such as shear point, a jagged or sharp edge).

.9 Arrange the guards so as not to impede a worker from performing the Work efficiently and conveniently.

.10 Finish the metal components of the guarding devices in a bright yellow paint with one base primer coat and two finishing coats or, alternatively, in baked enamel, so as to make them highly visible.

.11 Ensure that the global protection respects the maintenance path and clearance requirements set out in the Code and in particular the 450 mm (18") clearance requirement.

.12 Provide removable guards such that regular maintenance procedures can be performed.

.13 Provide guards removable only with the use of a tool.

.14 Provide machine room equipment guarding in accordance with the prevailing regulations.

.15 Make the necessary submissions to the TSSA and obtain approval of the submissions.

.16 Provide an entry in the elevator maintenance logbook confirming that the elevator controller covers and doors are closed and that the machine room guards are in place and functioning properly, this entry to be checked when performing regular maintenance.

.17 Where the status (in motion or stationary) of the lift machine cannot be visually determined as viewed from the disconnect switch, provide at the machine a manually opened and closed stop switch to prevent movement of the elevator.

2.46 Counterweight balance

.1 Statically balance the counterweight so that, at the centre of the travel, with the top guiding means removed, the counterweight hangs in the centre of the rails.

.2 Arrange the equipment so that there is, in this position, with the guiding means properly adjusted, no pressure upon the guides.

.3 Adjust the guiding means so that the pressure upon any guide at any point in the travel does not exceed 110 Newtons (25 pounds).

2.47 Counterweight

.1 Make the counterweight equal to the weight of the complete elevator car plus between 40 percent and 45 percent of the rated load.

.2 Provide counterweight guards where required by Code.

2.48 Car balance

.1 Statically balance the car so that, at the centre of the travel, with the top guiding means removed, the car hangs in the centre of the rails.

.2 Arrange the equipment so that there is, in this position, with the guiding means properly adjusted, no force upon the guides.

.3 Make this test with empty car and car doors closed.

.4 Locate and adjust devices such as the compensating devices, travelling cable hangers and cab balancing weights so that the force upon any guide at any point in the travel does not exceed 110 Newtons (25 pounds) with empty car and car doors closed.

2.49 Limit switch dowelling

.1 After the final limit switches are adjusted and prior to the performance of safety tests and checks by the inspecting authorities, fasten, by throughbolting or dowelling, the final limit switches and final limit switch brackets so as to minimize the possibility of future incorrect adjustment.

2.50 Car ride

.1 Improve upon the existing ride quality as much as possible in an effort to attain:

.1 Arrange that the horizontal acceleration front to rear or side to side measured in the car with the elevator travelling, with a load of less than 10 per cent of capacity, from top to bottom and bottom to top does not exceed 0.15 m/s^2 (0.5 ft/s^2) measured between two consecutive points of opposite value.

.2 Arrange that the vertical acceleration measured in the car with the elevator travelling, with a load of less than 10 per cent of capacity, from top to bottom and bottom to top at contract speed, does not exceed 0.10 m/s^2 (0.3 ft/s^2) measured between two consecutive points of opposite value.

2.51 Traction elevator emergency power device

.1 Provide a device to automatically move the elevator to a floor in the event of power failure.

.2 Arrange that when normal power fails, sufficient power is provided by the device to lift the brake, cause the elevator to move to a floor, open the doors and then remove the elevator from service until normal power is restored.

.3 Provide batteries complete with charging system to power the unit.

.4 Provide batteries having a minimum life expectancy of ten years.

2.52 Painting

.1 Ensure that machine room and hoistway equipment, except for machined surfaces and non-rusting surfaces, is protected with rust inhibiting primer of a neutral colour.

.2 Where rust has developed on the existing equipment, brush the surface to the bare metal and re-paint.

.3 Clean and paint the machine room floor.

.4 Clean and paint the pit floor.

.5 Clean and paint the car top.

2.53 External connections

.1 Provide a junction box on the external wall of the hoistway at a point to be designated later for connections for such items as telephones, CCTV, lobby panels, monitor systems, to external locations such as the CACF Room.

.2 Locate this box as instructed and provide clearly marked terminal blocks for the wiring connections.

.3 Supply the required wiring for the connections from this box to the external locations (provision of external conduit and pulling of wiring by others).

2.54 Travelling cable

.1 Provide travelling cables with flame-retarding and moisture-resisting outer covers and stranded conductors.

.2 Supply cables approved for elevator use.

.3 Provide in the travelling cables:

.1 14 AWG (1.5 square mm) conductors for current-carrying circuits;

.2 18 AWG (0.75 square mm) conductors for signal circuits;

.3 20 AWG (0.5 square mm) shielded pair conductors with shielding for telecommunications circuits and data circuits;

.4 one RG6/U stranded centre conductor coaxial cable and one pair 18 gauge stranded conductor cable within an overall braided shield for closed-circuit television.

.4 Provide ten percent additional minimum spare signal and current-carrying wires in each cable.

.5 Terminate cables using terminal blocks or suitable connectors having identifying numbers to facilitate replacement and service.

.6 Suspend light weight cables using a wire mesh sleeve to relieve strain in the individual conductors and heavier cables using a steel supporting strand if the suspended weight exceeds 35 kg (seventy-five pounds).

2.55 Electric wiring

.1 Provide wiring required to interconnect the new equipment.

.2 Provide copper wire.

.3 Provide insulated wiring having a flame retarding and moisture resisting outer cover.

.4 Where flexible conduit is used, supply it in aluminum.

.5 Provide travelling cable to connect car operating panels and other car operating devices to the controller in the machine room.

.6 Where shielded wire is specified, provide wire of not less than 0.52 mm^2 area (20 gauge) having individually shielded pairs with 100% shielding.

.7 Provide colour or number coded wires in multiwire cables.

.8 Provide waterproof terminal labels.

.9 Provide stranded field wire except for the individual wires in multiwire cables which may be either stranded or solid.

.10 Provide a minimum of ten percent spare wires throughout the elevator wiring signal runs.

.11 Provide, if required by the inspecting authorities, in the main machine room or auxiliary machine room, additional main line safety disconnect switches and associated wiring.

3 Execution

3.1 Operation: simple

.1 Provide a micro-processor based simplex control for the elevator.

3.2 Operation: call response

.1 Store all hall and car calls in the control memory until answered.

.2 Cancel a call when it is answered by a car.

.3 Stop a running car at the first landing for which a car call is registered.

.4 Stop a running car for a hall call registered for the same direction as the car is travelling, subject to higher priority assignments and to load in the car.

3.3 Operation: dispatch recovery

.1 If a hall call remains registered for longer than 60 seconds and within that period the cars are not running, dispatch all cars and run without dispatch delay or assignment until all registered hall calls are cancelled.

3.4 Operation: car call anti-nuisance feature

.1 Arrange the control circuits to cancel all car calls when an unreasonable number of car calls has been registered relative to the number of passengers in the car.

.2 Prevent nuisance car calls by:

.1 Not allowing car calls to be registered below the current position of an up travelling car;

.2 Not allowing car calls to be registered above the current position of a down travelling car;

.3 Or, by cancelling car calls when the car reverses direction.

3.5 Operation: call initiation

.1 Control the elevator automatically by buttons in the car, marked to correspond with the respective landings served, and by the call buttons at the landing stations.

.2 Register a call by momentary pressure of a button.

3.6 Operation: high & low call return

.1 Cause the car to proceed to the calls until it has come to the limit of calls placed in the direction in which it is travelling, and having done this, subject to the assignment of the dispatch system, to reverse direction.

.2 Do not stop the car, except in the case of high and low return, for hall calls in the opposite direction to the direction of the car.

3.7 Operation: coincident calls

.1 Assign a hall call to an elevator with a car call at the same floor if the elevator is travelling in the same direction as the hall call.

3.8 Operation: direction reversal

.1 Cause a car without registered car calls, arriving at a floor where both up and down hall calls are registered, to initially respond to the hall call in the direction that the car was travelling.

.2 If, subsequent to the stop at this landing, there are no car or hall calls registered such as to require immediate travel in the same direction as before stopping at that landing, cause the car to close its doors, immediately reopen them and respond to the hall call in the opposite direction.

3.9 Operation: fault recovery

.1 Provide a recovery circuit arranged to take the elevator at low speed to the next floor in the event of an overspeed condition, overload trip, or other similar fault condition.

.2 Do not implement the recovery circuit if the movement of the car would endanger the passengers in the car.

.3 Provide a circuit separate from the normal speed control circuits, with power derived through separate controls and limited in power by resistance or fixed devices to an appropriate low level.

.4 Do not use, in this circuit, any solid state or other device which could fail in a mode that would allow an increase in applied power.

.5 Upon arrival of the car level at the next floor, cause the doors to open and remain open, and turn off the car lights.

.6 Leave the elevator in this state until the fault is corrected and the car restored to service.

3.10 Operation: independent service

.1 Provide independent service.

.2 On independent service:

.1 Remove the car from the automatic supervisory control system;

.2 Arrange the circuits so that the car does not respond to hall calls;

.3 Render the hall lanterns (if provided) inoperative;

.4 Cause the car to park with its doors open;

.5 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;

.6 Cause the doors to reopen if the button is released at any time up to the point at which the elevator starts to move;

.7 Render inoperative the normal door protective devices;

.8 Arrange the controls so that the attendant can select direction of travel;

.9 Cancel all registered car calls when the direction reverses or a car call is answered.

.10 Arrange the independent service operation so that it does not override security features or security systems.

3.11 System clock

.1 Where operations or functions are subject to clock control or require clock input, provide a solid state clock.

.2 Provide, in the machine room or at the central control console, means to indicate the current clock time.

.3 Provide, in the machine room or at the central control console, means to readily reset the clock time.

.4 Provide crystal regulation of frequency and voltage control adequate to maintain the time within an accuracy of plus or minus five seconds per month.

.5 Provide software to automatically adjust the time for changes from standard to daylight saving time and from daylight saving time to standard time.

.6 Provide battery back-up to maintain for a period of at least 24 hours accurate clock time in the event of power loss.

3.12 Door protective device by-pass (nudging)

.1 Should a door protective device be operated continuously for more than 20 seconds after the elapse of the normal door open time, cause the doors to close slowly under reduced power and operate a buzzer in the car panel as a warning to the person obstructing the door.

.2 Cause the 20 seconds to be reduced to 6 seconds until a normal door cycle is performed.

3.13 Door open pause time

.1 Arrange the circuits so that when the car is stopped in response to a hall call the doors remain open a predetermined length [approximately 5 seconds for an elevator whose entrances are within 3 metres (10') of the hall push button and approximately 6 seconds for an elevator whose entrances are further than 3 metres (10') from the hall push button].

.2 Arrange that this predetermined length of time is reduced to approximately 0.7 seconds if a person moves through the entrance (as indicated by the actuation of the door protective device).

.3 Unless otherwise specified (e.g. to allow for advance hall lantern warning), arrange the circuits so that when the car is stopped in response to a car registered call the doors remain open a predetermined length of time (approximately 3 to 4 seconds).

.4 Make the times separately adjustable over a range from 0.25 seconds to 15 seconds.

.5 Arrange the circuits so that the door open pause time is cancelled if a car call button is pressed or the door close button is pressed.

3.14 Operation: door protective device

.1 Arrange the door protective device so that, should it detect a person or any object in its path, at any point during the door closing operation, it will cause the doors to return to the open position.

.2 Adjust both the detection device and the door operation so that an object or person in the way of the door will cause the doors to reverse without the door panel of either hall or car doors actually striking the object or person.

3.15 Deadweight or reaction change

.1 Weigh the car and the counterweight (where applicable) so as to determine the cumulative deadweight change (The cumulative deadweight change is the sum of previous deadweight changes and the current proposed weight change) where any of the following apply:

.1 Where the cumulative deadweight increase of the car is more than 11 kg (25 lbs).

.2 Where there is evidence of a previous cab modernization and the prior weight changes were not recorded.

.3 Where there is doubt as to the accuracy of the car crosshead data tag.

.2 If the cumulative deadweight increase of the car is more than 11 kg (25 lb):

.1 Record the car and counterweight weight change on an Auxiliary Data Tag;

.2 Post the Auxiliary Data Tag on the car crosshead.

.3 If the cumulative deadweight change is less than 115 kg (255 lb) and less than 5% of the weight of the originally installed elevator car plus elevator capacity:

.1 Record the car and counterweight weight change on an Auxiliary Data Tag;

.2 Make the counterweight equal to the weight of the complete elevator car plus between 40 percent and 45 percent of the contract load;

.3 Post the Auxiliary Data Tag on the car crosshead.

.4 If the cumulative deadweight change is greater than 115 kg (255 lb) but less than 5% of the weight of the originally installed elevator car plus elevator capacity:

.1 Perform an engineering assessment of the installation with regard to the equipment which may be affected by the weight change including machine and sheaves, car and counterweight frame, buffers, traction and

overbalance, lift ropes, plunger strengths and working pressure, hydraulic components under pressure and safeties;

.2 Record the car and counterweight weight change on an Auxiliary Data Tag;

.3 Make the counterweight equal to the weight of the complete elevator car plus between 40 percent and 45 percent of the contract load;

.4 Post the Auxiliary Data Tag on the car crosshead.

.5 If the cumulative deadweight change is greater than 5% of the weight of the originally installed car plus the elevator capacity:

.1 Perform a full engineering assessment of the installation with regard to all equipment which may be affected by the weight change including machine and sheaves, car frame and counterweight, buffers, traction and overbalance, lift ropes, plunger strengths and working pressure, hydraulic components under pressure, safeties, car frame and platform, capacity and loading, governors, guide rails, beams, supports and foundations;

.2 Record both car and counterweight changes on the Auxiliary Data Tag;

.3 Make the counterweight equal to the weight of the complete elevator car plus between 40 percent and 45 percent of the contract load;

.4 Post the Auxiliary Data Tag on the car crosshead.

.6 Where alterations increase the original building design reactions by more than 5%:

.1 Perform a full engineering assessment of the installation with regard to all equipment which may be affected by the reaction change including machine and sheaves, car frame and counterweight, buffers, traction and overbalance, lift ropes, plunger strengths and working pressure, hydraulic components under pressure, safeties, car frame and platform, capacity and loading, governors, guide rails, beams, supports and foundations;

.2 Record both car and counterweight changes on the Auxiliary Data Tag;

.3 Make the counterweight equal to the weight of the complete elevator car plus between 40 percent and 45 percent of the contract load;

.4 Post the Auxiliary Data Tag on the car crosshead.

.7 Provide an Auxiliary Data Tag to meet the requirements of latest edition of the Code.

.8 Enter, as a minimum, the following data on the Auxiliary Data Tag:

.1 The measured car weight prior to the alteration;

.2 The weight change of the car and counterweight;

.3 The year and month of the alteration;

.4 The name of the contractor who performed or supervised the work.

.9 For traction elevators, test the traction relations in accordance with the latest edition of the B44 code.

3.16 Noise level: door operation

.1 Arrange the equipment so that the noise level, as measured within the cab, does not exceed 60 decibels at any time during a full door open, door close and door reversal cycle.

.2 Initiate the door reversal by triggering the door protective device.

.3 Measure the noise level using an ANSI type 2 sound level meter on the "A" scale with an "F" response.

3.17 Noise level: cab

.1 Arrange that, with the elevator travelling from one end of the hoistway to the other, the noise level as measured within the elevator cab does not vary by more than 3 decibels.

.2 Measure this noise level with an ANSI type 2 sound level meter on the "A" scale with an "F" response.

3.18 Cab fan: operation

.1 Arrange that there is no discernible vibration in the car with the fan operating.

.2 Arrange that the noise level developed by the fan, measured in the car with the fan running, does not exceed 55 db.

3.19 Noise level: control and machine room

.1 Design the equipment so that the noise level with the elevator running, as measured by a meter positioned in the centre of the control and machine rooms, does not exceed 80 decibels.

.2 Measure this noise level using an ANSI type 2 sound level meter on the "A" scale with an "F" response.

3.20 Levelling

.1 Cause the car to stop automatically at floor level, without overshoot, regardless of load or direction of travel so that the car sill is level, within 6 mm (1/4"), with respect to the hoistway sill.

.2 When the elevator cab is stopped at a floor, correct for over travel or under travel or movement of the cab away from the floor, by returning the car imperceptibly to floor level.

3.21 Brake

.1 Arrange the brake to stop the elevator with full load in the car from full speed in the down direction with an average deceleration of approximately 1.2 m/s^2 (4.0 ft/s^2) without shock or jar.

.2 Adjust the brake to hold a minimum of 125 percent of the contract load.

.3 Design and adjust the brake so that when it operates no noise can be detected either in the elevator cab, at the top floor landing or outside the closed machine room door.

3.22 Speed control

.1 Design and adjust the equipment so that the average acceleration over the period of constant acceleration is 0.8 m/s^2 (2.6 ft/s^2) plus or minus 10%.

.2 Design and adjust the equipment so that the average change in acceleration (jerk) is 1.4 m/s^3 (4.6 ft/s^3) plus or minus 10%.

.3 Design and adjust the equipment so that the rated speed is maintained with an accuracy of 1.5 percent.

3.23 Safety tests

.1 Arrange the safety so that the car stops at both no load and full load on a safety test without excessive acceleration and without damage to the equipment.

3.24 Test data form: traction

.1 After completion of the Work, and prior to the inspection by the Consultant, submit a test data form certifying that the unit is complete and ready for inspection.

.2 Arrange that this form be signed by the person responsible for the performance of the Work.

.3 Include a check list of the items in the specifications as well as other performance data such as door times, operating times, brake-to-brake times, starting, running, stopping currents and voltages, slowdown and limit switch settings, governor settings, and, in general, settings of any adjustable devices.

.4 List on this form safety devices, together with their settings and indicate whether they have been checked and adjusted.

.5 Submit a soft copy of the data form in PDF (Acrobat Reader) format.

3.25 Operating time

.1 Adjust the equipment so that the elapsed time to travel one typical floor does not exceed the time shown in the data table.

.2 Measure this time under the following conditions:

.1 A typical floor height of less than 4000 mm (13');

.2 Floor levelling accuracy of ± 6 mm (1/4");

.3 Start time when the fully opened doors begin to close;

.4 Stop time when the car is stopped level with the next floor and the car and hall doors are 800 mm (32") open;

.5 Time measured with full load in the car and in both directions of travel;

.6 Power door operation for the hall and car doors conforms to the elevator code requirements.

.3 Adjust the equipment so that the operating time is compatible with dependable, consistent operation without undue wear or excessive maintenance and so that this operating time can be readily maintained over the life of the elevator installation.

.4 Adjust the equipment so that, with the control functioning so as to give the required time, the elevator operates under smooth acceleration and retardation and provides a comfortable and agreeable ride.

3.26 Firefighters' Emergency Operation: automatic recall

.1 Provide Firefighters' Emergency Operation including:

.1 Phase I automatic Emergency Recall Operation;

.2 Phase I Emergency Recall Operation to an alternate level;

.3 Phase II Emergency In-Car Operation.

.2 Provide switches and indicators in the hall and car stations as required by Code.

END OF SECTION

Section 14220 Hydraulic Passenger Elevator

1 General

1.1 General requirements

.1 Conform to Section 14200.

1.2 Type

.1 Modernization of one hydraulic passenger elevator.

1.3 Data

Hydraulic Elevator			
Item	Existing		Modernization
number of units	1		no change
designation	n/a		#2
licence number	67239		no change
application	passenger		no change
rated speed (m/s, fpm)	0.64	125	no change
capacity (kg, lb)	1,134	2,500	no change
motor power (kW, HP)	22.4	30	new
operation	simplex		no change
motor location	roof		no change
pump type	submerged		new submerged
jack type	buried		no change
hydraulic piping	provided		new, where needed
corrosion protection	PVC		no change
valve assembly	Maxton		new
drive type	buried hydraulic		no change
emergency brake	not provided		no change
heat exchanger	not provided		no change
tank heater	not provided		no change
scavenger pump	not provided		no change
overspeed valve	not provided		new
control system	Otis LRS2 500		new microprocessor
front entrances	*1, 2, 3, 4, 5, 6		no change
rear entrances	none		no change
car door type	single speed side opening		no change
hall door type	single speed side opening		no change

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Hydraulic Elevator			
hoistway door fire resistance			no change
entrance width (mm, “)	1067	42	no change
entrance height (mm, “)	2134	84	no change
entrance markings			new
cab width (mm, “)	2032	80	no change
cab depth (mm, “)	1295	51	no change
cab height to suspended ceiling (mm, “)	2286	90	no change
cab height to car top (mm, “)	2438	96	no change
car door restrictor	not provided		new, steel angles
door safety retainers	provided		new, where needed
door reopening device	infrared multi-beam		new
car door operator	Otis		new closed loop
hall door equipment	Otis		new, where needed
interlocks	Otis 6940A		no change
hall door closer	sill mounted spring closer		new spirator at all entrances
main car station	provided, applied		retain and modify
auxiliary car station	not provided		no change
verbal annunciation	not provided		new
car position indicator	provided in car station		no change
cab emergency lighting	provided in car station		no change
cab communication	provided in car station		no change
car CCTV camera	not provided		new
car call security	not provided		provisions
hall call security	not provided		no change
hall stations (typical)	single riser, flush mount		new, flush mount
hall stations (main floor)	single riser, flush mount		new, flush mount
hoistway access switches	not provided		new
cab ventilation			new
cab finishes	raised textured stainless steel panels		no change
hall door finish (typical)	painted		no change
hall door finish (main floor)	painted		no change
car door finish	stainless steel		no change
in-cab LCD screen	not provided		no change
hall lanterns	not provided		no change
in-car lanterns	not provided		new, flush mount
hall position indicator	analogue at floor 1		new digital, flush mount

Hydraulic Elevator		
lobby panel	not provided	no change
CACF panel	not provided	no change
central control monitor	not provided	no change
car top inspection station	provided	new
load weighing device	not provided	no change
car guiding	roller	retain and refurbish
guide rails	provided	no change
emergency recall	provided	new automatic
firefighter's operation	provided	new
emergency power	battery lowering	new battery lowering
car top railing	not applicable	no change
equipment guarding	submerged equipment	new, where applicable
operating time		20.0 s
acceleration rate		0.6 m/s/s

1.4 Dimensions

.1 Provide equipment to suit the existing machine room, hoistway, pit and overhead dimensions.

2 Products

2.1 Generic equipment

.1 Provide generic equipment that can be purchased, installed and maintained by any competent vertical transportation contractor.

.2 Provide equipment that has been installed within the province by at least four different vertical transportation contractors.

.3 Provide generic controls from GAL, Automatisation JRT or an approved equivalent.

.4 Provide proven components that have been used during the last two years as a minimum.

.5 Provide a written guarantee from the control manufacturer that over the life of the installation software and firmware updates will be provided at no charge to the Owner.

2.2 Hydraulic: pumping machine unit

.1 Provide a pumping machine unit compactly and neatly designed with all the components as follows in a self-contained unit: drip pan, floating inner base for mounting motor pump assembly, oil reservoir with tight fitting tank cover, oil fill strainer with air filter, self-cleaning strainer in suction line, oil hydraulic pump, electric motor, oil control unit.

.2 Provide an oil level gauge that can be read without removing the tank cover.

.3 Provide, to measure the oil temperature, a thermometer that can be read without removing the tank cover.

.4 Provide a pump especially designed and manufactured for oil hydraulic service of the rotary positive displacement type inherently designed for steady discharge with minimum pulsations to give smooth and quiet operation.

.5 Provide a motor designed for oil hydraulic service.

.6 Provide a motor rated for not less than 80 starts/hour at 40°C.

.7 Provide equipment which will deliver its rated output continuously with a temperature rise not to exceed 50°C (90 F).

.8 Provide an oil control unit consisting of the following components: relief valve, safety check valve, levelling valve, manual lowering valve, tank shut-off valve.

.9 Design the equipment so that all adjustments are accessible and can be made without removing the assembly from the oil line.

.10 Provide variable flow bypass valves to give controlled high and levelling speed operation.

.11 Provide valves with individual adjustments, such that changing one adjustment does not affect other adjustments.

.12 Provide an externally adjustable relief valve capable of by-passing the total oil flow without increasing the back pressure more than 10% above that required to barely open the valve.

.13 Provide a 50 mm (2") pressure gauge, complete with isolating shut-off valve, for measuring the setting of the relief valve.

.14 Design the safety check valve to close quietly without permitting any reverse flow and to support the elevator on a positive locked column of oil when the car is at rest.

.15 Provide an externally adjustable up start valve to by-pass oil flow during initial start of the motor pump assembly, and to close slowly, gradually diverting oil to the jack unit, insuring smooth up starts, so as to relieve load on the motor during starting.

.16 Provide an externally adjustable lowering valve and levelling valve for drop away speed, lowering speed, levelling speed and stopping speed to insure smooth down starts and stops.

.17 Provide a manual lowering valve for manual lowering of the elevator car in the event of power failure and for use in servicing and adjusting the elevator mechanism.

.18 Provide shut off valves in the machine room and elevator pit for isolating oil in the power tank unit to facilitate servicing and adjusting the elevator mechanism without removing the oil from the tank.

.19 Provide self cleaning strainers to prevent foreign materials from lodging in the oil system.

.20 Provide an externally adjustable up stop valve to by-pass the oil flow for landing stops in the up direction.

.21 Provide temperature and pressure compensation so as to minimize speed variations.

.22 Arrange the equipment so that the car stops at the landing through controlled oil flow with the motor and pump running and so that the motor shuts off only after the car has come to rest at the landing.

.23 Use flexible hose on the pumping machine unit where required but only within the regulations of the governing safety codes.

.24 Provide a tank of sufficient capacity to contain, as a minimum, all of the oil in the hydraulic system (pipe lines and hydraulic cylinder) plus 10%.

.25 Install the pumping machine unit in a dedicated machine room and not within the hoistway.

2.3 Hydraulic piping

.1 Provide pipes and fittings to connect the power unit to the jack unit.

.2 Seal connections adequately to prevent any leakage or seepage of oil.

.3 Provide pipe of minimum 50 mm (2") nominal size to reduce oil velocity, noise and vibration.

.4 Run the oil lines above ground and suspend the oil lines with isolating hangers to reduce sound transmission.

2.4 Hydraulic fluid: biodegradable

.1 Provide hydraulic fluid of the non-toxic, inherently or readily biodegradable type.

.2 Provide hydraulic fluid having a minimum viscosity index of 95.

.3 Provide mineral oil (do not use vegetable oil).

2.5 Hydraulic motor starting

.1 Start the hydraulic pump motor after the doors start to close so that the motor is running at full speed before the doors are fully closed.

.2 Stop the hydraulic pump motor if the door closing operation is interrupted.

.3 Provide solid state control of the starting operation so as to limit the motor starting current to not more than two times the full load running current.

.4 Energize the hydraulic machine up start valve, subject to the standard safety circuits, after the doors are closed and a signal is received from the solid state starter indicating that the motor is up to operating speed.

2.6 Hydraulic: time protective device

.1 Provide a time protective device.

.2 If the pump motor should run continuously for 20 seconds longer than the period of time necessary to move the elevator (in normal operation) from the bottom floor to the top floor, the time protective device will cause:

.1 Up direction relays and contactors to be de-energized.

.2 Automatic registration of a bottom floor call to bring the car to the lowest landing where it will remain with its doors open.

.3 No response to any further hall calls or car calls until the main line switch has been opened and closed again.

2.7 Hydraulic: main line strainer

.1 Provide a main line strainer and shut off cock assembly of the self cleaning type, equipped with a 60 minimum mesh element, and a magnetic drain plug, in the oil line.

.2 Design the unit for a minimum 2800 kilopascals (400 psi) working pressure and provide easy access for cleaning.

2.8 Hydraulic: silencing devices

.1 If the motor and pump are not submersible:

.1 Enclose the power unit on all four sides with sheet steel panels combined with 20 mm (3/4") suitable sound-deadening material;

.2 Form the panels with approximately 20 mm (3/4") returns, returning to, but separated from, the main power unit frame with suitable rubber mouldings.

.2 To reduce hydraulic pulsations through the oil, provide a blow-out proof double-faced hydraulic muffling device in the oil line adjacent to the power unit, downstream to the valve assembly.

.3 To reduce any vibration transmitted through the oil line itself, provide two approved blow-out proof sound isolating couplings in the oil line, located between the check valve and the hydraulic jack.

.4 Design each sound-isolating coupling to completely eliminate any solid metal to metal contact from the pipe on one side of the coupling to the pipe on the other side.

.5 Mount the motor and pump on a resilient rubber base to isolate them from the oil reservoir, controller and building structure.

2.9 Overspeed valve

.1 Provide an overspeed valve in the elevator pit.

.2 Use Victaulic couplings to connect the valve in the oil line.

.3 Provide a data tag on the valve showing the operating pressure, maximum pressure rating and overspeed setting.

.4 Arrange the valve to operate in the event that the elevator speed in the down direction exceeds 125% (plus or minus 10%) of the elevator operating speed in the down direction

.5 Arrange that the valve cuts off the flow of oil from the hydraulic jack in the event that the set tripping speed is exceeded.

.6 Arrange that when the valve operates the elevator will be decelerated at a rate of not less than 0.25 g nor more than 1.00 g with any peak deceleration rate in excess of 2.50 g having a duration of not more than 0.04 seconds.

.7 If the valve is field-adjustable, provide a numbered seal and record the date and number in the log book.

2.10 Hydraulic pit shut-off valve

.1 Provide a pit shut-off valve for the hydraulic jack.

2.11 Speed

.1 Arrange the elevators to run under any condition of loading, except the case of overload, within 1.5 percent of the rated speed.

2.12 Solid-state hardware

.1 Mount solid-state devices, except for high power silicon controlled rectifiers, on removable printed circuit boards.

.2 Gold plate the contact points of edge connectors.

.3 Use G10 glass epoxy with minimum equivalent 57 gram (2 ounce) copper.

.4 Coat the circuits with tin-lead.

.5 Provide a solder resist screen.

.6 Provide plated through holes for double sided boards.

.7 Make all connections to the printed circuits on the printed circuit boards by means of properly dimensioned pads.

.8 Do not provide "patched" connections.

.9 Design solid-state devices for a high level of noise immunity.

.10 Incorporate electrical noise suppression devices in the power supplies and the inputs and outputs associated with the solid-state circuits.

.11 Provide filters and circuits to limit the generated electromagnetic noise level at any frequency to not more than 0.1 db above the ambient electromagnetic noise level, as measured in the centre of the machine room using a calibrated radio frequency

receiver designed in accordance with CSA Standard C108.1.1 together with a calibrated rod or loop antenna.

.12 Provide filters and circuits to limit the generated electromagnetic noise level at 10 KHz to not more than 0.01 db above the ambient electromagnetic noise level, as measured in the centre of the machine room using a calibrated radio frequency receiver designed in accordance with CSA Standard C108.1.1 together with a calibrated rod or loop antenna.

2.13 Auxiliary slowdown devices

.1 Provide auxiliary slowdown devices compatible with the solid state speed control and so arranged that, if the normal slowdown devices fail to operate correctly, the elevator will be brought to a controlled stop at the terminal landing with an acceleration not exceeding 0.3 g.

.2 Arrange the control circuits so that, if the auxiliary slowdown devices were required to act to stop the elevator, the elevator parks at the terminal landing until the system is checked by a maintenance technician.

2.14 Position transducer

.1 Provide a position transducer device to transmit to the control system the position of the elevator.

.2 Arrange that the device transmit a minimum of 10 counts per 25 mm (1") of travel.

.3 Provide a device having an overall precision within ±1.0 mm (±0.04").

.4 Arrange the elevator controls so that the output from this device is read at least every 5 ms.

.5 Transmit the signal from this device either in serial format using a standard protocol (e.g, CAN) or in parallel format using low impedance (less than 10 kilohms) inputs.

.6 If the transducer is a relative (pulse counter) type rather than an absolute encoder type:

.1 Provide gray encoding so as to indicate the direction of movement of the car and to offset 'false' counts caused by vibration;

.2 In the event of a counter error reset the position with an accuracy within ±2.5 mm (±0.1") by returning the car at low speed to a fixed point in the hoistway.

2.15 Controller

.1 Provide a micro-processor based controller designed to give the required operation as herein specified.

.2 Mount panels securely on substantial, self supporting steel frames designed for floor or wall mounting.

.3 Provide completely enclosed controllers with covers.

.4 Do not mount equipment on the covers unless:

.1 Its wiring is designed to support bending caused by opening and closing the cover;

.2 Its wiring is protected against damage;

.3 If damages happen to the equipment mounted on the cover or the wiring of this equipment, the unit will continue to operate normally.

.5 Where relays are used, provide those having a design electrical life and mechanical life equivalent to thirty years operation in the given application, with their contacts designed for maximum conductivity and wiping action.

.6 Provide electronic time delay devices which employ stable capacitors or crystals as the time base.

.7 Install wiring on the controller, whether control or field wiring, in a neat workmanlike order and make connections to studs and terminals by means of solder or solderless lugs, or similar connecting devices.

.8 Mark relays, contactors, fuses, printed circuit boards and other components clearly and permanently with designations as shown on the schematics.

.9 Mount the designations for plug in components on the controller adjacent to the component; do not mount the designation on the plug in component.

.10 Provide a written guarantee from the control manufacturer that over the life of the installation software and firmware updates will be provided at no charge to the Owner.

.11 Install the controller in a dedicated control room and not within the hoistway.

2.16 Computing devices

.1 Where computing devices are used, such as micro-processors or mini-computers, along with associated devices, design to the following requirements:

.1 Isolate the inputs from external devices (such as push-buttons) and isolate the outputs to external devices (such as indicators) by means of relays or optical devices;

.2 Provide the control program on read-only-memory with spare capacity to allow for future programming modifications and extensions;

.3 Provide crystal regulation of frequency;

.4 Provide for separate regulated power supplies to serve each micro-processor system.

2.17 Speed control: hydraulic

.1 Provide a speed control system of the hydraulic-electric type in which control is accomplished by varying the oil flow to and from the hydraulic jack.

.2 Design and adjust the equipment so that the average acceleration over the period of constant acceleration is 0.6 m/s^2 (2.0 ft/s^2) plus or minus 10%.

.3 Design and adjust the equipment so that the average change in acceleration (jerk) is 1.8 m/s^3 (6.0 ft/s^3) plus or minus 10%.

.4 Design and adjust the equipment so that the rated speed is maintained with an accuracy of 5%.

2.18 Power interruption restart

.1 Provide means so that the elevator system will restart automatically in the event of power interruption.

.2 Where volatile memories are provided for position and other data necessary to the continuing operation of the elevators, provide means of preserving this data on power failure or fading ('brownout') for a minimum of four hours and means of automatic recovery upon restoration of normal power.

2.19 Control circuits grounding

.1 Arrange the control circuits so that one side of the control power supply for external circuits is grounded to facilitate testing and trouble shooting.

.2 An external circuit is defined as one wired outside micro-processors or solid-state devices, as for example, buttons, relays, lights, limits, locks and such similar devices.

.3 Arrange that accidental grounding in the control system will not defeat the safety circuits.

2.20 Main floor elevator markings

.1 Provide at the main floor, for each elevator designated as a Firefighter's Elevator, a suitable symbol such as a Firefighter's Hat.

.2 Provide at the main floor for each elevator a numeral indicating the number of the elevator.

.3 Provide markings as selected by the Owner.

.4 Provide samples for review.

2.21 Entrance floor markings

.1 Provide, on each hall entrance jamb, raised tactile and braille metallic markings to designate the floor.

.2 Provide markings as selected by the Owner.

.3 Provide samples for review.

2.22 Floor marking: hoistway

.1 Identify each landing by means of markings on the inside of the hoistway.

.2 Place these markings so that people in a stalled elevator will be able to readily see the floor marking upon opening the car doors.

.3 Use a stencil to ensure that the floor markings are neat and uniform in appearance.

.4 Provide numerals and letters approximately 100 mm (4") high and of a clearly contrasting colour to the colour of the doors and fascias.

2.23 Hoistway switches

.1 Provide new pit stop switches.

.2 Provide new hoistway switches.

2.24 Car door restrictor

.1 Provide a car door restrictor to mechanically prevent the opening of the car door from inside the cab unless the elevator is in the door unlocking zone.

.2 Provide a device that does not require electrical or electronic components to function.

.3 Provide vertically mounted car door steel angles arranged to interlock with steel angles vertically mounted on the hoistway front wall so arranged as to prevent the car door from opening unless the elevator is in the door unlocking zone.

2.25 Car and hoistway door safety retainers

.1 Provide safety retainers at the top and bottom of horizontally sliding doors to retain the closed door panel in position if the primary guiding means fail.

.2 Provide retainers that will prevent the displacement of the door panel top and bottom by more than 20 mm (0.8") when the door panel is subjected to a force of 5 000 N (1130 lbf) applied towards the hoistway at right angles to the panel over an area of 300 mm by 300 mm (12" by 12") at the centre of the panel.

.3 Provide retainers that will withstand, without detachment or permanent deformation, a force of 1 000 N (225 lbf) applied upward at any point along the width of the door panel together with an additional concurrent force of 1 100 N (250 lbf) applied at right angles to the door at the centre of the panel over an area of 300 mm by 300 mm (12" by 12").

.4 Arrange that the retaining means are not involved in the guiding of the panel and are not subjected to wear or stress during normal door operation.

2.26 Hoistway entrance lunar key access

.1 Provide lunar key access for each hoistway entrance.

2.27 Door friction

.1 Adjust the doors so that with the door closing device disconnected, the doors can be started into motion, from any position, with a force of less than 25 newtons (six pounds) per door panel applied horizontally at the mid-point of the door in line with the direction of movement of the door.

2.28 Door detector: multiple beams

.1 Provide a multiple infra-red beam door detector device.

.2 Design and locate the receivers and emitters so that the active area of the door opening, i.e. the full width and from within 25 mm (1") of the floor to a height of 1800 mm (6'), is protected, such that a person or object passing through the car entrance causes the doors to re-open.

.3 Position the receivers and emitters at least 25 mm (1") back from the leading edge of the door.

.4 Provide logic control to ensure that each receiver receives light from every emitter.

.5 Arrange that if the system fails to provide protection over the active area of the door opening, the elevator will park at the current floor with its doors open and the lights off, or the system will go over to nudging operation.

.6 Provide a signal on the unit or in the machine room to indicate that a failure has occurred.

.7 Should a door protective device be operated continuously for more than 20 seconds after the elapse of the normal door open time, cause the doors to go over to nudging operation.

.8 Arrange the nudging operation as follows:

.1 Cause the doors to close slowly under reduced power;

.2 Operate a buzzer in the car panel as a warning to the person obstructing the door;

.3 Cause the 20 seconds to be reduced to 6 seconds until a normal door cycle is performed.

.9 Supply a device, reliable and consistent in operation, not affected by dust or temperature changes, and having inherent long term reliability with minimum maintenance.

2.29 Door operator

.1 Provide a heavy duty door operator to open and close the car and hoistway doors simultaneously.

.2 Mount the operator on the cab above the car doors.

.3 Provide either:

.1 An alternating current motor, either standard or linear induction type, with associated variable voltage and variable frequency solid state drive to control the speed and torque of the door operator, or;

.2 A direct current motor with associated solid state drive to control the speed and torque of the door operator.

.4 Provide as a minimum a 375 W (0.5 HP) motor.

.5 Provide dual drive arms for centre-opening doors.

.6 Provide GAL MOVFR or approved equivalent.

.7 Provide a solid state door operator control incorporating negative feedback circuits for position, acceleration, velocity and torque.

.8 Provide event logging with non-volatile memory so as to retain the event log under power-off conditions.

.9 Provide fully automatic installation algorithm profiles that self-adjust the motion profile for the relevant parameters.

.10 Provide an output from the door control for a pre-start command to the elevator speed control system.

.11 Provide optical isolation for input and output signals.

.12 Provide signal line short circuit protection.

.13 Provide a serial input to the door control to allow adjustment of speed, acceleration, torque and pre-start point using a notebook computer or keypad.

.14 Provide the keypad or software for a standard notebook computer.

.15 Arrange that the settings for the door operator can be uploaded to the keypad or notebook computer and then downloaded to another identical operator.

.16 Provide an average door closing speed of 300 mm (12") per second, respecting the parameters for door force and door inertia as set out in the elevator code.

.17 Provide an average door opening speed of 700 mm (28") per second.

.18 Provide, either in the door operator control or in the main elevator control, means to automatically recycle the doors in the event that they stall during the opening or closing operations.

.19 Design the door operator and associated components for a minimum of noise.

2.30 Hoistway doors: refurbishing

.1 Replace existing hall door hanger rollers with plastic insert rollers.

.2 Check and replace interlocks, gibs, rollers, hangers and all other door components that have more than 10 per cent wear.

.3 Provide a new car door gate switch.

.4 Provide new spirator door closers.

.5 Provide new clutches or vanes so that the master door operator can drive the hoistway doors.

.6 Replace relating cables.

.7 Install sound absorbing materials so as to eliminate interlock noise.

.8 Replace astragals (car and hall doors).

.9 Clean, lubricate and re-adjust car and hoistway door equipment.

.10 Adjust the doors so that with the door closing device disconnected, the doors can be started into motion, from any position, with a force of less than 25 Newtons per door panel applied horizontally at the mid-point of the door in line with the direction of movement of the door.

.11 Adjust the hoistway door rollers so as to obtain 6 mm (1/4") clearance from the car sill and on either side of the skate.

.12 Adjust the hoistway door roller pressure so that when engaged in the skate both rollers exert a firm pressure on the skate.

.13 Eliminate any rattles, loose connections or worn bearings that might cause noise.

2.31 Car station

.1 Retain and modify the car station to meet current Code requirements (e.g. Firefighters' Emergency Operation).

.2 Ensure proper operation of all car station components with the new elevator equipment (e.g. car position indicator, emergency lighting, telephone, etc.).

2.32 Signal lights

.1 Provide LED position indicators and call registered lights having a minimum contrast ratio of 8:1 throughout a life expectancy greater than 100,000 hours.

.2 The contrast ratio is to be determined by subtracting the brightness of the indicator background from the brightness of the marking and then dividing the result by the brightness of the background.

.3 Arrange that the variation in intensity and contrast ratio between position indicators does not exceed 5 percent.

.4 Arrange that the variation in intensity and contrast ratio between call registered lights does not exceed 5 percent.

.5 All measurements are to be made in ambient lighting conditions meeting Code requirements.

2.33 Cab fan and light ‘Green Control’

.1 Arrange that the cab lights and fan are turned off in five minutes when:

.1 The elevator is level at a floor;

.2 The elevator doors are closed;

.3 The elevator has not been selected to answer a call;

.4 The elevator is on automatic operation;

.5 The elevator safety circuit (including interlocks) is intact.

.2 Should any of the above conditions no longer obtain or when emergency communication devices are initiated, turn the car lights and fan on within 0.5 seconds.

2.34 Car position annunciator

.1 Provide automatic verbal announcement to announce the floors and to provide floor passing tones.

.2 Provide a unit to meet the requirements of the Code.

.3 Provide means in the service cabinet to adjust the volume over a range from 55 and 70 decibels.

.4 Use a female voice for the announcements.

2.35 Security system

.1 Provide for the future installation of an elevator card reader security system.

.2 Provide accessible space, mounting supports and wiring for a security antenna in the cab main front return panel.

.3 Provide a free space 100 mm (4") in height, 175 mm (7") in width and 75 mm (3") in depth centred behind the car panel insert for the security antenna installation.

.4 Provide in front of the security antenna a translucent polycarbonate cover.

.5 Provide an elevator security interface box in the machine room mounted on the side of an elevator controller.

.6 Provide wiring from the car station card reader to the security interface box using standard connectors.

.7 Interface with the security system using serial data transfer.

.8 Provide a signal, unique for each car call, to the security system when a car call "request" (which could either be by means of a button or touch screen) is entered and enter the car call when a return signal is received from the security system validating the request.

.9 Arrange that the elevator system functions without restriction by the security system when Firefighters' Emergency Operation or independent service is operative.

.10 Until such time as the security system is installed, arrange that the elevator system functions without restriction by the security system.

.11 Provide any incidental elevator material and elevator work necessary to obtain a complete functioning elevator security system.

.12 Submit for review, interface box drawings, location drawings and electrical schematics.

2.36 Closed circuit camera security system

.1 A closed circuit camera (CCTV) will be installed in the cab by others.

.2 Provide wiring from the camera in the cab to a designated point in the machine room as follows.

.3 Provide one RG6/U stranded centre conductor coaxial cable and one pair 18 gauge stranded conductor cable within an overall braided shield or such other interconnections as may be required by the CCTV contractor.

.4 Run the interconnecting wiring from the elevator security interface box in the machine room to the top of the elevator cab.

.5 Provide an excess loop of 3050 mm (10') of cable at either end.

.6 Provide a cable access hole in the top of the cab at the camera location.

.7 Provide a 110 vac power source on the cab to power the camera.

.8 Provide assistance to the CCTV contractor for the installation of the camera.

2.37 Hall push button stations

.1 Replace the existing hall push button stations with new hall push button stations.

.2 Provide at the intermediate floors, for each station, up and down push buttons located one above the other and call registered lights.

.3 Provide at the upper terminal and lower terminal, for each station, a single button and call registered light.

.4 Illuminate the call registered light only when there is an elevator in service to respond to the call.

.5 Install the stations substantially flush with the wall (i.e. do not use surface mount stations).

.6 Secure the hall push button stations to the wall using countersunk spanner head fasteners or approved equivalent.

2.38 Hoistway access switch

.1 Provide hoistway access switches in accordance with the Code.

.2 Locate the switches in the entrance frame or in the sight guard in an inconspicuous place.

2.39 Cab ventilation

.1 Provide an exhaust fan capable of developing 30 pascals (0.1" H_2O) static pressure differential with a minimum capacity of 165 litres per second (350 cfm).

.2 Provide a two speed motor for the fan with the speed control located in the car operating panel.

.3 Arrange that the increase in noise level caused by the fan, measured in the car with the fan running at maximum speed, does not exceed 3 decibels.

2.40 Pad hooks

.1 Provide stainless steel pad hooks inside the elevator cab for protective pads.

2.41 In car lanterns and gongs: applied

.1 Provide in car lanterns complete with electronic gongs at each side of the elevator cab entrance to indicate the future direction of the elevator.

.2 Mount the lanterns on the car entrance columns.

.3 Arrange the lanterns and circuits so that as the car doors start to open in response to a call, the lanterns illuminate and the gong strikes.

.4 Sound the gong once to indicate the up direction and twice to indicate the down direction.

.5 Maintain the lantern illuminated until the car has stopped and the door open time has elapsed.

.6 Do not illuminate the lantern on a door re-open unless the re-open is caused by a reversal of direction of travel of the car.

.7 Arrange the operation of the lanterns and gongs to comply with requirements for persons with physical disabilities.

.8 Provide LEDs for illumination.

.9 Design the fixture so that the lamps may be readily changed. Do not mount any equipment to the covers; arrange that the covers can be removed completely without disturbing the electric wiring.

2.42 Hall position indicator: digital

.1 Replace the existing hall position indicator with a new digital position indicator.

.2 Arrange the indicator to display a number or symbol at least 50 mm (2") high.

.3 Indicate the position of the car at all times, corresponding to the landing through which the car is passing or at which it is stopped.

.4 Provide a segmented display using light emitting diodes with a minimum of 16 segments per character.

.5 Arrange the circuits so as to provide continuous indication of car position.

.6 Overlapping dual indication, when the elevator is between floors, is acceptable.

.7 Cover the opening for the existing position indicator in a seamless manner, replacing, if necessary, the existing transom.

2.43 Car inspection devices

.1 Provide, on the top of the car, a fixed lamp receptacle, with switch, outfitted with wire clamp guards, and a GFI duplex receptacle with safety ground connection.

.2 Provide, on the top of the car, an inspection station consisting of an emergency stop button, up, down and common inspection running buttons, on-off switch for the door operator and other devices necessary for top-of-car inspection operation.

2.44 Roller guides: retain

.1 Retain the existing roller guides.

.2 Replace any worn or deformed rollers with new rollers true and free from deformations of the surface and with a tolerance on the circumference of 0.05 mm (0.002") total indicator reading.

.3 Replace worn or noisy bearings.

.4 Adjust the roller to secure good contact with the rail.

2.45 Guide rails: retain

.1 Retain the existing guide rails and brackets.

.2 Ensure that the guide rail system is of structural strength and rigidity sufficient to limit the horizontal deflection of the guide at any point to less than 0.6 mm (0.025") under normal conditions of operation.

.3 Align guide rails with a variation of not more than 1.6 mm (0.06") over any 6 m (20') section and with a maximum variation of not more than 0.8 mm (0.03") in 30 mm (1").

.4 Ensure that the guide rails and brackets are installed in a strong and substantial manner.

.5 Extend rails to within less than 300 mm (12") and more than 150 mm (6") of the pit floor and to within less than 300 mm (12") and more than 150 mm (6") of the underside of the overhead slab.

2.46 Emergency lowering

.1 Provide battery operated emergency lowering.

.2 Provide, as a minimum, sufficient battery power to perform the following cycle of operation five times within a 30 minute period:

.1 Close the elevator doors;

.2 Run the car to the bottom floor;

.3 Open the doors;

.4 Close the doors.

.3 Cause the emergency lowering operation to be implemented in the event of a power failure or electrical fault de-energizing the normal elevator power supply.

.4 Under emergency lowering conditions cause the elevator to close its doors and travel down, without stopping, to the bottom floor, open its doors, and after the normal door open time has elapsed, close its doors and remain parked at the lowest floor.

.5 On emergency lowering operation, maintain operational all of the normal safety devices including door open buttons, and door protective devices.

.6 Provide for the automatic termination of the emergency lowering operation and the automatic recharging of the battery when normal power is restored.

.7 Provide a rechargeable battery of the hermetically sealed type, or of a type which provides a reserve of electrolyte, capable of operating unattended and requiring no addition of water or electrolyte for a period of not less than ten years, with provision for visual checking of the electrolyte level without opening the battery or removing caps or fittings.

.8 Arrange the battery charging means to operate automatically upon restoration of normal power, to remain in operation until the battery is fully recharged and to maintain the battery at full rated capacity at all times when emergency lowering is not in operation.

.9 Provide a pilot lamp to indicate that the normal power supply and battery charging are in operation.

.10 Provide means for convenient manual operation and testing.

2.47 Machine room equipment guarding: hydraulic elevators: component guarding

.1 Provide component guards for the hydraulic machine, high-voltage components, tripping hazards and any other machine-room items that present a hazard to personnel.

.2 As an alternative to individual guards for the external motor and belts, provide an expanded metal screen around the lower part of the hydraulic machine.

.3 Provide machine room equipment guarding in accordance with the prevailing regulations and these specifications.

.4 Provide drawings of the guarding under the seal of a Professional Engineer.

.5 Where expanded metal screens are used for guards construct them of minimum 2.2 mm thick metal so supported and braced as to deflect not more than 15 mm when subjected to a force of 450 N applied perpendicularly to the screen at any point

.6 Arrange the guards so as to prevent hands, arms, or any other part of a worker's body from coming in contact with moving parts

.7 Affix the guards in a strong and substantial manner so that they cannot be accidentally removed.

.8 Construct the guards of durable materials that can withstand the workplace conditions.

.9 Arrange the guards to protect from falling objects so that no objects (such as tools) can fall into moving parts or into open electrical components.

.10 Ensure that the guards do not themselves create a hazard (such as shear point, a jagged or sharp edge).

.11 Provide removable guards such that regular maintenance procedures can be performed.

.12 Arrange the guards so as not to impede a worker from performing the Work efficiently and conveniently.

.13 Wherever practicable, arrange the guards so that those devices requiring regular attention can be maintained without removing the guards.

.14 Wherever practicable, provide fixed guards that cannot be easily removed.

.15 Finish the metal components of the guarding devices in a bright yellow paint with one base primer coat and two finishing coats or, alternatively, in baked enamel, so as to make them highly visible.

.16 Where polycarbonate covers are used, add marking stripes of tape in bright yellow so as to make them highly visible.

.17 Provide protective guards for high voltage circuits.

.18 Arrange that those elements of the controller with potentials to ground in excess of 130 volts are separated from the low voltage elements by means of barriers that can be removed for maintenance and repair purposes.

.19 Provide barriers consisting of clear polycarbonate covers (where consistent with the prevailing regulations), hinged so as to allow access without removing the covers.

.20 Arrange the barriers so that they are of sufficient dimension that the controller covers cannot be closed completely when the barriers are in the open position.

.21 Provide an entry in the elevator maintenance logbook confirming that the elevator controller covers and doors are closed and that the machine room guards are in place and functioning properly, this entry to be checked when performing regular maintenance.

.22 Where the status (in motion or stationary) of the lift machine cannot be visually determined as viewed from the disconnect switch, provide at the machine a manually opened and closed stop switch to prevent movement of the elevator.

2.48 Car balance

.1 Statically balance the car so that, at the centre of the travel, with the top guiding means removed, the car hangs in the centre of the rails.

.2 Arrange the equipment so that there is, in this position, with the guiding means properly adjusted, no force upon the guides.

.3 Make this test with empty car and car doors closed.

.4 Locate and adjust devices such as the compensating devices, travelling cable hangers and cab balancing weights so that the force upon any guide at any point in the travel does not exceed 110 Newtons (25 pounds) with empty car and car doors closed.

2.49 Limit switch dowelling

.1 After the final limit switches are adjusted and prior to the performance of safety tests and checks by the inspecting authorities, fasten, by throughbolting or dowelling, the final limit switches and final limit switch brackets so as to minimize the possibility of future incorrect adjustment.

2.50 Car ride

.1 Improve upon the existing ride quality as much as possible in an effort to attain:

.1 Arrange that the horizontal acceleration front to rear or side to side measured in the car with the elevator travelling, with a load of less than 10 per cent of capacity, from top to bottom and bottom to top does not exceed 0.15 m/s^2 (0.5 ft/s^2) measured between two consecutive points of opposite value.

.2 Arrange that the vertical acceleration measured in the car with the elevator travelling, with a load of less than 10 per cent of capacity, from top to bottom and bottom to top at contract speed, does not exceed 0.10 m/s^2 (0.3 ft/s^2) measured between two consecutive points of opposite value.

2.51 Painting

.1 Ensure that machine room and hoistway equipment, except for machined surfaces and non-rusting surfaces, is protected with rust inhibiting primer of a neutral colour.

.2 Where rust has developed on the existing equipment, brush the surface to the bare metal and re-paint.

.3 Clean and paint the machine room floor.

.4 Clean and paint the pit floor.

.5 Clean and paint the car top.

2.52 External connections

.1 Provide a junction box on the external wall of the hoistway at a point to be designated later for connections for such items as telephones, CCTV, lobby panels, monitor systems, to external locations such as the CACF Room.

.2 Locate this box as instructed and provide clearly marked terminal blocks for the wiring connections.

.3 Supply the required wiring for the connections from this box to the external locations (provision of external conduit and pulling of wiring by others).

2.53 Travelling cable

.1 Provide travelling cables with flame-retarding and moisture-resisting outer covers and stranded conductors.

.2 Supply cables approved for elevator use.

.3 Provide in the travelling cables:

.1 14 AWG (1.5 square mm) conductors for current-carrying circuits;

.2 18 AWG (0.75 square mm) conductors for signal circuits;

.3 20 AWG (0.5 square mm) shielded pair conductors with shielding for telecommunications circuits and data circuits;

.4 one RG6/U stranded centre conductor coaxial cable and one pair 18 gauge stranded conductor cable within an overall braided shield for closed-circuit television.

.4 Provide ten percent additional minimum spare signal and current-carrying wires in each cable.

.5 Terminate cables using terminal blocks or suitable connectors having identifying numbers to facilitate replacement and service.

.6 Suspend light weight cables using a wire mesh sleeve to relieve strain in the individual conductors and heavier cables using a steel supporting strand if the suspended weight exceeds 35 kg (seventy-five pounds).

2.54 Electric wiring

.1 Provide wiring required to interconnect the new equipment.

.2 Provide copper wire.

.3 Provide insulated wiring having a flame retarding and moisture resisting outer cover.

.4 Where flexible conduit is used, supply it in aluminum.

.5 Provide travelling cable to connect car operating panels and other car operating devices to the controller in the machine room.

.6 Where shielded wire is specified, provide wire of not less than 0.52 mm^2 area (20 gauge) having individually shielded pairs with 100% shielding.

.7 Provide colour or number coded wires in multiwire cables.

.8 Provide waterproof terminal labels.

.9 Provide stranded field wire except for the individual wires in multiwire cables which may be either stranded or solid.

.10 Provide a minimum of ten percent spare wires throughout the elevator wiring signal runs.

.11 Provide, if required by the inspecting authorities, in the main machine room or auxiliary machine room, additional main line safety disconnect switches and associated wiring.

3 Execution

3.1 Operation: simple

.1 Provide a micro-processor based simplex control for the elevator.

3.2 Operation: call response

.1 Store all hall and car calls in the control memory until answered.

.2 Cancel a call when it is answered by a car.

.3 Stop a running car at the first landing for which a car call is registered.

.4 Stop a running car for a hall call registered for the same direction as the car is travelling, subject to higher priority assignments and to load in the car.

3.3 Operation: dispatch recovery

.1 If a hall call remains registered for longer than 60 seconds and within that period the cars are not running, dispatch all cars and run without dispatch delay or assignment until all registered hall calls are cancelled.

3.4 Operation: car call anti-nuisance feature

.1 Arrange the control circuits to cancel all car calls when an unreasonable number of car calls has been registered relative to the number of passengers in the car.

.2 Prevent nuisance car calls by:

.1 Not allowing car calls to be registered below the current position of an up travelling car;

.2 Not allowing car calls to be registered above the current position of a down travelling car;

.3 Or, by cancelling car calls when the car reverses direction.

3.5 Operation: call initiation

.1 Control the elevator automatically by buttons in the car, marked to correspond with the respective landings served, and by the call buttons at the landing stations.

.2 Register a call by momentary pressure of a button.

3.6 Operation: high & low call return

.1 Cause the car to proceed to the calls until it has come to the limit of calls placed in the direction in which it is travelling, and having done this, subject to the assignment of the dispatch system, to reverse direction.

.2 Do not stop the car, except in the case of high and low return, for hall calls in the opposite direction to the direction of the car.

3.7 Operation: coincident calls

.1 Assign a hall call to an elevator with a car call at the same floor if the elevator is travelling in the same direction as the hall call.

3.8 Operation: direction reversal

.1 Cause a car without registered car calls, arriving at a floor where both up and down hall calls are registered, to initially respond to the hall call in the direction that the car was travelling.

.2 If, subsequent to the stop at this landing, there are no car or hall calls registered such as to require immediate travel in the same direction as before stopping at that landing, cause the car to close its doors, immediately reopen them and respond to the hall call in the opposite direction.

3.9 Operation: fault recovery

.1 Provide a recovery circuit arranged to take the elevator at low speed to the next floor in the event of an overspeed condition, overload trip, or other similar fault condition.

.2 Do not implement the recovery circuit if the movement of the car would endanger the passengers in the car.

.3 Provide a circuit separate from the normal speed control circuits, with power derived through separate controls and limited in power by resistance or fixed devices to an appropriate low level.

.4 Do not use, in this circuit, any solid state or other device which could fail in a mode that would allow an increase in applied power.

.5 Upon arrival of the car level at the next floor, cause the doors to open and remain open, and turn off the car lights.

.6 Leave the elevator in this state until the fault is corrected and the car restored to service.

3.10 Operation: independent service

.1 Provide independent service.

.2 On independent service:

.1 Remove the car from the automatic supervisory control system;

.2 Arrange the circuits so that the car does not respond to hall calls;

.3 Render the hall lanterns (if provided) inoperative;

.4 Cause the car to park with its doors open;

.5 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;

.6 Cause the doors to reopen if the button is released at any time up to the point at which the elevator starts to move;

.7 Render inoperative the normal door protective devices;

.8 Arrange the controls so that the attendant can select direction of travel;

.9 Cancel all registered car calls when the direction reverses or a car call is answered.

.10 Arrange the independent service operation so that it does not override security features or security systems.

3.11 System clock

.1 Where operations or functions are subject to clock control or require clock input, provide a solid state clock.

.2 Provide, in the machine room or at the central control console, means to indicate the current clock time.

.3 Provide, in the machine room or at the central control console, means to readily reset the clock time.

.4 Provide crystal regulation of frequency and voltage control adequate to maintain the time within an accuracy of plus or minus five seconds per month.

.5 Provide software to automatically adjust the time for changes from standard to daylight saving time and from daylight saving time to standard time.

.6 Provide battery back-up to maintain for a period of at least 24 hours accurate clock time in the event of power loss.

3.12 Door protective device by-pass (nudging)

.1 Should a door protective device be operated continuously for more than 20 seconds after the elapse of the normal door open time, cause the doors to close slowly under reduced power and operate a buzzer in the car panel as a warning to the person obstructing the door.

.2 Cause the 20 seconds to be reduced to 6 seconds until a normal door cycle is performed.

3.13 Door open pause time

.1 Arrange the circuits so that when the car is stopped in response to a hall call the doors remain open a predetermined length [approximately 5 seconds for an elevator whose entrances are within 3 metres (10') of the hall push button and approximately 6 seconds for an elevator whose entrances are further than 3 metres (10') from the hall push button].

.2 Arrange that this predetermined length of time is reduced to approximately 0.7 seconds if a person moves through the entrance (as indicated by the actuation of the door protective device).

.3 Unless otherwise specified (e.g. to allow for advance hall lantern warning), arrange the circuits so that when the car is stopped in response to a car registered call the doors remain open a predetermined length of time (approximately 3 to 4 seconds).

.4 Make the times separately adjustable over a range from 0.25 seconds to 15 seconds.

.5 Arrange the circuits so that the door open pause time is cancelled if a car call button is pressed or the door close button is pressed.

3.14 Operation: door protective device

.1 Arrange the door protective device so that, should it detect a person or any object in its path, at any point during the door closing operation, it will cause the doors to return to the open position.

.2 Adjust both the detection device and the door operation so that an object or person in the way of the door will cause the doors to reverse without the door panel of either hall or car doors actually striking the object or person.

3.15 Deadweight or reaction change

.1 Weigh the car and the counterweight (where applicable) so as to determine the cumulative deadweight change (The cumulative deadweight change is the sum of previous deadweight changes and the current proposed weight change) where any of the following apply:

.1 Where the cumulative deadweight increase of the car is more than 11 kg (25 lbs).

.2 Where there is evidence of a previous cab modernization and the prior weight changes were not recorded.

.3 Where there is doubt as to the accuracy of the car crosshead data tag.

.2 If the cumulative deadweight increase of the car is more than 11 kg (25 lb):

.1 Record the car and counterweight weight change on an Auxiliary Data Tag;

.2 Post the Auxiliary Data Tag on the car crosshead.

.3 If the cumulative deadweight change is less than 115 kg (255 lb) and less than 5% of the weight of the originally installed elevator car plus elevator capacity:

.1 Record the car and counterweight weight change on an Auxiliary Data Tag;

.2 Make the counterweight equal to the weight of the complete elevator car plus between 40 percent and 45 percent of the contract load;

.3 Post the Auxiliary Data Tag on the car crosshead.

.4 If the cumulative deadweight change is greater than 115 kg (255 lb) but less than 5% of the weight of the originally installed elevator car plus elevator capacity:

.1 Perform an engineering assessment of the installation with regard to the equipment which may be affected by the weight change including machine and sheaves, car and counterweight frame, buffers, traction and overbalance, lift ropes, plunger strengths and working pressure, hydraulic components under pressure and safeties;

.2 Record the car and counterweight weight change on an Auxiliary Data Tag;

.3 Make the counterweight equal to the weight of the complete elevator car plus between 40 percent and 45 percent of the contract load;

.4 Post the Auxiliary Data Tag on the car crosshead.

.5 If the cumulative deadweight change is greater than 5% of the weight of the originally installed car plus the elevator capacity:

.1 Perform a full engineering assessment of the installation with regard to all equipment which may be affected by the weight change including machine and sheaves, car frame and counterweight, buffers, traction and overbalance, lift ropes, plunger strengths and working pressure, hydraulic components under pressure, safeties, car frame and platform, capacity and loading, governors, guide rails, beams, supports and foundations;

.2 Record both car and counterweight changes on the Auxiliary Data Tag;

.3 Make the counterweight equal to the weight of the complete elevator car plus between 40 percent and 45 percent of the contract load;

.4 Post the Auxiliary Data Tag on the car crosshead.

.6 Where alterations increase the original building design reactions by more than 5%:

.1 Perform a full engineering assessment of the installation with regard to all equipment which may be affected by the reaction change including machine and sheaves, car frame and counterweight, buffers, traction and overbalance, lift ropes, plunger strengths and working pressure, hydraulic components under pressure, safeties, car frame and platform, capacity and loading, governors, guide rails, beams, supports and foundations;

.2 Record both car and counterweight changes on the Auxiliary Data Tag;

.3 Make the counterweight equal to the weight of the complete elevator car plus between 40 percent and 45 percent of the contract load;

.4 Post the Auxiliary Data Tag on the car crosshead.

.7 Provide an Auxiliary Data Tag to meet the requirements of latest edition of the Code.

.8 Enter, as a minimum, the following data on the Auxiliary Data Tag:

.1 The measured car weight prior to the alteration;

.2 The weight change of the car and counterweight;

.3 The year and month of the alteration;

.4 The name of the contractor who performed or supervised the work.

.9 For traction elevators, test the traction relations in accordance with the latest edition of the B44 code.

3.16 Noise level: door operation

.1 Arrange the equipment so that the noise level, as measured within the cab, does not exceed 60 decibels at any time during a full door open, door close and door reversal cycle.

.2 Initiate the door reversal by triggering the door protective device.

.3 Measure the noise level using an ANSI type 2 sound level meter on the "A" scale with an "F" response.

3.17 Noise level: cab

.1 Arrange that, with the elevator travelling from one end of the hoistway to the other, the noise level as measured within the elevator cab does not vary by more than 3 decibels.

.2 Measure this noise level with an ANSI type 2 sound level meter on the "A" scale with an "F" response.

3.18 Cab fan: operation

.1 Arrange that there is no discernible vibration in the car with the fan operating.

.2 Arrange that the noise level developed by the fan, measured in the car with the fan running, does not exceed 55 db.

3.19 Noise level: control and machine room

.1 Design the equipment so that the noise level with the elevator running, as measured by a meter positioned in the centre of the control and machine rooms, does not exceed 80 decibels.

.2 Measure this noise level using an ANSI type 2 sound level meter on the "A" scale with an "F" response.

3.20 Levelling

.1 Cause the car to stop automatically at floor level, without overshoot, regardless of load or direction of travel so that the car sill is level, within 6 mm (1/4"), with respect to the hoistway sill.

.2 When the elevator cab is stopped at a floor, correct for over travel or under travel or movement of the cab away from the floor, by returning the car imperceptibly to floor level.

3.21 Test data form: hydraulic

.1 After completion of the Work, and prior to Substantial Performance, submit a test data form certifying that the unit is complete and ready for inspection.

.2 Arrange that this form be signed by the person responsible for the performance of the Work.

.3 Include a check list of the items in the specifications as well as other performance data such as door times, operating times, starting and running currents and voltages, operating pressures, slowdown distances, valve settings, and, in general, settings of any adjustable devices.

.4 List on this form safety devices, together with their settings and indicate as to whether they have been checked and adjusted.

.5 Submit a soft copy of the data form in PDF (Acrobat Reader) format.

3.22 Operating time

.1 Adjust the equipment so that the elapsed time to travel one typical floor does not exceed the time shown in the data table.

.2 Measure this time under the following conditions:

.1 A typical floor height of less than 4000 mm (13');

.2 Floor levelling accuracy of ± 6 mm (1/4");

.3 Start time when the fully opened doors begin to close;

.4 Stop time when the car is stopped level with the next floor and the car and hall doors are 800 mm (32") open;

.5 Time measured with full load in the car and in both directions of travel;

.6 Power door operation for the hall and car doors conforms to the elevator code requirements.

.3 Adjust the equipment so that the operating time is compatible with dependable, consistent operation without undue wear or excessive maintenance and so that this operating time can be readily maintained over the life of the elevator installation.

.4 Adjust the equipment so that, with the control functioning so as to give the required time, the elevator operates under smooth acceleration and retardation and provides a comfortable and agreeable ride.

3.23 Firefighters' Emergency Operation: automatic recall

.1 Provide Firefighters' Emergency Operation including:

.1 Phase I automatic Emergency Recall Operation;

.2 Phase I Emergency Recall Operation to an alternate level;

.3 Phase II Emergency In-Car Operation.

.2 Provide switches and indicators in the hall and car stations as required by Code.

END OF SECTION
END OF SPECIFICATION

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