

1 General

1.1 **SECTION INCLUDES**

- .1 Design, labour, Products, equipment, tools, supervision, and services necessary for the manufacture, delivery, installation, testing, maintenance, and adjusting of gearless, machine room-less, traction elevators in accordance with the Contract Documents.

1.2 **REFERENCES**

- .1 ASTM A167, Specification for Stainless and Heat-Resisting Chromium-Nickel Steel Plate, Sheet and Strip.
- .2 ASME A17.1/CSA B44, Safety Code for Elevators and Escalators.
- .3 BS EN 12016, Electromagnetic Compatibility. Product Family Standard for Lifts, Escalators and Moving Walks. Immunity.
- .4 CSA B651, Accessible Design for the Built Environment.
- .5 CSA C22.1, Canadian Electrical Code, Part 1 (23rd Edition), Safety Standard for Electrical Installations.
- .6 CSA C22.2 No.141-M, Unit Equipment for Emergency Lighting.
- .7 Elevating Devices Act and Ontario Regulation 463/86.

1.3 **DESIGN REQUIREMENTS**

- .1 Design elevator with electric operating and control equipment in accordance with the Elevating Devices Act and Regulation in accordance with the requirements of ASME A17.1/CSA B44 safety code and latest supplement.
- .2 Design elevator equipment to fit into space provided for hoistway, pit and areas shown on Contract Drawings.
- .3 Provide smooth acceleration and deceleration of car without perceptible steps so adjusted as not to cause passenger discomfort.
- .4 Elevator to travel between typical floors in not more than 10s. Measure time from instant doors start to close until car has stopped level with next floor.
- .5 Design guide rail brackets for attachment to elevator pit and shaft walls as shown on Contract Drawings.
- .6 Design car and counterweight safety to release when car or counterweight moves in "up" direction.

- .7 Seismic Design Criteria:
 - .1 Design and assemble elevator equipment and components to withstand earthquake forces for Peterborough contained in the Ontario Building Code.

- .8 Elevator Characteristics:
 - .1 Rated net capacity: 1160 kg.
 - .2 Rated speed: 100 feet/minute.
 - .3 Travel Distance (nominal): As indicated on drawings.
 - .4 No. of Stops: 4.
 - .5 No. of Openings: 4 in-line.
 - .6 Elevator dimensions: 2032 mm x 1300 mm.
 - .7 Cab height: 2438 mm
 - .8 Clear car entrance height: 2286 mm.
 - .9 Door type: single.
 - .10 Door Operation: side opening in single speed.
 - .11 Provide clear door opening of: 914 mm wide x 2286 mm high.

- .9 Car operation:
 - .1 Simplex Collective Operation: Using a microprocessor-based controller, operation shall be automatic by means of the car and hall buttons. If all calls in the system have been answered, the car shall park at the last landing served.

- .10 Include independent service on cars as follows:
 - .1 By means of switch in service cabinet, allow removal of that car from group service and operate in response to car calls only.
 - .2 Open doors automatically on arrival at floor.
 - .3 Render hall signals inoperative when operating on independent service.

- .11 Furnish car lighting and ventilation operation with energy saving mode as follows:
 - .1 Automatically extinguish regular interior lighting and stop car fan or blower.
 - .2 Disable power circuits to convenience outlets and plug receptacles on top and bottom of car.
 - .3 Resume normal function of lighting and fan when power is reinstated.
 - .4 Arrange circuits so that power to lighting and fan or blower is not interrupted by overload, blown fuse or other abnormal condition.

- .12 When car without registered car calls arrives at floor where both up and down calls are registered, initially respond to hall call in direction of travel. If no car or hall call is registered for future travel in that direction, close doors, immediately reopen them and respond to hall call in opposite direction.

- .13 Operate lanterns to correspond with next direction of travel. When responding to hall call, operate lantern to correspond with direction of call being answered.

- .14 Fire Fighter's Operation: In accordance with Authorities having Jurisdiction.

- .15 Arrange emergency power to operate position indicators in cars.

- .16 Power Supply:
 - .1 Equipment Power: ~~Indicated on electrical drawings.~~ **208 V, 3 phase, 90 A fuse in 100 A disconnect.**
 - .2 Lighting: 120 V, 15 A, single phase, 60 Hz, alternating current.

1.4 SUBMITTALS

- .1 Product data:
 - .1 Submit duplicate copies of manufacturer's Product data for each Product specified in accordance with Section 01 33 00 indicating:
 - .1 Performance criteria, compliance with appropriate reference standards, characteristics, limitations, and trouble-shooting protocol.
 - .2 Signal and operating fixtures, operating panels, indicators, car design and components, doors and frame details, door protective devices, microprocessor controller, and telephone.
 - .3 Product transportation, storage, handling and installation requirements.
 - .2 Shop drawings:
 - .1 Submit shop drawings in accordance with Section 01 33 00. In addition to the requirements of ASME A17.1/CSA B44, shop drawings shall indicate:
 - .1 Elevations, sections and details of elevator and operating components, dimensions, gauges, finishes and relationship of operating components to adjacent construction.
 - .2 Size and location of machine and controller.
 - .3 Weights of principal components.
 - .4 Complete electrical wiring diagrams including electrical schematics and sequence of operation.
 - .5 Complete engineering design data to confirm that elevators meet design criteria specified.
 - .6 Electrical power information including voltage confirmation sheet, recommended fuse ratings, sizes and types, equipment starting and running current.
 - .7 Size and location of car, hoisting beam, Guides, buffers, buffer supports, and other components in hoistway.
 - .8 Details of work required by other trades.
 - .9 Rail bracket spacing and maximum loads on guide rails.
 - .10 Forces on guide rails, and at other points of support.
 - .11 Rating of drive motor.
 - .12 Top and bottom clearance and over travel of car.
 - .13 Location of disconnects, circuit breaker, light switches and feeder extension points.
 - .14 Heat dissipation rate for elevator equipment.
 - .15 Hoistway entrances and doors showing method of operation, details of construction, and method of fastening to structural members of structure.
 - .16 Signal and operating fixtures including, car riding lanterns, hall buttons, car position indicator, control switches.
 - .17 Wiring diagram showing connections from each source.

- .18 Loads on hoist beams.
- .19 Seismic design data.

- .3 Samples:
 - .1 Eight weeks after Notification of Award, submit 2 samples of the following in accordance with Section 01 33 00.
 - .1 Elevator operating buttons, car interior, car ceiling, car door, hoistway entrance door and frame finishes.

- .4 Reports:
 - .1 Prior to installation of elevators, submit to the Consultant 2 approved copies of submissions made to the Technical Standards and Safety Authority (TSSA).
 - .2 Provide inspection certificates upon elevator completion.

- .5 Operations and Maintenance Manuals:
 - .1 Submit following for each Product for incorporation into Operations and Maintenance Manuals in accordance with Section 01 78 23 :
 - .1 Identification: Manufacturing name, type, year, serial number, number of units, capacity, and identification of related systems.
 - .2 Functional description detailing operation and control of components.
 - .3 Performance criteria and maintenance data.
 - .4 Operating instructions and precautions.
 - .5 Safety precautions.
 - .6 Component parts availability including names and addresses of spare part suppliers.
 - .7 Consumables.
 - .8 Maintenance and troubleshooting guidelines/protocol, and recommended equipment for analysis and repair.
 - .9 Final tests and commissioning reports.
 - .10 Items to be submitted to Consultant: keys, tools, special devices, maintenance materials.
 - .11 Record drawings.
 - .12 Description of operation and control equipment.
 - .13 Equipment maintenance check chart.
 - .14 Equipment trouble shooting guide and instructions.
 - .15 Name, address, telephone and facsimile numbers for major component manufacturers.
 - .2 Manual documents that are larger than standard size sheets shall be neatly folded and housed in large envelopes or drawing pockets. These documents shall be inserted and housed in each manual binder.

1.5 **QUALITY ASSURANCE**

- .1 Retain a Professional Engineer, licensed in Province of Ontario, with experience in Elevator Work of comparable complexity and scope, to perform following services as part of Work of this Section:
 - .1 Design of elevators.
 - .2 Review, stamp, and sign shop drawings and design calculations.

1.6 **MAINTENANCE SERVICE**

- .1 Provide complete service and maintenance of elevator system components during building contract and 12 month warranty period at no additional cost to Owner.
- .2 Provide Maintenance Control Program (MCP) complying with ASME A17.1/CSA B44, and any other local authority rulings and requirements. MCP shall be turned over to the Owner upon completion and will be maintained as necessary.
- .3 Maintenance to include systematic examination, adjustment of elevator equipment and repair or replace parts whenever required as per planned maintenance tasks and frequencies. Use genuine parts produced by the manufacturer of specific equipment.
- .4 Perform work without removing cars during peak traffic periods.
- .5 Provide emergency call back service during regular operating hours for the maintenance period.
- .6 Maintenance service shall not be assigned or transferred to any agent or subcontractor without prior written consent of Consultant.

2 Products

2.1 **MATERIALS**

- .1 Drawings and specifications are based on the 'Gearless Traction Elevator' by Delta Elevators and shall be base bid. If another manufacturer's equipment is used, adjust surrounding construction to suit other manufacturer's product. If requirements or characteristics of lift equipment differ from that which is specified herein, such as: power requirements, electrical conductor size from control box to lift controller, motor hp size, or other such difference; list such differences at the time of bidding in accordance with the Contract Documents. Alternatives by the following will be considered provided they are approved prior to purchase.
 - .1 'EcoSpace' by KONE Inc.
 - .2 Schindler Elevator Corporation.
 - .3 ThyssenKrupp Elevator.
- .2 Use components only which have performed satisfactorily together under conditions of normal use in not less than two other elevator installations of similar design and for a period of at least one year. Furnish names and addresses of Owners or managers of buildings, in which proposed combination of major components has so performed.
- .3 Stainless steel sheet and plate: ASTM A167, Type 304 [316], brushed finish. Sizes and shapes indicated.

2.2 SOUND ISOLATION

- .1 Include resilient pads to effectively isolate machine from machine beams or flooring.
- .2 Prevent lateral displacement of machine.

2.3 CONTROL ROOM EQUIPMENT

- .1 Controller: A microcomputer based control system shall be provided to perform all of the functions of safe elevator operation. The system shall also perform car and group operational control.
- .2 All high voltage (110V or above) contact points inside the controller cabinet shall be protected from accidental contact in a situation where the controller doors are open.
- .3 High voltage motor power conductors shall be routed so as to be physically segregated from the rest of the controller.
- .4 Field conductor terminations points shall be segregated; high voltage (>30 volts DC and 110 VAC,) and low voltage (< 30 volts DC).
- .5 Controllers shall be designed and tested for Electromagnetic Interference (EMI) immunity according to the BS EN 12016.
- .6 Drive: A Variable Voltage Variable Frequency AC drive system shall be provided.

2.4 HOISTWAY COMPONENTS

- .1 Machine: AC gearless machine, with a synchronous permanent-magnet motor, dual solenoid service and emergency disc brakes, mounted at the top of the hoistway.
- .2 Buffers, Car and Counterweight:
 - .1 200 fpm Compression spring type buffers shall be used.
- .3 Hoistway Operating Devices:
 - .1 Emergency stop switch in the pit.
 - .2 Terminal stopping switches.
- .4 Positioning System: Consists of an encoder, reader box, and door zone vanes.
- .5 Guide Rails: Tee-section steel rails with brackets and fasteners.
- .6 Coated Steel Belts: Five polyurethane coated belts with 12 high-tensile-grade, zinc-plated steel cords in each.
- .7 Governor Rope: Governor rope shall be steel and shall consist of at least eight strands wound about a sisal core center.
- .8 Fascia: Galvanized sheet steel shall be provided at the front of the hoistway.

- .9 Hoistway Entrances:
 - .1 Frames: Entrance frames shall be of bolted construction for complete one-piece unit assembly. All frames shall be securely fastened to fixing angles mounted in the hoistway and shall be of 14-gauge (2 mm) sheet steel.
 - .2 Sills shall be extruded aluminum.
 - .3 Doors: Entrance doors shall be of hollow metal construction with vertical internal channel reinforcements.
 - .4 Fire Rating: Entrance and doors shall be UL fire rated for 1-1/2 hour.

2.5 ELEVATOR CONTROLLER CABINET

- .1 Provide elevator controls in an EEMAC 12 ventilated galvanized steel cabinet mounted adjacent to or attached to the power unit.
- .2 Provide controller with hinged doors, designed to allow ready access to all internal components.
- .3 Controller shall house contactors, relays, switches, timers, fuses and other control and operating devices. Clearly label all components with permanently marked tags or designations, corresponding to the electrical circuit wiring diagrams. Provide similar switch and relay units of same manufacturer.

2.6 VOLTAGE CONTROL

- .1 Include voltage control as follows:
 - .1 Effect voltage control by means of uniformly varying ac voltage applied to motor.
- .2 Include manufacturers standard AC variable voltage variable frequency drive system.
- .3 Include solid state motor drive as follows:
 - .1 Convert 3 phase, 60 hz ac to variable ac voltage for motor operation.
 - .2 Use automatic closed loop control system.
 - .3 Provide instant and noiseless response according to power required.
 - .4 Conform to ASME A17.1/CSA B44.
 - .5 Design circuitry with redundant systems to fail safe.
 - .6 Filter power supply to give essentially ripple free current.
 - .7 Design solid state devices to handle 200% current for 30 s and 300% for 10 s.
 - .8 Eliminate surges on the ac line which might cause blowing of the dc line fuses or which might cause trouble in other equipment connected to ac line. Filter dc if necessary.
 - .9 Modify frequencies emanating from rectifier drive which are objectionable to personnel or which interact with various parts of building.
 - .10 Design motor to suit control system.
 - .11 Automatically re-start equipment which has stopped due to ac power failure.
 - .12 Withstand damage and do not malfunction due to any variation of power supply to a maximum of +/- 10% flux.
 - .13 ***Elevator motor shall be equipped with a soft starter.***

- .14 ***Disable the elevator regenerative power feature when running under generator power.***
- .15 Cause no adverse effects on power supply, or other equipment connected to power supply, under operating conditions.
- .16 Include governor switch set to trip at no more than 90% of governor tripping speed; activated by overspeed in both directions.

2.7 **BUFFERS**

- .1 Do not compress oil buffers when car is level with bottom landing.
- .2 Use reduced stroke buffers and emergency terminal stopping devices where pit depth or overhead height does not permit installation of normal stroke buffers.
- .3 Include buffer extensions where necessary to suit pit depth as indicated.
- .4 Provide buffer switch on spring return buffers.

2.8 **CAR GUIDE RAILS**

- .1 Provide steel "T" section car guide rails, complete with brackets and sliding rail clips. Size rails to accommodate a 1500 mm vertical span between adjacent guide rail supports, even when the actual distances between supports are less.
- .2 Fasten rails to hoistway construction using fastening devices and members as provided by this Section.
- .3 Accurately machined car guide rail joints. They shall have tongues and grooves in the ends and centre of each rail head and base, so as to form matching joints between the rail head and base.
- .4 Maximum joint gap to be 1.5 mm. All rail joints to be filed smooth.
- .5 Provide fitted fishplates to the back of each rail joint. Each fishplate shall contain no less than eight through bolts. Fishplates shall be accurately machined surfaces for all surfaces which contact the guide rails.
- .6 Locate rail joints so fishplates will not interfere with the relative motion of the guide rail column with respect to rail clips, brackets and beams.
- .7 Positioned and aligned car guide rails so they are within 3 mm plumb and parallel from top to bottom.
- .8 Where rail shims are used, ensure they remain securely fastened, even though fastening bolts may become loose. Do not use shim packing for gaps exceeding 25 mm.

- .9 Cut car guide rails off at the top so there is a minimum clearance of at least 50 mm between the underside of the hoistway ceiling or nearest obstacle above the rail head.
- .10 Guide rails shall be cleaned, filed smooth and de-rusted before Substantial Completion of the work.

2.9 **ROLLER GUIDES**

- .1 Equip car with roller guides mounted on top and bottom of car frame.
- .2 Provide each guide with durable, oil resistant, resilient tired ball bearing rollers running on three finished rail surfaces.
- .3 Do not lubricate guide rails. Maintain each roller on its respective guide in uniform contact with rail surface at all times by means of substantial springs or by resilient mountings.
- .4 Provide guide operation which is inaudible to passengers in car or outside hoistway with car operating at rated speed and car fan turned off.
- .5 Use tire material which will not develop flat spots after standing idle for 24 h under average environmental conditions.

2.10 **HOISTWAY SWITCHES**

- .1 Provide normal terminal stopping devices at each top and bottom landing level. Arrange these enclosed switches so that as the elevator approaches either landing, a roller with a noiseless tread, mounted on a movable arm, will come in contact with cams mounted on the elevator car. The activation of this device will cause the elevator to automatically come to a smooth stop at that terminal landing. The switch roller shall engage the full surface area on the car cam.
- .2 Provide a final terminal stopping device at the top and bottom of the hoistway.
- .3 Operate final limits by a fixed car cam which is securely attached to the elevator car's structure.
- .4 Locate switches so they will only be activated in the event the elevator travels a predetermined distance above or below the corresponding terminal landing.
- .5 These switches shall be independent of the normal stopping devices.
- .6 Through bolt final limit switches once the car has passed TSSA final acceptance inspections.
- .7 Hoistway switches shall be of a type that can operate without noise being heard from inside the elevator cab whenever the ventilation fan is OFF.

2.11 **HOISTWAY ENTRANCE**

- .1 Hoistway doors and frames: stainless steel; 1.5 mm thick. Fascia panels constructed same as doors.
- .2 Door and frame construction: ULC rated for with fire rating; test to CAN4-S104; sandwich panel construction, 32 mm thick minimum.
- .3 Frames: bolted construction.

2.12 **OPERATING PANEL AND BUTTONS**

- .1 One operating panel per car with stainless steel faceplate mounted in each car, containing buttons with integral illumination corresponding to floors served, alarm button and "DOOR OPEN", "DOOR CLOSE" buttons.
- .2 One riser with UP and DOWN buttons at intermediate landings, and single call button at terminal landings, each with integral illumination and faceplate.
- .3 Button Illumination:
 - .1 Include LED illumination of each button in each landing and car operating fixture.
 - .2 Illuminate corresponding "up" or "down" button and car button whenever call is registered. Extinguish illumination when call has been answered.
- .4 Signal Illumination: Illuminate signal fixtures with sufficient intensity to produce distinct and well-defined indications under ambient lighting conditions.

2.13 **DOOR OPERATION**

- .1 Automatic door operation: at each landing by means of power operator mounted on top of car.
- .2 Door protective devices: multiple infrared light beams with solid state electronics providing extensive criss-crossed continuous scan across car entrance, unaffected by dust, humidity and vibration.
- .3 Door operating sequence to minimize car and hall door open and close times. Provide independently adjustable door open times.
- .4 Include arrangement specifically designed to minimize delays and return of car to service, should doors be prevented from closing for predetermined time.
- .5 If doors are prevented from closing for approximately 10 s because of obstruction or operation of safety devices, automatically disconnect door control device and allow doors to close more slowly and recycle until obstruction is cleared. Sound alarm.

2.14 **NEXT FLOOR STOP FEATURE**

- .1 In case of over-speed or tripping of overload relay stop car at next floor rather than make emergency stop between floors when serving between local floors.

2.15 **AUTOMATIC SELF LEVELING FEATURE**

- .1 Install self-leveling feature which will automatically bring car to floor landings. Correct for over-travel, independent of operating device.
- .2 Maintain car floor level within 10 mm of landing floor with two-way automatic maintaining leveling device.

2.16 **CAR PLATFORM AND ENCLOSURE**

- .1 Structural steel platform frame: filled with wood or steel subflooring. Threshold plate: durable and easily maintainable.
- .2 Enclosure: Sheet steel panels attached to steel frame.
- .3 Floor, walls and ceiling: 19 mm plywood, fire retardant treated surfaces and edges. Attach with flush mechanical fasteners.
- .4 Enclose car on all sides except entrance, suitable for removing or resurfacing for maintenance purposes.
- .5 Panels: Three, removable, retained securely with hidden fastenings. Design for removal of panels from inside car. Face panels with plastic laminate.
- .6 Floor finish: To be selected by Consultant.
- .7 Ceiling: aluminum eggcrate as provided by elevator manufacturer.
- .8 Include lighting providing a light intensity of 215 lx measured 0.75 m above floor. Totally enclose and conceal wiring and fixtures from view within car.
- .9 Ventilate by an exhaust air handling unit through roof and through concealed perforations at base. Limit total fan noise to 55 dB on "A" scale of General Radio Sound Level meter type 1551A from reading 1000 mm above floor with fan on high speed.
- .10 Operating panel and face plate: stainless steel with illuminating call buttons.
- .11 Indicator panel within car panel.
- .12 In-car card reader and security camera: ~~Supplied and~~ **Rough-in by elevator supplier**, installed by Others.
- .13 Pad hooks: Stainless steel, permanently mounted at 2100 mm.

- .14 Wall mats: one set canvas covered, padded with cotton wadding fill material and sewn.
- .15 Furnish stainless steel license holders integral with return panel in each elevator car or control room to suit certificate issued by enforcing authority. Design holder with hidden or tamper proof fastening.
- .16 Provide recessed mounted, hands-free, emergency telephone, with automatic dialing feature for dedicated line. Program to suit building manager's requirement. Provide vandal resistant mounting to prevent unit removal from cabinet.

2.17 **FINISHING**

- .1 Structural metal surfaces: clean surfaces of rust, oil or grease; wipe clean with solvent; prime two coats.
- .2 Machine components: clean and degrease; prime one coat, two coats enamel.
- .3 Field welds: chip and clean away oxidation and residue; wire brush weld; prime two coats.
- .4 Galvanized surfaces: clean with neutralizing solvent; prime one coat.
- .5 Wood surfaces not exposed to public view: one coat primer; two coats enamel.
- .6 Baked enamel on steel: clean degrease metal surface, one coat of zinc oxide primer sprayed and baked; two coats of semi-gloss enamel sprayed and baked; color as later selected by Consultant.

2.18 **BARRIER FREE DESIGN**

- .1 Comply with CSA B651.
- .2 42 mm dia. stainless steel handrails as indicated on drawings with ends returned close to panels and removable from inside car.
- .3 Sound audible soft-toned signal in car when car is passing or stopping at floor.

2.19 **EMERGENCY LIGHTING**

- .1 Include emergency lighting in each car as follows:
 - .1 Battery operated emergency lighting equipment, to CSA C22.2 No.141, to provide general illumination and 10 lx minimum illumination in car at operating panels and telephone cabinet for 4 h minimum.
 - .2 Key operated switch for manual testing of unit from within car.
 - .3 Battery unit of sufficient strength to support 100 kg person without causing malfunction or damage.
 - .4 Means to contain leakage or spillage of electrolyte.

3 Execution

3.1 **EXAMINATION**

- .1 Verify that hoistway and pit are ready for equipment installation.
- .2 Verify shaft and openings are of correct size and within tolerances.
- .3 Confirm electrical power is available and of correct characteristics.
- .4 Report defects in writing to Consultant.
- .5 Verify condition and dimensions of previously installed Work upon which this Section depends. Report defects to Consultant. Commencement of Work means acceptance of existing conditions.

3.2 **INSTALLATION**

- .1 Install equipment in accordance with the Contract Documents, reviewed shop drawings, and in accordance with ASME A17.1/CSA B44, local codes and regulations. Position components so as to allow for future replacement or repair work to be undertaken, without having to dismantle or relocate other equipment.
- .2 Connect to electrical services as provided.
- .3 Provide wiring and conduit from electrical disconnects to car controller. Coordinate location of controller and electrical connection routing.
- .4 Provide suitable rail bracket fasteners and make secure attachments to hoistway construction.
- .5 Provide inserts for placement in concrete form work or self drilling expansion shell bolt anchors that will perform to four times rated pull-out load.
- .6 Set entrance frames in proper alignment with car platform. Fasten frames to available wall and floor supports.
- .7 Exposed Work within car enclosure and hall landing entrances shall be fabricated in true planes. Metal and wood sections shall be installed flat, be securely fastened and aligned so as to be straight and true. They shall be free of visible imperfections. Joints shall be accurately fitted, aligned and installed in same plane.
- .8 Install entrances so frames are plumb within maximum variation of 3 mm, measured between entrance landing sill and header, top to bottom.
- .9 Install hoistway door sills, frames and headers in hoistway walls. Set entrances in vertical alignment with car openings and aligned with plumb hoistway lines.
- .10 Balance car.

3.3 **WIRING**

- .1 Install wiring in accordance with reviewed shop drawings. Tie wrap conductors.
- .2 Provide wiring to connect all parts of the elevator equipment including interconnecting wiring running between controller and elevator hoistway.
- .3 Wiring to be stranded or solid, to suit manufacturer's specific requirements. Wiring shall be provided with flame proof and moisture resisting outer cover.
- .4 Do not parallel conductors to increase current carrying capacity unless individually fused.
- .5 Wrap spare conductors together and labeled with their ends insulated.
- .6 Solder or fasten wiring connections to terminal strips or studs using approved mechanical fasteners.
- .7 Provide wiring harness where multiplicity of conductors are terminated at remote panel terminal strips.
- .8 Clearly identify controller components with designations corresponding to those used on electrical circuit drawings.
- .9 Provide insulated bushings around wiring openings where traveling cable and other multi conductor cables are run through openings in car enclosure.
- .10 Wiring connections to door detectors shall be protected from chaffing and splitting.
- .11 Where liquid tight conduit is used, provide conduit supports and fastenings at intervals of not more than 1500 mm.
- .12 Use proper anti shorts in all conduit connections.
- .13 Provide hoistway troughing and conduit.
- .14 Run hoistway wiring within conduit or troughing.
- .15 Provide ETT type flexible traveling cable, complete with flame resistant and moisture proof outer cover. Provide traveling cables of identical size and diameter and ensure each cable's loop has a similar hanging radius.
- .16 In all hoistway wiring risers, remote panel conduits and traveling cables runs provide a minimum of 10% spare conductors. Identify, tie wrap and isolate ends of all spare conductors.

3.4 FIELD TESTING

- .1 During installation, Consultant may carry out periodic Site inspections to gauge progress of the work and assess monthly invoices.
- .2 Provide full co-operate with Consultant to allow unrestricted access of the installation, hoistway, pit and car platform.
- .3 Perform all tests and inspections as required under ASME A17.1/CSA B44 and Authorities having Jurisdiction.
- .4 Include all costs of Provincial registration, design submission and acceptance inspection fees.
- .5 Coordinate and schedule with TSSA acceptance inspections.
- .6 Performance and operation or commissioning inspections shall be carried out by the Owner's designated representatives and shall be scheduled to take place before TSSA acceptance inspection.
- .7 During commissioning inspections, supply sufficient test weights to demonstrate performances under full load and no load conditions.

3.5 EQUIPMENT PERFORMANCE AND ADJUSTMENT SETTINGS

- .1 Adjust elevator to attain the following performance criteria:
 - .1 Car movement on guide rails: smooth movement, with no perceptible lateral or oscillating movement or vibration.
 - .2 Car speed variation: maximum 5% in lifting rated load.
 - .3 Car speed variation: maximum 10% in UP or DOWN speed, empty to full rated load.
 - .4 No noticeable shift in acceleration or deceleration rates.
 - .5 Car leveling accuracy shall be maintained at +/- 6 mm, under all load conditions.
 - .6 Guide rail alignment: plumb and parallel to each other within 3 mm.
- .2 Adjust door opening and closing times to suit handicapped users in accordance with Consultants instructions.
- .3 Adjust automatic floor levelling feature at each floor.

3.6 CLEANING

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

END OF SECTION