PART E

SPECIFICATIONS

PART E - SPECIFICATIONS

GENERAL

E1. APPLICABLE SPECIFICATIONS, STANDARD DETAILS AND DRAWINGS

E1.1 These Specifications are applicable to the Work of the Contract.

E2. SERVICE TO BE PROVIDED

E2.1 Work Included

(a) The Contractor will be responsible for the elevator maintenance services at the location(s) on the terms and conditions outlined in the Specifications.

(b) The Contractor shall be responsible for ensuring that up-to-date wiring diagrams, manufacturer's manuals, leaflets, and other information relevant to the maintenance of the equipment are in the elevator room prior to the commencement of the service. All wiring diagrams, manuals, leaflets, etc., are the property of the City of Winnipeg and are not to be removed for any reason from the elevator room.

E2.2 Services Provided by the Contractor

(a) The Contractor shall provide a **FULL MAINTENANCE SERVICE** which shall comprise of maintaining the elevator equipment in its original condition, regularly examining, cleaning, lubricating and making **all repairs and replacement parts to the entire elevator equipment**, including within the machine rooms, hoist way, pit, and car top, as outlined in the Specifications. (with exceptions listed in E3). All Work shall be done in a careful, workmanlike manner, acceptable to the Contract Administrator. All Work shall be in compliance with the original manufacturer's specification and the latest CAN/B44 Code for elevators.

E3. WORK NOT INCLUDED IN CONTRACT

E3.1 The Contractor shall assume no responsibility for the following items of elevator equipment, which are not included in this Contract: car enclosures (including removable panels, door panels, car gate bodies, plenum chambers, hung ceilings, light diffusers, light tubes, bulbs and ballasts, mirrors and tile flooring or carpets); hoist way gate bodies, frames and sills.

E4. NOTICE OF REPAIRS

E4.1 The Contractor shall provide the Department with as much advance notice as possible of major maintenance repairs for which the Contractor is responsible including cleaning that has been planned for the elevator giving approximate dates for such Work.

E5. ADJUSTMENTS

E5.1 The Contractor shall examine the equipment and make adjustments as required to maintain Contract speed and performance, smooth operation, including operation of groups supervisory control systems. This applies also to all solid state and electronics components.

E6. EMERGENCY POWER GENERATOR SYSTEM TESTING

E6.1 The Contractor shall not normally be required to make any tests to the elevator equipment utilizing emergency power supply. Where such supply is available, the testing of the emergency system will be normally undertaken by the City of Winnipeg.

E7. CONTRACTOR'S RESPONSIBILITIES

E7.1 The Contractor shall maintain the elevator equipment herein described on the following terms and conditions as per the original manufacturer's specifications and the latest CAN/B44 code for elevators.

E7.2 The Contractor shall be responsible for ensuring that the specified Works herein described, or as otherwise required in current and relevant manufacturer's instruction/manuals, are diligently executed and rigidly adhered to, including the required number and frequency of servicing and inspections of the equipment.

E7.3 Labour

(a) The Contractor shall only use trained personnel directly in his employment with proper supervision. The elevator mechanics shall be qualified to keep the equipment properly adjusted and maintained and shall hold a valid limited Electrical License issued by the Department of Labour, Province of Manitoba.

(b) During the term of this Contract, all personnel employed by the Contractor at these premises shall pass a security check by the City of Winnipeg Police Services, prior to commencement of Work.

(c) The Contractor shall immediately upon award, supply to the Contract Administrator, the following data on personnel he intends to employ at these premises for the term of this Contract: full name, present address, and verified date of birth, for each employee.

(d) The list of names of all persons submitted by the Contractor, for the clearance procedure, must be accompanied by the "Authorization" form supplied by the City of Winnipeg, signed by the prospective employees.

(e) Any supervisor or workman not acceptable to the Contract Administrator because of improper conduct or security, shall upon notice to the Contractor, be removed from the location of Work and replaced forthwith unless the Contractor can show valid reason to the contrary.

E8. PERFORMANCE - CONTRACT SPEED

E8.1 The Contractor shall agree, where applicable, to maintain the original equipment speed in feet per minute, the original performance time, including acceleration and retardation as designed and installed by the manufacturer and to perform the necessary adjustments, as required, to maintain the original door opening and closing time, within limits of applicable codes.

E8.2 Group Dispatching

(a) The Contractor shall, where applicable, check the group dispatching systems and make necessary tests to insure that all circuits and time settings are properly adjusted and that the system performs as designed and installed by the manufacturer.

E8.3 Damage

(a) The Contractor shall be responsible for all damage, which may occur to the equipment during this Work, due to faulty or negligent workmanship on the part of his employees.

(b) The Contractor shall also be held responsible for any damage caused to the building or its contents, which may occur during the Work, where such damage is directly attributable to the use or misuse of equipment or materials of all kinds on the part of his employees or for any other type of damage caused directly by his employees. Damage shall be made good by new materials as required to match existing Work in kind, quality and workmanship.

(c) The City of Winnipeg reserves the right to withhold any payment due to the Contractor, until such time as damage is repaired to the satisfaction of the Contract Administrator.

E9. MATERIALS

E9.1 The Contractor shall provide all materials necessary to perform the Service to the Contract Administrator's satisfaction.

E9.2 The Contractor shall supply all parts, except as otherwise excluded, including lubricants, hydraulics fluid and cleaning materials, and tools, and have an adequate stock of normal replacement parts in a parts cabinet on the job, so that the mechanic can effect prompt repairs. All parts supplied by the Contractor shall be new, unused and of the best quality available.

E9.3 All materials and equipment supplied in the undertaking of this Contract shall be of the best quality.

E9.4 All cleaning materials, lubricants and hydraulic fluids shall be supplied and applied in accordance with the original manufacturer's requirements.

E9.5 All repair or replacement parts and/or components when required, shall be supplied using only genuine original manufacturer's replacement parts or equivalents acceptable to the City of Winnipeg. If other than the manufacturer's parts must be used, permission must be obtained from the Contract Administrator in writing and such parts must be C.S.A. Approved where applicable, in accordance with the original manufacturer's specifications and the latest C.S.A. Code B44, for elevators.

E9.6 N.B. - Current, Material Safety Data Sheets, (M.S.D.S.) must be available on all products on Site and be contained in a binder specifically marked M.S.D.S., in each area where chemicals are stored or dispensed. Where a Contractor wishes to use a product that does not have a current M.S.D.S., the Contract Administrator must give prior written approval and that written approval must be in the binder.

E9.7 Storage

(a) The City of Winnipeg will provide reasonable space for the storage of the Contractor's materials and inventory. Such storage space will be locked to other than the employees of the Contractor, wherever reasonable possible.

(b) In providing such space, the City of Winnipeg accepts no responsibility for loss to, or damage of, the material, inventory and other property of the Contractor. The Contractor acknowledges that any insurance policies held, or to be held by the City of Winnipeg, in respect of the Building and contents, will not cover loss or damage pertaining to the Contractor's materials and inventory.

E10. CONTRACTOR'S INVENTORY

E10.1 Steel Parts, Cabinets and Wiring Diagrams

(a) The Contractor shall maintain steel cabinets for the orderly storage of replacement parts in the machine room. Original manufacturer's engineering wiring diagrams must remain within the elevator room at all times, in compliance with the Department of Labour and Elevator Board Regulations. Upon completion of Contract provisions, Contractors shall leave all diagrams within the elevator room, removing only their parts cabinet and contents.

E10.2 Job Material Inventory

(a) The Contractor shall maintain a supply of contacts, coils, leads and generator brushes, lubricants, cleaning materials, and other minor parts in such elevator machine room for the performance of routine preventative maintenance.

E10.3 Spare Parts Inventory - Acceptable Equivalents

(a) The Contractor shall maintain a supply of genuine manufacturer's replacement parts or equivalents acceptable to the City of Winnipeg, in his warehouse inventory. This inventory will include, but is not limited to, door operator motors, brake magnets, generator and motor brushes, controller switch contacts, solid state components, selector tapes, door hangers, rollers hoist way limit switches.

E11. SAFETY

E11.1 The Contractor shall be knowledgeable of and abide by the provision of all legislative enactments, by-laws and regulations in regard to safety in the Province of Manitoba and must be covered by Workers' Compensation, as noted below.

E11.2 The Contractor shall examine all safety devices and governors and shall carry out all required tests and examinations per Section 12, Supplement No. 1-1992 to CAN/CSA-B44-M90 Safety Code for Elevators. Annually conducted no load safety tests on each elevator shall occur during September/October of each year and shall be recorded on the monthly inspection report to the Authorized Representative.

E11.3 If the Contractor deems the equipment to be unsafe to operate, he will make sure that it is inoperative and immediately notify the Contract Administrator. The Contractor shall provide adequate barricades, warning signs, out of order signs and all reasonable protection and shall not leave the premises until steps have been taken to protect the public from all hazards. These provisions shall remain in force until the necessary adjustments or repairs are made to make the elevator(s) safe to operate.

E11.4 The Contractor shall be responsible for utilizing the services of the Department of Labour, Province of Manitoba, Elevator Inspection Branch, to determine the adequate factor of safety in compliance with the original manufacturer's specifications and the latest C.S.A. Code B44 and all relating standards, under such circumstances where the Contractor is in doubt as to the prudent and safe operation of the equipment.

E12. INSPECTION, TESTING

E12.1 Inspection, testing and maintenance shall be carried out as outlined in the Manitoba Fire Code, Section 7.2, sub-section 7.2.2 and Section 12, Supplement No. 1-1992 to CAN/CSA-B44-M90 Safety Code for Elevators.

E13. INSPECTIONS - REPORTING

E13.1 The Contractor shall make arrangements with the Contract Administrator, or his approved designate, as to the time and date for all regular inspections. The Contractor's mechanic(s) shall report to the office of the Contract Administrator and make an entry, in a log, as to arrival and departure times and other information as requested. The Contract Administrator, or his designate, shall be witness to such entries. The log shall be provided by and remain the property of the City of Winnipeg.

E13.2 The Contractor shall provide the Contract Administrator with a record of the Work undertaken during each visit to the building. The standard checklist normally provided by the Contractor may be used, upon approval by the Contract Administrator. The checklist shall be retained within the Building Manager's Office, or the elevator machine room, for review by the Contract Administrator at any time. Work performed and items replaced shall be indicated together with the mechanic's signature.

E13.3 The City of Winnipeg reserves the right to implement its own standard checklist in lieu of the Contractor's, at any time during the term of the Contract.

E13.4 The Contractor shall submit, to the Contract Administrator on a monthly basis, reports detailing the Work completed in that month's regular maintenance service provision. The reports may be computer print outs or copies of time sheets indicating the pertinent information.

E13.5 The Contractor shall submit time tickets for each call back detailing the cause of the call back and the action taken.

E13.6 The Contract Administrator, or designate, shall have access to the elevator room at all times during the period(s) of the mechanic's visitations to observe, or be informed by the mechanic, of potential problems that may arise.

E14. WORK

E14.1 The Contractor shall be responsible for all maintenance related Work performed during normal business hours for that facility as part of the "Full Maintenance" Contract. The Contractor shall be responsible for all maintenance repairs during normal business hours except for vandalism.

E14.2 Emergency Call Back Services - Service Calls

(a) In the event that trouble develops between regular examinations, the Contractor shall, upon receipt of notification from the Contract Administrator or Authorized Representative, make every reasonable effort to provide prompt service to perform any necessary adjustments and repairs that may be required.

(b) Costs for such service calls shall be as indicated on Form A Unit Price Schedule of Prices.

E14.3 Extra Work

(a) The Contractor shall advise the City of Winnipeg of Work outside the scope of this Contract that needs to be done. Extra Work outside the scope of this Contract shall only be done upon prior written authorization of the Contract Administrator or his designate.

E14.4 Shutdown of Equipment by Contractor

(a) When any pre-planned Work requires shut down of equipment, or decrease in capacity of the equipment, the Contractor shall obtain permission from the Contract Administrator, prior to commencing the Work, allowing sufficient notice for the Contract Administrator to make the required arrangements.

(b) Every effort shall be made, by the Contractor, to coordinate the Work with the Contract Administrator and hold interruptions to service, to a minimum.

E14.5 Changes to Equipment

(a) The Contractor shall make no changes, to the equipment, including circuit changes, without written permission of the Contract Administrator.

E14.6 Report on Condition of Equipment

(a) The Contractor shall inform the Contract Administrator promptly and confirm in writing, any recognizable hazards, malfunctions or repairs that are necessary either for the protection of the equipment, or for general safety, that are not covered by the Contract.

E15. PERFORMANCE OF CONTRACTOR'S OBLIGATIONS

E15.1 The Contractor represents and warrants that:

(a) the Contractor and the Contractor's mechanic(s) possess the necessary skills, expertise and experience to perform the Service, in accordance with the provisions of this Contract; and

(b) the Contractor understands the City of Winnipeg's requirements under this Contract and will be able to satisfy these requirements.

E15.2 The Contractor agrees:

(a) to perform all obligations and provide the Service in a professional manner satisfactory to the Contract Administrator.

E16. SERVICE REDUCTION

E16.1 The City of Winnipeg reserves the right to reduce the number of elevator units under this Contract from service, if it is deemed prudent to do so, at any time within the Contract duration. Such elevator unit(s) will be closed for access and use.

E16.2 In the event that shut down does occur, the reimbursement payable to the Contractor for service to the total number of units shall be proportionately reduced by the unit(s) being deactivated from service. The decision to deactivate any unit(s) will be subject to a minimum of thirty (30) days written notice of intent to the Contractor.

E17. NOTICE

E17.1 In regard to emergency call back services; the Contract Administrator may request the Contractor for service by means of the telephone, or any other method, in order that prompt remedial action by the Contractor is achieved.

E18. RESPONSE TIME

E18.1 Services shall be provided on an "as required" basis available twenty-four (24) hours a day, three hundred and sixty-five (365) days a year.

E18.2 Emergency services shall be provided on a twenty-four (24) hours a day basis and Work crews shall be on Site and Working within one half hr. (30 min.) from telephone notification.

E18.3 Contractor shall provide, a telephone number at which they may be contacted twenty-four (24) hours a day, three hundred and sixty-five (365) days a year. An answering service is acceptable provided that the Contractor returns calls within fifteen (15) minutes of a message from the City.

1. PHASING THE WORK

1.1 PHASE #1 ELEVATORS #1 & #3

1.1.1 Within two (2) weeks of anticipated delivery of the controllers commence the dismantling *Work* on Elevator #1 & #3.

1.1.2 The initial residual old equipment shall be retained on site to serve as emergency replacement parts for the original elevators. Once Phase #1 is complete such material may then be removed and disposed of as described elsewhere herein.

1.1.3 Maintain normal existing service, no unauthorized downtime at all times, on elevators #2 and #4.

1.1.4 Perform all *Work* continuously without delay on elevator #1 & #3.

1.1.5 Perform elevator cab finishes *Work* until complete.

1.1.6 Prior to commencing Phase #2 provide City of Winnipeg an in-depth review of new elevator operational features.

1.2 PHASE #2 ELEVATORS #2 & #4

1.2.1 Do not start Phase #2 to until the Contract Administrator agrees that elevator #1 & #3 is functioning as specified.

1.2.2 Upon instruction by the Contract Administrator commence Work continuously without delay on elevator #2 & #4.

1.2.3 The residual old equipment may be removed and disposed of as described elsewhere herein.

1.2.4 Maintain normal existing service, no unauthorized downtime at all times, on elevators #1 and #3.

1.2.5 Perform elevator cab finishes Work until complete.

1.2.6 All subject to revision, updating and adjustment as instructed by the Contract Administrator

1.3 PHASE #3

1.3.1 Maintain normal new service with no down time at all times on not less than three elevators.

1.3.2 Perform Dispatching, performance adjustments to synchronize the group operation including all operational features.

1.3.3 Perform all Work required to Clean, paint all materials and remove all residual materials.

2. MAN POWER:

2.1 The *Contractor*'s manpower must be experienced in all aspects of *Work* and will continuously *Work* on the elevators as described herein.

2.2 To achieve the goal of timely completion of project, the *Contractor*, will provide a continuous uninterrupted level of manpower at all times during normal working hours of normal business days, which shall include four (4) experienced personnel working in two (2) separate *Work Teams* and make available as maybe required by the City of Winnipeg, a separate Journeyman Maintenance Man as more specifically defined by the *Contractor*.

2.3 As a minimum, each *Work Team* will consist of one experienced Journeyman Elevator Modernization Mechanic and one experienced journeyman's Helper.

2.4 A Journeyman Maintenance Man not part of the *Work Team* must be, available at all times other than Normal

Business Hours/Days, 24 hours a day, 7 days a week, able to respond to breakdowns and arrive at the place of *Work* within 30 minutes of a call for service by the City of Winnipeg.

2.5 A Journeyman Maintenance Man not part of the *Work Team* must be, during normal *Work*ing hours of normal business days, able to respond to breakdowns and arrive at the place of *Work* within 15 minutes of a call for service by the City of Winnipeg.

2.6 The *Contractor* will designate a Journeyman Elevator Mechanic to perform weekly maintenance routines and respond and repair breakdowns of the functioning elevators both old and new.

2.7 In the event of a breakdown of the functioning elevators, the *Contractor* shall immediately and simultaneously dispatch the *Work* Team and the Maintenance Man to respond to the breakdown. The *Work* Team shall *Work* on restoring service until the Maintenance Man's arrival. Thereafter the Maintenance Man shall take over breakdown repair *Work* and if required one of the members of the *Work* Team will provide assistance.

2.8 Maintaining the operational elevators must not delay the *Work* on the Construction of the other elevators and vise versa.

-END OF SECTION-

1. CSA APPROVED ELECTRICAL EQUIPMENT

1.1 Either CSA or the Manitoba Labour shall approve all electrical equipment. There shall be a label on each piece of equipment indicating this.

1.2 Do not deliver electrical equipment to the City of Winnipeg's building unless CSA or the Manitoba Labour approves it.

1.3 For all electric equipment not CSA approved, the Contractor or supplier shall coordinate the equipment approvals with the Manitoba Labour Elevator Inspection Branch, and pay for all costs involved. The Contractor (or supplier) shall provide a copy all approval documents in each equipment Maintenance Operations Manual.

2. OUTLET BOXES

2.1 Outlet junction and switch boxes shall be galvanized steel sized according to the Canadian Electrical Code and to suit each application.

2.2 All boxes shall be 100 mm (4") square complete with square-cut Raco rings to flush with the finished wall, or straight-sided masonry boxes as required.

2.3 Outlet boxes located in exposed concrete block or masonry construction shall be Raco type masonry boxes, saw-cut into the bottom edge of the nearest course of block or masonry as may be required at a height nearest that specified. They shall be of sufficient depth to allow conduit to pass through the centre of the block.

2.4 Where outlet boxes are shown on the field drawings as being aback to back' on opposite sides of a wall, or close to being aback to back' there shall be a minimum offset of 200 mm (8") between boxes to reduce sound transmission. In no case shall "through-wall" boxes be used.

2.5 In finished areas, where blank covers are installed on outlet or junction boxes, they shall match the switch cover plates specified. In ceilings, they shall be painted to match the finish of the adjacent surface.

2.6 Outlet boxes, where surface wiring is permissible, shall be galvanized pressed steel construction sizes as required for the installation.

2.7 Outlet boxes for exterior Work or where indicated shall be cast type with cover gaskets and threaded hubs.

2.8 Sectional boxes shall not be used without specific approval of the Contract Administrator.

3. RECEPTACLES

3.1 Receptacles shall not have aluminum yokes, blades or terminals. Receptacles with CO/ALR rating will not be accepted.

4. CONDUIT SYSTEM, WIRING AND CABLES

4.1 Unless otherwise specified or shown on the drawings, all systems in the building shall be wired in steel electrical metallic tubing (EMT) complete with 12 minimum AWG green insulated ground wire. Conduits installed in concrete may be EMT plus ground wire or PVC plastic conduit with ground wire.

Refer to drawings for wiring in hazardous locations. Wiring in these areas shall meet code requirements.

4.2 All conduit shall be concealed except in mechanical rooms and electrical rooms, or unless otherwise indicated in this specification, or noted on the field drawings.

4.3 Unless indicated otherwise, minimum conduit size shall be 19 mm (3/4") and shall not be reduced without the approval of the Contract Administrator.

4.4 For "EMT" installations bushings, couplings and connectors shall be steel complete with setscrew connectors and insulated throat with plastic throat liner. Other EMT fittings such as "LB" fittings, etc. in dry locations may be die cast provided that they have integral threaded outlets and threaded steel connectors with plastic throat liners are used. Die cast fittings with integral setscrew connectors are not permitted.

4.5 Unless specifically noted, do not embed conduit into concrete. Except with the approval of the Contract Administrator, all conduit runs embedded in concrete shall not be larger in outside diameter than one quarter (1/4) the thickness of the wall or beam in which they are embedded, nor shall they be spaced closer than three diameters on centre, nor so located as to impair unduly the strength of the construction. Where installed in columns, the conduit shall be placed in the centre of the column and then offset to the outlet box. In no case shall the conduits be placed so that there is less than 25 mm (1") of concrete covering. All conduit runs in concrete shall be inspected and approved by the Contract Administrator before concrete is poured. Conduit shall not be embedded in floating concrete slab construction unless specifically indicated otherwise.

4.6 Watertight fittings shall be installed in areas exposed to moisture. All conduit shall be laid out to avoid interference with other Work, and where necessary shall be graded to drain with no pockets in which water can collect. Conduits shall be at least 150 mm (6") clear of all steam pipes or other high temperature equipment. Running threads will not be permitted, proper couplings shall be used.

4.7 No circuits fed from emergency or essential power sources shall run in the same conduit as other systems.

4.8 Conduit and cable runs shall be supported at intervals not exceeding 1500 mm (5' 0") and shall be run on the square, parallel with building structure, beams, etc. Where conduits and cables are run in close proximity to each other, they shall be grouped and installed in a neat and professional manner, properly supported on approved hangers, securely anchored. All conduit and cable runs shall be properly clipped; wire support or ties will not be accepted. All junction, pull and outlet boxes shall be adequately supported, independent of conduit and cable runs to them.

4.9 Unless otherwise designated, install pull boxes or fittings in runs where more than four bends are necessary. Install pull-boxes where runs exceed 23 metres (75'-0") in length. Pull boxes and fittings shall be readily accessible.

4.10 All conduits, raceways; etc., passing across expansion joints of the building shall be installed utilizing approved expansion fittings, and bonding device.

4.11 All open conduit ends, including that entering wall or floor boxes, shall be sealed immediately after installation by approved caps to prevent the entrance of dirt and moisture during construction.

4.12 All conduits and raceways shall be clean and dry before installation of wires.

4.13 No power driven pins (Ramsey) shall be utilized to secure any portion of the electrical installation without specific approval from the Contract Administrator.

4.14 "BX" cables shall not be used on this project.

4.15 All conduit and cable penetrations through floor slabs are to be sealed liquid-tight.

4.16 The term "roughing in" is to mean installing conduits, wiring, boxes, etc.;

4.17 All boxes, conduit access fittings and pull boxes for all systems shall be mounted not more than 600 mm (24") above finished ceiling where possible for easy access in ceiling space without requiring that a step ladder extend through the finished ceiling. The mounting of aforementioned devices shall, in no case interfere with ceiling tile removal or access to ceiling spaces.

4.18 Coordinate the installation with other trades.

-- END OF SECTION --

1. ELEVATOR MAINTENANCE

1.1 DURATION

1.1.1 Effective March 1, 2003, the maintenance of the four (4) elevators will be the responsibility of the Contractor from the start of the execution of this Contract until the end of the warranty period.

1.1.2 The maintenance consists of Interim Maintenance and Maintenance and requirements are found in the front end documents under Part –E Specifications.

1.2 INTERIM MAINTENANCE

1.2.1 Interim Maintenance commences March 1, 2003 and continues month to month until Total Performance of all Work is attained as certified by the Contract Administrator.

1.2.2 The cost for providing month-to-month Interim Maintenance is included in the Total Bid Price.

1.2.2.1 This month-to-month cost for the Interim Maintenance will be amount listed in Bid Form.

1.2.3 The elevators must remain in service as long and as quickly as possible. Respond to all calls for service as an emergency and arrive at the site within 30 minutes or less.

1.2.4 Maintenance intervals must not to exceed 7 days during this period.

1.2.5 The coverage is all-inclusive which includes all labour (24 hours a day 7 days a week) all parts and all miscellaneous sundries including travel time and transportation costs.

1.2.6 Prorating of retained, reused, recycled materials is prohibited. No extra costs will be allowed for any labour or material necessary to perform the maintenance Work, to obtain the desired performance results, whether exactly described in the specification or not, except where such cost is explicitly provided for in this specification.

2. MAINTENANCE

2.1 Includes annual terms and coverage is as defined elsewhere.

2.2 The cost for providing this maintenance is included in the Total Bid Price.

- END OF SECTION -

1. FIRES

1.1 Fires and burning rubbish on City of Winnipeg's property is not permitted.

2. WASTE DISPOSAL

2.1 Do not bury rubbish and waste materials on City of Winnipeg's property.

2.2 Legally dispose of waste or volatile materials, such as mineral spirits, oil or paint thinner and do not dispose into waterways, storm or sanitary sewers.

2.3 Legally dispose of all waste materials.

2.4 Do not use City of Winnipeg's existing waste disposal containers.

3. POLLUTION CONTROL

3.1 Prevent sandblasting and other extraneous materials from contaminating air beyond application area, by providing temporary enclosures and/or other control methods. If necessary, arrange for shutdown of air handling units that have air intakes in the vicinity of the Work. Dust can trigger fire alarm smoke detectors and can plug ducts and filters. Dust and suspended particles can damage air-cooled mechanical and electrical equipment. If necessary, arrange for shutdown of this equipment. Contractor shall be responsible for all damages. Prior to start of Work, identify locations of air intakes and air-cooled mechanical and electrical equipment within and adjacent to the area of Work.

3.2 Control noxious and hazardous gases. Prevent hazardous accumulations. Control emission from equipment and plant to local authority's emission requirements.

3.3 Prevent hydraulic and all other extraneous oils from contaminating drains and sump pits. If necessary, arrange for shutdown pumps and capping of drain holes in the vicinity of the Work. Contractor shall be responsible for all damages. Prior to start of Work, identify locations of possible contamination within and adjacent to the area of Work.

4. WORKPLACE HAZARDOUS MATERIALS INFORMATION SYSTEM

4.1 The Contractor is responsible for securing Materials Safety Data relating to specified products or other regulated products and materials that will be used on the Work site, including those materials not specified herein.

4.2 The Contractor, at award of Contract, will submit copies of all pertinent Materials Safety Data Sheets to the Contract Administrator.

4.3 The Contractor is responsible for making available to his employees, hazard information and warnings related to products specified herein as well as other products not specified but used.

4.4 The Contractor shall take all precautions as required or reasonable in circumstances encountered to protect its employees and employees, visitors (general public), and facilities of the City of Winnipeg during the handling, storage and application of these products and materials for carrying out the Work.

4.5 The Contractor will be held responsible for any damage, costs or losses to the City of Winnipeg, its employees, visitors (general public) and facilities for his failure to take the necessary precautions during the handling, storage and application of all products used for carrying out the Work.

4.6 Storage of hazardous materials within or around the City of Winnipeg's building(s) will not be allowed.

END OF SECTION

1. PRODUCTS

1.1 QUALITY

1.1.1 All materials, equipment, and articles incorporated in the Work shall be new, not damaged or defective, and of the best quality for the purpose intended. If required, furnish evidence as to type, source, and quality of products provided.

1.1.2 Defective material, equipment, and articles whenever found at any time prior to completion of Work, will be rejected, regardless of previous inspections. Inspection by Contract Administrator does not relieve responsibility but is merely a precaution against oversight or error. Remove and replace defective materials at the Contractor's expense and be responsible for all unnecessary delays and expenses caused by rejection.

1.1.3 Should any dispute arise as to the quality or fitness of materials, equipment or articles, decision rests strictly with Contract Administrator, based upon the requirements of the Contract Documents.

1.1.4 Unless otherwise indicated in Specifications, maintain uniformity of manufacture for any particular or like item throughout the building.

1.1.5 Permanent labels, trademarks, and nameplates on materials, equipment and articles are not acceptable in prominent locations, except where required for operating instructions, and when located in mechanical or electrical rooms.

1.1.6 Materials and products containing asbestos fires or polychlorinated biphenals are not permitted on this project.

1.2 CONFORMANCE

1.2.1 When material or equipment is specified by standard or performance specifications, upon request of Contract Administrator, obtain from manufacturer an independent testing laboratory report, stating that material or equipment meets or exceeds specified requirements.

1.3 STORAGE, HANDLING, AND PROTECTION

1.3.1 Certain storage of construction materials, tools, equipment, etc., when established during initial job site meeting, may be used and designated as such by the City of Winnipeg. Storage in areas outside the designated Work areas is not permitted.

1.3.2 If required, obtain and pay for use of off-site storage or Work areas needed for operations or for delivered equipment or materials not required immediately on premises.

1.3.3 Handle and store products in a manner to prevent damage, adulteration, deterioration, and soiling and in accordance with manufacturer's recommendations when applicable.

1.3.4 Store packaged or bundled products in original and undamaged condition with manufacturer's seals and labels intact. Do not remove from packaging or bundling until required in the Work.

1.3.5 Store and mix paints in a heated and well-ventilated room assigned for this purpose. Keep room under lock and key at all times. Remove oily rags and any other combustible debris from site daily. Take every precaution necessary to prevent spontaneous combustion. Provide an operational fire extinguisher in the room at all times.

1.3.6 Remove and replace damaged products at own expense and to satisfaction of the Contract Administrator.

1.4 MANUFACTURERS' DIRECTION

1.4.1 Unless otherwise indicated in the Specifications install or erect all products in accordance with manufacturer's recommendations. Do not rely on labels or enclosures provided with products. Obtain instructions directly from manufacturers.

1.4.2 Notify the Contract Administrator in writing of any conflicts between the Specifications and manufacturer's instructions so that the Contract Administrator may establish the course of action to follow.

1.4.3 Improper installation or erection of products due to failure in complying with these requirements authorizes the Contract Administrator to require any removal and reinstallation that may be considered necessary, at no increases in Bid Price.

2. WORKMANSHIP

2.1 CONCEALMENT

2.1.1 Conceal pipes, conduit and wiring in wall and ceiling if construction of finished areas except where indicated otherwise.

2.1.2 Provide suitable access doors, panels or plates to permit easy access to all electrical access fittings (junction boxes, pull boxed, etc.), valves and all equipment, which requires periodic servicing. If access opening is larger than 1 ft square (0.09 m2) and bottom of opening is less than 7'11" (2.4 m) above finished floor, except in mechanical or electrical rooms or other continuously locked rooms not accessible to the general staff and the general public (e.g. storage rooms), provide a suitable access door and lock. Key lock cylinder to the building master key system. Check with the City of Winnipeg’s Plant Maintenance Department for keying requirements. Key cylinder to these requirements and provide three (3) keys per lock.

2.1.3 Prior to installation of access doors, panels or plates, check required fire rating (number of hours) of building structure. If the assembly requires fire rating, provide appropriate fire rated door which is ULC approved and recommended for the application. Confirm selection with the Contract Administrator.

2.1.4 Leave free space above all ceiling tiles to permit easy off removal of ceilings.

2.1.5 Do not obstruct access space above removable ceiling tiles or behind access doors, panels or plates. Install piping, ducting, conduit, wiring, equipment and fixtures to permit maximum access space and accessibility to valves, electrical access fittings and to equipment, which requires periodic servicing.

2.1.6 Prior to installation of equipment, fixtures, and electrical services, confirm layout with Contract Administrator. If in the opinion of the Contract Administrator layout obstructs or restricts required access of free space, make alterations as directed by Contract Administrator, at no additional cost to the Contract.

2.2 FASTENINGS AND ATTACHMENTS

2.2.1 Provide metal fastenings and accessories in the same texture, color, and finish as adjacent materials, unless otherwise indicated in the Specifications.

2.2.2 Prevent electrolytic action between dissimilar metal and materials, by means of suitable isolation coatings.

2.2.3 Use non-corrosive hot dip galvanized easterners and anchors for securing exterior Work, unless stainless steel or other corrosion resistant material is specifically requested in the affected Specifications Section.

2.2.4 Space anchors within their load limit or shear capacity and ensure they provide positive permanent anchorage. Wood or any other organic material, plugs are not acceptable.

2.2.5 Exposed fastenings on architectural finishes are prohibited.

2.2.6 Fastenings that cause chipping or cracking of material and mounting surfaces are not acceptable.

2.2.7 Prior to installing fasteners, anchors or hangers into concrete slabs, concrete joists or slab soffits, confirm proposed method and materials with Contract Administrator.

2.2.8 Prior to installing structural anchors, hangers, or support systems, confirm proposed method and materials with Contract Administrator.

2.2.9 When method of attachment, fastenings or support system is unclear or not specified, submit written request for clarification to Contract Administrator no later than 14 days prior to close of tender. Failure to submit request for clarification prior to stated deadline indicates Contractor shall provide safe and functional installation as specified in Contract specifications and drawings, and as directed by Contract Administrator, at no additional cost to Contract. This Contract shall include all Work and costs involved to produce safe and functional installation for all equipment, fixtures and material specified.

2.2.10 Unless specifically noted in specifications or on drawings, do not attach, fasten or support pipes, conduit, wiring equipment or fixtures from or onto ceiling tiles, ceiling tile grid or 7 ceiling tile grid supports.

2.2.11 Be absolutely certain that fastener or anchor installation will not puncture damage or sever essential mechanical or electrical services. Essential services involve life support and monitoring systems, which must operate continuously. Services may be concealed within walls, ceilings or slabs.

2.3 EXPLOSIVE ACTUATED FASTENING DEVICES

2.3.1 Generally, the use of explosive actuated fasteners is not permitted. If for whatever reason the Contractor requires the use of such devices they may be used only upon the consent of the Contract Administrator and the City of Winnipeg. Whenever possible, use drilled-in insert fasteners recommended for the application.

2.3.2 If use is permitted, conform to the requirements of CSA - "Explosive Actuated Fastening Tools" and local governing authorities. These tools are to be operated by persons possessing a valid operator's certificate indicating that they are qualified to use such tools.

END OF SECTION

1. GENERAL

1.1 Site access is limited. Field offices, tool sheds, materials storage shall be located in designated staging areas and construction areas as designated by the Contract Administrator. (See General Conditions 6.29)

2. ACCESS TO AREAS OF *WORK*

2.1 Areas beyond construction areas are out of bounds to all construction personnel. If Work must be performed in another area, notify and obtain permission from the City of Winnipeg prior to commencement of such Work.

2.2 The Contractor is responsible for the cost of parking. Parking in the facility is prohibited.

3. TELEPHONE SERVICE

3.1 Uses of the City of Winnipeg's telephones are not permitted and are off limits to construction personnel with the exception of emergency requiring police, fire or ambulance.

4. SANITARY FACILITIES

4.1 Certain permanent facilities may be used and designated as such on approval of the City of Winnipeg. This shall be established during initial job site meeting.

5. NO SMOKING AREAS

5.1 The Contractor shall ensure that its personnel will adhere to all of the City of Winnipeg's Smoking Regulations. Smoking is NOT permitted in any areas in the facility.

6. WATER

6.1 For construction activities, water may be available from the City of Winnipeg's supply system.

6.2 Obtain written approval from the Contract Administrator for use of the City of Winnipeg's existing water supply system.

6.3 Available water supply is not unlimited. Exceeding if available capacity could drop system pressure that could affect and interrupt equipment serving building areas. Some equipment (requiring water for operation) and related systems must operate continuously and cannot be interrupted for even the briefest time.

6.4 If existing available water supply has insufficient spare capacity for construction needs, provide other temporary water supply as construction requirements demand.

7. LIGHTING

7.1 Provide temporary lighting as construction, safety and security requirements demand.

7.2 Make good all damage.

8. VENTILATION

8.1 Prevent hazardous accumulations of dust, fumes, mists, vapors or gases in areas occupied during construction.

8.2 Provide local exhaust ventilation to prevent harmful accumulation of hazardous substances into atmosphere of occupied areas.

8.3 Dispose of exhaust materials in manner that will not result in harmful exposure to persons.

8.4 Ventilate storage spaces containing hazardous or volatile materials.

8.5 Continue operation of ventilation and exhaust system for time after cessation of Work process to assure removal of harmful elements.

8.6 Ensure that the environment (air temperature, relative humidity, air velocities, etc.) of occupied areas is not adversely affected by construction activities.

8.7 Pay costs of temporary ventilation used during construction, including costs of fuel, operation, maintenance and removal of equipment.

8.8 Maintain strict supervision of operation of temporary ventilating equipment to:

8.8.1 Conform to applicable codes and standards.

8.8.2 Enforce safety practices.

8.8.3 Prevent abuse of services.

8.8.4 Prevent damage to finishes.

8.8.5 Do not use direct-fired combustion units.

9. PROTECTIVE COVERS

9.1 In areas where furniture, furnishings, etc., will remain in place during alteration Work, provide covers to protect against construction debris, dust, etc.

9.2 Remove covers and clean up after each Work stage as requested by and to approval of the *Contract Administrator* and the *City of Winnipeg*.

10. SCAFFOLDING

10.1 Provide and maintain adequate scaffolding as may be required for the Work. Scaffolding is to be rigid, secure and constructed to ensure proper safety for Workers and erected and maintained and in full compliance with Provincial Codes or regulations governing scaffolding. Erect without damage to the building or finishes.

11. SIGNS AND NOTICES

11.1 Only project identification signboards and notices for safety are permitted.

11.2 Format, location and quantity of site signs and notices to be approved by the Contract Administrator.

11.3 Signs and notices for safety or instruction to be in English language, or commonly understood graphic symbols.

11.4 Maintain signs and notices for duration of project. Remove and dispose of signs off site when directed by the Contract Administrator.

11.5 This project shall not be used to advertise or promote systems, construction or assembly methods, tools or equipment used or incorporated therein without written approval of the Contract Administrator and the City of Winnipeg.

12. WASTE REMOVAL

12.1 Execute removals via designated and approved exits only.

12.2 Legally dispose of all waste materials.

12.3 Do not use City of Winnipeg’s existing on-site waste disposal containers.

END OF SECTION

1. GENERAL

1.1 Conduct cleaning and legally dispose of construction waste to comply with local ordinances and anti-pollution laws.

1.2 Prevent accumulation of wastes that create hazardous conditions.

1.3 Store flammable liquids in ULC approved containers. Remove flammable or combustible wastes from premises daily.

1.4 Provide adequate ventilation where noxious or volatile substances are used.

2. CLEANING MATERIALS

2.1 Use only cleaning materials recommended by manufacturer of surface to be cleaned, and as recommended by cleaning material manufacturer.

3. CLEANING DURING CONSTRUCTION

3.1 Maintain project grounds and public properties free from accumulations of waste materials and rubbish from site and dispose of them legally.

3.2 Provide on-site suitable containers for collection of waste materials, and rubbish. Do not use City of Winnipeg's containers unless Contract Administrator has granted permission in writing.

3.3 In occupied areas, clean up Work area each day, before leaving area.

3.4 Wet mop or vacuum immediate interior building areas when Work in area is complete or ready to receive finish painting. Continue cleaning operations on an as-needed basis until all Work is complete or until the Work is ready for Total Performance or occupancy. Maintain tools and equipment necessary for cleaning operations on site (i.e., pails, mops, vacuum cleaners with excellent suctioning capabilities, etc.)

3.5 Schedule cleaning operations so that resulting dust and other contaminants will not fall on wet, newly painted surfaces, infiltrate into occupied areas, or trigger fire alarm smoke or dust detectors.

4. FINAL CLEANING

4.1 In preparation for Substantial Performance or occupancy, conduct inspection of sight-exposed interior and exterior surfaces.

4.2 Remove grease, dust, dirt, stains, labels, fingerprints, and other foreign materials, from sight-exposed interior and exterior finished surfaces including glass and other polished surfaces.

4.3 Clean lighting reflectors, lenses, and other lighting surfaces.

4.4 Remove debris and surplus materials from roof areas and accessible concealed spaces including crawl spaces.

4.5 The entire hoistway, pit, machine room, car top and bottom and all equipment therein shall be cleaned to remove dust, lint, debris, grease, oil and other such matter that would otherwise detract from the end result of a like new installation.

5. FINAL PAINTING

5.1 Ensure that all new and reused machine room hoistway and pit equipment, except for machined surfaces and non-rusting surfaces, is protected with 2 coats of rust inhibiting paint of a neutral color. Where rust has developed, brush the surface to the bare metal and re-paint.

5.2 All machines shall be repainted with two coats of high gloss (Blue) enamel paint.

5.3 Repaint machine room floor with two coats of high gloss (Grey) enamel paint. The area immediately surrounding the machines shall be repainted in high visibility gloss yellow enamel paint.

5.4 Repaint car top including crosshead equipments and ceiling.

5.5 Repaint pit floor and pit equipment.

5.6 Without exception all rotating equipment shall be painted with two coats of high gloss high visibility gloss yellow enamel paint.

-END OF SECTION-

1. CONSTRUCTION SAFETY REQUIREMENTS

1.1 SAFETY CODES AND STANDARDS

1.1.1 Observe and enforce construction safety measures required by Canadian Construction Safety Code, Provincial Government, Worker's Compensation Board, municipal statutes and authorities having jurisdiction.

1.1.2 In event of conflict between any provisions of above authorities, the most stringent provision will apply.

1.2 SECURITY REQUIREMENTS

1.2.1 Make provision for and provide security covering the entire construction site and Work meeting the requirements of the following guidelines and as outlined by City of Winnipeg's Security Policies.

1.2.2 Provide supervision of entire construction site and Work, maintained continually during working hours.

1.2.3 Maintain total inaccessibility, to entire construction site and Works, of all members of the public and unauthorized City of Winnipeg's staff, except under the express control of the Contractor and then only during daylight hours.

1.2.4 Provide and maintain sufficient fire fighting equipment and apparatus to ensure the fire safety of the building(s), its staff and the public within and in proximity of the construction site.

1.2.5 Hoarding and physical separations of construction site and Works from surrounding areas must be of sufficient strength and dimension to prevent unauthorized entry of all persons except via the designated access doors.

1.2.6 The Contractor will maintain at the site, at all times, the names and telephone numbers of all Contractors' representatives, available at hand for use in the event of "need" for immediate response in an emergency situation. The evaluation of "need" is the responsibility of the City of Winnipeg.

1.2.7 Contractor to instruct his own forces that, if an emergency arises and the City of Winnipeg's deem it necessary, the Contractors' forces are to respond and assist in the action required to deal with the emergency.

1.3 SHUTDOWN OF EXISTING SERVICES

1.3.1 When shutdown of any existing service is required, initiate the request through the Contractor Administrator.

1.4 PHONE NUMBERS FOR CITY OF WINNIPEG'S USE IN CASE OF EMERGENCY

1.4.1 Submit a complete list of business and home telephone numbers of site foreman and project manager (or City of Winnipeg) for Contractor and all Subcontractors. Prior to starting Work on project, send list to:

City of Winnipeg
Attention: Mr. Len Rocke
30 Fort St., Winnipeg, Mb., R3C 4X5
Phone: 986-2148 Fax: 947-2284
LRocke@city.winnipeg.mb.ca

1.4.2 Immediately after any change occurs, update list and resubmit as above.

1.5 CONSTRUCTION KEYS FOR CITY OF WINNIPEG USE

1.5.1 For fire safety and emergencies, the City of Winnipeg requires construction keys for immediate access to construction areas at all times. Cooperate with City of Winnipeg in this regard.

2. CITY OF WINNIPEG'S FIRE SAFETY REQUIREMENTS

2.1 FIRE SAFETY REQUIREMENTS

2.1.1 Ensure that all Contractor's employees adhere to all the City of Winnipeg's Fire Safety Precautions (listed below). Fire prevention measures and procedures acceptable to the City of Winnipeg's Fire Safety Officer shall be maintained on the construction site and on all the City of Winnipeg's property at all times.

2.1.2 Should a "false" fire alarm or a fire result from any action on part of the Contractor, the Contractor shall immediately send a report to the City of Winnipeg. If requested by the City of Winnipeg, immediately complete necessary documentation and attend necessary meetings, pertaining to each incident.

2.1.3 Supply and maintain in working order the necessary fire safety equipment on the construction site; extinguishers, fire prevention equipment, fire fighting equipment, etc. required by codes, authorities and municipal statutes, or if requested by Contract Administrator or City of Winnipeg. Make regular inspections to ensure fire safety equipment is at its designated locations, in working order. Immediately rectify deficiencies. Do not remove extinguishers that are the property of the City of Winnipeg from their designated locations, except for extinguishing a fire. If an City of Winnipeg's extinguisher is used for any reason, immediately notify both the Contract Administrator by telephone and in writing, to ensure that extinguisher is replaced and/or recharged immediately.

2.1.4 Provide one assistant for each employee cutting, grinding or welding metal. Assistant shall be armed with a fire extinguisher (ABC Multipurpose Class, minimum l0 lb. capacity) and shall have no other duties other than to watch for and extinguish sparks and to enforce the City of Winnipeg's Fire Safety Precautions (listed below), while partner is cutting, grinding or welding metal. Assistant shall have a thorough knowledge of the City of Winnipeg's Fire Safety Precautions and shall be trained in fire extinguishing.

2.1.5 Maintain, for duration of the Work, the function of existing fire exits and fire access lanes affected by the Work, including the surrounding building.

2.2 FIRE SAFETY PRECAUTIONS

2.2.1 While brazing, soldering, grinding, cutting or welding, protect building and contents against heat, sparks and fire by shielding. Maintain a fire extinguisher (ABC Multipurpose Class, minimum 10 lb. capacity) in working order, at each workstation; within close reach of all personnel located at that station, including stations where lead or lead joints are heated and where materials are heated with torches or open flames.

2.2.2 Provide and maintain in working order fire extinguishers (ABC Multipurpose Class, minimum 10 lb. capacity), fire resistant blankets and shields, and welding screens on all welding carts.

2.2.3 Immediately prior to performing brazing, soldering, grinding, cutting, welding, lead caulking, sanding, painting or any operations which create dust, fumes, vapors, or smoke, check Work area for smoke detection equipment; Initiate a request for a "Service Shut Down Permit" to replace smoke detectors with thermal detectors in areas where Work may trigger smoke detectors. Immediately after Work in the affected area(s) has been completed, initiate a request to replace the smoke

detectors, which were initially removed. Seal off each Work area to produce an airlock, to ensure smoke detectors in other areas will not be triggered. Provide necessary ventilation to outdoors to maintain Work area under negative pressure, in order to maintain the dust, fumes, vapors or smoke from Work at density such that smoke detectors in building will not be activated.

2.2.4 Ensure that all the Contractor's tradesmen on site have thorough knowledge of the City of Winnipeg's General Fire Regulations and the City of Winnipeg's Fire Prevention Regulations. Complete copy of these Regulations is available from the City of Winnipeg's Fire Safety Officer. Ensure that these Regulations are enforced at all times. The following paragraphs are a summary of the most important Regulations.

2.2.4.1 Maintain cleanliness and order in all areas at all times. DO NOT ALLOW RUBBISH TO COLLECT. Keep fire alarm pull stations, alarm panels, telephone stations, doorways, exits and corridors free of obstructions. Unless equipped with ULC approved magnetic hold open devices, exit and fire doors shall remain closed except during use. DO NOT USE WOOD WEDGES OR OTHER OBJECTS TO HOLD OPEN FIRE DOORS.

2.2.4.2 Personnel shall know location of fire alarm pull stations, fire extinguishing equipment, and fire exits and evacuation routes for areas in which they are working.

2.2.4.3 Personnel shall know proper method of operating portable fire extinguishers, be familiar with various classifications of fire and appropriate method of extinguishing agent for each classification.

2.2.4.4 Personnel shall immediately report to the City of Winnipeg the discovery that fire-fighting equipment is not in proper working order or has been removed or is missing. Immediately rectify all deficiencies.

2.2.4.5 Personnel shall participate in all fire drills conducted by Contract Administrator, with or without notice, to familiarize personnel with fire safety procedures.

2.2.4.6 On discovery of a fire or evidence of a fire (smoke of undetermined origin):

2.2.4.7 Remove any person in imminent danger from the area of the fire

2.2.4.8 Immediately send an alarm from the nearest fire alarm pull station, regardless of the apparent significant nature of the fire.

2.2.4.9 Close all doors (leave unlocked) and windows and leave all lights on. Overhead or sliding fire separation doors shall remain open until ordered to be closed by the Fire Department, the City of Winnipeg's Fire Safety Officer, or a senior staff member at the scene. Turn off power to nonessential equipment.

2.2.4.10 Attempt to extinguish the fire with the correct fire fighting equipment only if it is possible without immediate personal danger. Otherwise leave the area or building via the most convenient fire evacuation route. DO NOT USE AN ELEVATOR.

2.2.4.11 Do not use the telephone except to confirm location of fire.

2.2.4.12 Return to the area of building only after "All Clear" is sounded by the Fire Department.

2.2.4.13 When a fire alarm is sounded:

2.2.4.14 Do not use the telephone. Immediately terminate telephone conversation in progress.

2.2.4.15 Close all doors (unlocked) and windows and leave all lights on. Overhead or horizontal sliding fire separation doors shall remain open until ordered to be closed by either the Fire Department, the City of Winnipeg's Fire Safety Officer, or a senior staff member at the scene (only in an extreme case). Turn off the power to all nonessential equipment.

2.2.4.16 Leave the area and/or building via the most convenient fire evacuation route. DO NOT USE AN ELEVATOR.

2.2.4.17 Return to the area or building only after "All Clear" is sounded by the Fire Department.

2.2.5 Store flammable or combustible gases used on the construction site in ULC approved containers. Use and storage of these materials on City of Winnipeg's property is subject to the approval of Contract Administrator and the City of Winnipeg's Fire Safety Officer.

2.2.6 Ensure that all the Contractor's tradesmen are familiar with the operating principle and the precautions necessary to avoid "accidental tripping of the following fire sensing devices:

2.2.6.1 Smoke detectors

2.2.6.2 Fixed temperature detectors.

2.2.6.3 Rate of rise temperature detectors.

2.2.6.4 Sprinklers.

2.2.7 Contractor shall be liable for and repair, replace or pay for all damage caused by water discharging from the sprinkler piping due to negligence.

2.2.8 Remove all waste material from each Work area on a daily basis and temporarily store at disposal sites, in containers approved by both the Contract Administrator and the City of Winnipeg's Fire Safety Officer. Keep disposal sites tidy and clear on a regular basis or whenever requested by the Contract Administrator. Do not bury or burn rubbish or waste materials on City of Winnipeg's Property. Legally dispose of all waste materials.

2.2.9 The Contractor shall ensure that his personnel will adhere to all the City of Winnipeg's Smoking Regulations. Smoking is only permitted in designated areas. A complete copy of the City of Winnipeg's Smoking Areas is available upon request.

2.3 EXISTING FIRE ALARM SYSTEMS

2.3.1 Maintain, for duration of Contract, existing fire alarm systems in operable condition satisfactory to the City of Winnipeg. Shutdown of any part of any fire alarm system is not permitted except upon expressed written consent of the City of Winnipeg.

2.4 EXISTING FIRE EXITS AND FIRE ACCESS LANES

2.4.1 Maintain, for duration of Contract, the function of existing fire exits and fire access lanes affected by the Work, including surrounding building.

2.5 WORKPLACE HAZARDOUS MATERIAL INFORMATION SYSTEM (WHMIS)

2.5.1 The Contractor shall be responsible for securing Material Safety Data Sheets relating to specified products or other regulated products and materials that will be used on the Work site, including those materials not specified herein.

2.5.2 The Contractor shall be responsible for making available to his employees and Subcontractors, hazard information and warnings related to products specified herein as well as other products not specified but intended for use on the Work site.

2.5.3 The Contractor shall take all precautions as required or reasonable in circumstances encountered to protect his employees and employees (including students, volunteers, etc.), visitors (general public), and facilities of the City of Winnipeg during the handling, storage and application of these products and materials.

2.5.4 The Contractor shall be responsible for any and all damages, costs or losses to the City of Winnipeg, its employees (including students, volunteers, etc.), visitors; (general public), and facilities by his failure to take necessary precautions during handling, storage and application of all products and materials used for carrying out the Work.

2.5.5 Storage of hazardous materials within or around the City of Winnipeg's facility shall not be allowed.

3. HOARDING AND CONSTRUCTION FENCES

3.1 Provide, erect, maintain eight (8) foot high hoarding to protect the public and workers from injury and public and private property from damage, in accordance with local governing authorities or by-laws and, after the Work is complete, remove protective hoarding when required at openings into the hoist way and in the hoist way.

3.2 Such barricades shall at all time cover ever floor of ever elevator out of service or under construction without exception.

3.3 As a minimum, floors will be barricaded one floor above and below the floor where Work is being performed.

3.4 Barricades at the landings shall be painted in a semi-gloss beige colour and be cleaned daily to remove dirt.

3.5 At all times, without exception, there must be a lockable access barricade at Basement, Main and Top Landing. The intent is to provide ready access for the storage of tools and equipment to discourage storage of sale out in the open.

3.6 Where there is an adjoining hoist way and the elevator in the adjoining hoist way is to remain in service during the Work, a continuous hoarding/barrier shall be provided from the top overhead down to the pit floor. The intent is to prevent all objects from entering the adjoining hoist way during the Work.

3.7 Provide, maintain and, after the Work is complete, remove temporary sill plate covering both hall and car sill at all times while doors are open. Cover will project up the sides of the doorframe and be designed in such a way as to prevent all material from accidentally falling into and down the hoist way.

END OF SECTION

1. SCOPE

1.1 The specifications includes the provision of new motion controls and other ancillary components resulting in changes to the present equipment as maybe require to achieve the end result as described in the specifications, for the existing FOUR (4) mid-rise passenger elevators located at 151 Princess, Winnipeg, Manitoba and more commonly referred to as the Public Safety Building.

1.2 Interim Maintenance of the four (4) updated passenger elevators.

1.3 Maintenance of the four (4) updated passenger elevators.

1.4 The Contract is for a complete, code compliant, reliable, safe elevator installation.

Where singular items are specified, or where units numbers are estimated, provide as many such items as are appropriate to complete the Work on the four (4) elevators.

2. DEFINITIONS AND STANDARDS

2.1 The most current issue of CAN/CSA-B44 SAFETY CODE FOR ELEVATORS shall apply throughout the Work. Within the Specifications the repeated use of "B44" herein refers to the clauses found within the most current issue of the CAN/CSA-B44 SAFETY CODE FOR ELEVATORS inclusive.

2.2 The requirements of universal access apply and shall include the requirements of Appendix E of the B44.

2.3 An additional requirement is the compliance of all applicable Elevator Notices and Work Orders as issued by the Manitoba Labour.

3. GUARANTEE OF RE-USED / RETAINED EQUIPMENT

3.1 The Contractor must warranty all equipment that is being re-used and retained, on the same basis as the new equipment.

3.2 Prorating the cost of any re-used retained equipment requiring replacement at a later date will not be accepted.

3.3 All retained re-used equipment will have to operate without diminishing the operation of any new components and must provide reliable like new operation including Warranty.

3.4 Unfamiliarity with the equipment will not be considered valid grounds for extra cost, after the award of the Contract.

3.5 Inspect the existing equipment thoroughly and make due allowance for the existing wear or obsolescence.

3.6 Clean all equipment thoroughly before putting it back in operation. Replace all parts including but not limited to such parts as bearings, bushings brushes, rollers, toe guides, gibs, contacts, clutches, where there is wear that may effect reliable safe and proper operation.

3.7 If the Contractor is not prepared to retain and re-used one or more of these components, then the cost to replace the components shall be included in their Bid Price.

3.8 The Contractor may re-use and retain all components specifically not listed for replacement and prior to Submission deadline will inspect and verify all retained equipment are suitable to provide like new performance and warranty.

4. EQUIPMENT LOCATION

4.1 The existing travel and number of stops will remain the same.

4.2 Install the new equipment of the appropriate size and type.

4.3 New equipment added shall be:

4.4 Conveniently located for ease of servicing;

4.5 Clearly labeled to identify the device;

4.6 Located in such a way as not to create a tripping hazard to service personnel;

4.7 Protected from possible damage from maintenance personnel stepping on the device or wiring to and from the device;

4.8 Located in such a way as not to block any existing equipment or access.

5. POWER AND GROUNDING

5.1 VOLTAGE LIMITATIONS

5.1.1 Voltages in control and operating circuits shall be limited as specified in CSA Standard C22.1, Canadian Electrical Code Part I, and Rule 38.

5.2 REQUIREMENTS FOR ELECTRICAL WIRING AND EQUIPMENT

5.2.1 Except for the requirements of the B44, the installation of electrical equipment and wiring shall conform to CSA Standard C22.1, Canadian Electrical Code, Part I.

5.3 POWER

5.3.1 All new components requiring power (i.e. Door Protection Device) shall have their own self-contained power supply.

5.3.2 All power supplies shall contain internal fusing. It will also be independently labeled and fused in the main controller located in the elevator machine room.

5.3.3 Only readily available standard Fuses of the minimum proper rating shall be used.

5.4 POWER INTERRUPTION RESTART

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

5.4.2 Where volatile memories are provided for position and other data necessary to the continuing operation of the elevator, 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.

5.5 GROUNDING

5.5.1 Ground all existing equipment when carrying out the Work associated with the specifications.

5.5.2 Ground all new components.

5.5.3 To facilitate standard testing and trouble shooting practices, arrange the circuits so that one side of the power supply for external circuits is grounded. (An external circuit is as one wired outside microprocessors or solid-state devices. An example of this is buttons, relays, lights, limits, locks and such similar devices.)

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

6. COMPUTING DEVICES

6.1 MICROPROCESSORS

6.1.1 Where computing devices are used, such as microprocessors or mini-computers, along with associated devices, design to the following requirements:

6.1.1.1 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;

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

6.1.1.3 Provide crystal regulation of frequency;

6.1.1.4 Provide for separate regulated power supplies to serve each microprocessor system.

6.2 SOLID-STATE HARDWARE

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

6.2.2 Gold plate the contact points of edge connectors.

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

6.2.4 Coat the circuits with tin-lead.

6.2.5 Provide a solder resist screen.

6.2.6 Provide plated through holes for double-sided boards.

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

6.2.8 Do not provide patched connections.

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

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

7. GENERAL REQUIREMENTS

7.1 CERTIFICATES

7.1.1 The Contractor is responsible for making application to the Provincial Elevator Inspection Branch for the necessary permits, approvals and/or alterations licenses.

7.1.2 Provide and pay for certificates of approval and all other required inspections and permits.

7.1.3 When required by law and before final acceptance, arrange and pay for a safety inspection of the equipment the Provincial Elevator Inspection Branch or, if that is not available, by a recognized independent private professional inspection organization as approved by the Contract Administrator.

7.1.4 When the premises of the Place of Work falls within the jurisdiction of the Province of Manitoba, an additional requirement is the compliance of all applicable Elevator Notices as administered by the Manitoba Labour and Immigration, Mechanical and Engineering Branch.

7.1.5 Should more than one inspection for a license or approval be required due to inadequate Work give ample advance notice of such inadequate Work to allow the Work to be completed before the time of the subsequent inspection.

7.1.6 If ample advance notice of such inadequate Work has not been given, the Contractor will assume the cost of the additional inspections.

8. SITE CONDITIONS

8.1 NOISE AND VIBRATION

8.1.1 Excessive noise and vibration are not permitted.

8.1.2 Where excessive noise or obstruction is unavoidable, advise the Contract Administrator ahead of time and make arrangements to perform the Work at a time selected by the Contract Administrator at no extra cost unless otherwise authorized.

8.2 DAMAGE TO CONTRACT ARCHITECTURAL FINISHES

8.2.1 While executing the Work, provide protection to adjacent walls and equipment by means of protective paneling or blankets, subject to Contract Administrator approval. Accept liability for damage, safety, or overloading of equipment.

8.2.2 Contractors shall be responsible for all Contract Architectural Finishes that are broken, scratched, damaged or cracked during the execution of the Work and shall replace such finishes at its own expense.

8.3 ELEVATOR ACCESS FOR CAR WORK

8.3.1 The Contract Administrator will arrange for access to the elevator at a designated floor.

8.3.2 It will be required to allow passage through the elevator lobby at all floors. The corridor cannot be obstructed.

8.3.3 The Contractor will at all times prevent unauthorized entry into the Work area including the elevator, machine room, hoistway, etc, while under repair, out of service, being tested and not turned over for final acceptance.

8.4 EQUIPMENT AND FIXTURE LOCATION

8.4.1 Locate new equipment fixtures and distribution systems to provide minimum interference and maximum usable space and in accordance with all codes and the manufacturer's recommendations for safety, access and maintenance.

8.4.2 Prior to installation of equipment, fixtures, and electrical services, confirm layout with Contract Administrator. If in the opinion of the Contract Administrator layout obstructs or restricts required access of free space, make alterations as directed by Contract Administrator, at no additional cost to the City of Winnipeg.

8.4.3 Submit field drawings to indicate relative position of various services and equipment when required by the Contract Administrator. Notify the Contract Administrator in writing of any conflicts between the Specifications and manufacturer's instructions so that the Contract Administrator may establish the course of action to follow.

8.4.4 Unless otherwise indicated in the Specifications, install or erect all products in accordance with manufacturer's recommendations and the applicable codes. Do not rely on labels or enclosures provided with products. Obtain instructions directly from manufacturers.

8.4.5 Improper installation or erection of products due to failure in complying with these requirements authorizes the Contract Administrator to require any removal and reinstallation that may be considered necessary, at no increases in Bid Price.

8.5 EQUIPMENT ENVIRONMENT

8.5.1 The specifications require that the equipment is capable of normal operation in an ambient temperature range from 15.5 & 32.0 degrees Centigrade.

8.5.2 Ensure that the equipment is capable of normal operation within the specifications' requirements when the supply voltage is within plus 10 per cent and minus 15 per cent of the rated voltage.

9. MANUALS & DRAWINGS

9.1 Provide four (4) complete maintenance/operations manuals designed for manufacturers trained service persons for equipment tuning, operation, troubleshooting, repair and maintenance. The intent is that the equipment manufacture, supplier and installer provide complete maintenance/operations manuals such that qualified trades persons have ample information to be issued to tune, operate, troubleshoot, repair and maintain the equipment without further assistance from another outside party (manufacturer, supplier, repair company, etc.).

9.2 Provide complete, accurate and all-inclusive maintenance data and information. The intent is that qualified trades persons are able to quickly trouble shoot malfunctions and perform the required repairs without having to physically trace wiring and control circuits or having to “guess” at the theory of operations.

9.3 During installation, or during the warranty period, include in the maintenance manuals updated revisions to maintenance/operations data and drawings, without additional cost to the contract. Keep all maintenance/operations data current at all times. After warranty period update operation and safety information in the form of service bulletins warnings.

9.4 Provide 4 copies of each as indicated below:

9.4.1 User manual complete with detailed operating instructions and explanation of special features;

9.4.2 Maintenance schedule for complete system describing proper maintenance procedures and methods of maintaining the equipment in proper order;

9.4.3 Trouble shooting chart with recommended course of action;

9.4.4 Parts catalogues giving complete list of repair and replacement parts with cuts and identifying numbers;

9.4.5 Assembly drawings and parts list with electrical values of all electric and electronic components, plus part numbers;

9.4.6 Corresponding symbols and identification markings to those used in the field;

9.4.7 Electrical drawings and main layout.

10. TEST DATA INFORMATION

10.1 At Substantial Performance, supply, complete and present a test data form certifying that the unit is complete, the safety inspection report covers all items tested and ready for Contract Administrator's inspection. Arrange that the Contractor's Officer(s) and the person responsible for the performance of the Work sign this form.

10.2 Supply the Contract Administrator with certified true copies of all completed MANITOBA LABOUR inspection forms and reports and other data listed herein below.

10.3 Minimum additional information, Contractor inspection requirements are:

10.3.1 Electrical safety circuit check;
10.3.2 Door close torque pressure tests;
10.3.3 Test all Landing and car door locks and contacts;
10.3.4 Full-load full speed down direction brake tests;
10.3.5 Full-load over speed car safety tests;
10.3.6 No-load full speed up direction auxiliary brake tests;
10.3.7 No-load over speed up direction auxiliary brake tests;
10.3.8 Full-load full speed car buffer tests;
10.3.9 No-load car full speed counterweight buffer tests;
10.3.10 Car door dwell time;
10.3.11 Hall door dwell time;
10.3.12 Car door close speed;
10.3.13 Car door nudging speed
10.3.14 Car door nudging force and;
10.3.15 Car door nudging time.
10.3.16 Tests of all other safety devices.

-- END OF SECTION --

1. CIVIC PURCHASING POLICY

1.1 At the explicit request of the City of Winnipeg, Material Management, any and all components used in the scope of Work must be non proprietary.

2. PROPRIETARY TECHNOLOGY

2.1 The use of Proprietary technology is strictly prohibited.

2.2 The term "proprietary technology" means all forms and types of technical property, including data, parts, plans, tools, mechanisms, designs, prototypes, processes, procedures, programs, codes, or, whether tangible or intangible, and whether stored, compiled, or memorialized physically, electronically, or in writing that the City of Winnipeg thereof has taken reasonable measures, under the circumstances, to keep such information confidential; and the information derives independent economic value, actual or potential, from not being generally known to, and not being readily ascertainable, acquired, or developed by legal means by the public.

2.3 The Contractor, by executing the Contract, substantiates that any component(s) and/or part(s) supplied in the execution of the Work will not contain proprietary technology and that all elevator contractors, including the City of Winnipeg, can legally purchase outright, without trade in or exchange required, any or all component(s) and/or part(s) and at comparable fair market value.

2.4 Included in the Bid Price, the Contractor will supply all Technical support information, necessary to maintain service, adjust and repair the equipment. Such information shall be included the maintenance and operating manuals described herein and supplied in advance at the request of the Contract Administrator.

2.5 At the City of Winnipeg's sole discretion, should the Contractor fail to disclose whether any component(s) and/or part(s) supplied are proprietary and subsequently installs unauthorized proprietary component(s) and/or part(s) the Contractor shall:

2.6 Supply life time warranty to the offending component(s) and/or parts(s) and bare all associated costs consequential or otherwise, including but not limited to labour and materials, subject to the City of Winnipeg's final approval or;

2.7 Remove and replace the offending component(s) and/or parts(s) with non-proprietary components and/or parts pre-approved by the City of Winnipeg and bare all associated costs, subject to the City of Winnipeg's final approval;

2.8 Incur all associated costs to have the offending component(s) and/or parts(s) with components and/or parts replaced by a third party Contractor of the City of Winnipeg's choosing and subject to the City of Winnipeg's final approval.

3. SPECIAL TOOLS

3.1 Included in the Bid Price the Contractor will include one of each type of tool required to test, adjust, maintain and program or reprogram the primary and auxiliary operating parameters.

3.2 The Contractor will demonstrate to the City of Winnipeg's satisfaction the ability of such tools to perform the necessary maintenance tasks.

4. BACKUP SOFTWARE

4.1 Included in the Bid Price the Contractor will include one complete set of finalized software necessary to restore all adjusts to original operation in the event of technology failure.

4.2 The Contractor will demonstrate to the City of Winnipeg's satisfaction the ability of such software to perform the necessary elevator operations without reprogram any primary and auxiliary operating parameters.

END OF SECTION

1. NUMBER OF ELEVATORS

1.1 ELEVATOR RESTORATION & STANDARDS UPDATE AND MAINTENANCE OF FOUR (4) HIGH-RISE PASSENGER ELEVATORS LOCATED AT 151 PRINCESS AVENUE, WINNIPEG, MANITOBA AND COMMONLY REFERRED TO AS THE PUBLIC SAFETY BUILDING.

2. EXISTING ELEVATORS

2.1 SOUTH ELEVATORS (PUBLIC SIDE)

2.1.1	Quantity:	Two (2)
2.1.2	Designation:	#1 & #2
2.1.3	Manufacture:	Horn
2.1.4	Age:	Circa 1965
2.1.5	Type:	Overhead Traction Geared Roped 1:1
2.1.6	Drive:	Motor Generator DC VV
2.1.7	Motor:	40 HP, F. L. VOLTS 230, AMPS 144
2.1.8	M/G:	575 V., 25 KW. 37.5 HP., 38 Amps.
2.1.9	Contract Speed:	350 FPM
2.1.10	Rated Load	3,500 Lbs.
2.1.11	Rise:	approximately 70’-0”
2.1.12	Floors/Openings:	6 / 6
2.1.13	Doors:	Centre Opening 42" x 84"
2.1.14	Door Controller:	GAL
2.1.15	Door Locks:	GAL
2.1.16	Car Safeties:	Horn Type “B” Gradual Wedge
2.1.17	Governor/Rope:	Armor – ½ “ approximately 205’
12.1.1	Hoist Ropes:	Five - ⅝ ” approximately 105’
2.1.18	Buffers:	Oil, Spring Return

2.2 NORTH ELEVATORS (SECURE SIDE)

2.2.1	Quantity:	Two (2)
2.2.2	Designation:	#3 & #4
2.2.3	Manufacture:	Horn
2.2.4	Age:	Circa 1965
2.2.5	Type:	Overhead Traction Geared Roped 1:1
2.2.6	Drive:	Motor Generator DC VV
2.2.7	Motor:	40 HP, F. L. VOLTS 230, AMPS 144
2.2.8	M/G:	575 V., 25 KW. 37.5 HP., 38 Amps.
2.2.9	Contract Speed:	350 FPM
2.2.10	Rated Load	3,500 Lbs.
2.2.11	Rise:	approximately 83’-6”
2.2.12	Floors/Openings:	7 / 7
2.2.13	Doors:	Two Speed Side Opening 48" x 84"
2.2.14	Door Controller:	GAL
2.2.15	Door Locks:	GAL
2.2.16	Car Safeties:	Horn Type “B” Gradual Wedge
2.2.17	Governor/Rope:	Armor – ½ “ approximately 230’
2.2.18	Hoist Ropes:	Five - ⅝ ” approximately 120’
2.2.19	Buffers:	Oil, Spring Return

3. ELEVATOR STANDARDS UPDATE

3.1 SUMMARY

3.1.1 Supply and install new equipment that maintains the existing elevator speed of 350 FPM, rated load of 3,500 lbs., length of travel and number of landings and openings

3.1.2 Replace the relay-based controller with modern solid-state controls that incorporates standard features such as Independent Service, Homing, Special Emergency Service, Automatic and Standard Security. Including but not limited to position transducers, hoistway inductors or other devices associated with the position definition; power relays and control relays; control wiring; all logic associated with individual elevator motion and car and hall call response.

3.1.3 Remove and legally dispose of the existing generator, hoist machine/brake/motor assembly, hoist rope deflector & Hoist ropes, over speed governor/idler & rope/rope hitch. Provide new replacements.

3.1.4 Supply and install new solid state AC Drive to eliminate the generators.

3.1.5 Supply and install new hoist & governor ropes, ascending protection and car wiring including travelling cables.

3.1.6 Supply and install new high-speed solid state drive door operators with 3-D door protection.

3.1.7 Supply and install new Hall and Car fixtures including flush-mount Telephone Hands Free Auto Dialing and associated wiring.

3.1.8 Replace car cab finishes with hang on fire rated panels and car door cladding and button panel return and door frame finishes. Install new round handrails and rectangular bumper.

3.1.9 Supply and install Car Voice Synthesized floor announcement and any/all Service messages.

3.1.10 Car door lock to mechanically prevent opening of the car door when out of the door zone.

3.1.11 Supply and install new normal and final terminal-stopping devices.

3.1.12 Miscellaneous cleaning, painting and refurbishing of all retained components.

3.1.13 Provide Interim Maintenance on a month-to-month basis while the modernization proceeds.

3.1.14 Submit Pricing for Maintenance after Total Performance.

3.1.15 Submit cost reduction to retain Hoist machines #1 & #2.

3.1.16 The above items are described in more detail herein.

4. RELATED WORK

4.1 Cutting new openings and patching of discarded and new opening. Patching shall be performed to the standards acceptable to the Contract Administrator, which readily allow for painting by others.

4.2 Coordinate and assist in the hookup and testing of emergency power, telephone line and fire alarm signals provided by others.

-END OF SECTION-

1. QUANTITY

1.1 Supply and install a total of Two (2) new handrails. (North Elevators #3 & #4)

1.2 Supply and install a total of Two (2) new complete cab interiors. (South Elevators #1 &#2)

2. ELEVATOR ACCESS FOR CAB WORK

2.1 The City of Winnipeg will arrange for access to the elevators for refurbishing Work at a floor selected by the Contract Administrator.

2.2 The selected floor will not be the main and second floor.

2.3 It will be required to allow passage through the elevator lobby at all floors including the selected floor. The corridor cannot be obstructed.

2.4 The Contractor will at all times prevent unauthorized entry into elevators, under repair, out of service, being tested and not turned over for final acceptance.

3. SOUTH ELEVATORS #1 & #2

3.1 Car Cab

3.1.1 Modernize the cab interiors by replacing the existing cab shell, ceiling/car top and supply a new car cab shell, while renewing all exposed surfaces.

3.1.2 All exposed cab surfaces, unless other wise specified, shall be mirror finish stainless steel unless otherwise specified.

3.1.3 Provide materials and finishes to comply with the requirements for S.E.S. with a maximum flame spread rating of 25 for walls and ceiling and 100 for flooring.

3.1.4 Close existing openings created during fixture replacement or relocation such that the end result is not detectable by a trained eye.

3.1.5 Delete the curved corners without reducing the platform area.

3.2 Ceiling Lighting/Panels:

3.2.1 Replace the existing ceiling system.

3.2.2 Supply and install a new solid fixed Stainless steel, Mirror Finish paneled ceiling selected from your standard range of products.

3.2.3 Arrange the panel layout such that all panels are equal in size and set within a substantial ridged mirror finished frame.

3.2.4 Provide a wall to ceiling perimeter spacing of approximately ½–¾ of an inch for unobstructed spacing for cab ventilation.

3.2.5 Replace the existing light units with a minimum of eight (8) long life flush mount halogen lamp fixtures and insure uniform lighting with a minimum total of 300 watts.

3.3 Wall Panels above the handrail:

3.3.1 Replace the existing wall panels supply wall finishes.

3.3.2 Supply and install tempered smoke finish mirror glass-panels on all non-access walls.

3.3.3 Install the mirror above the handrail and below the ceiling running from cab corner to corner.

3.3.4 Where the mirror panels butt in the rear corner, seal joint with clear silicone.

3.3.5 Mount the mirror on removable panels such that the total thickness of the sub-panel plus the mirror approximates the thickness of the lower laminate panels.

3.3.6 The Mirror shall be type 3C film reinforced silvered mirror glass that conforms to CGSB Standard CAN/CGSB-12.5 (mirrors, silvered).

3.3.7 Clad all exposed edges with mirror finish stainless.

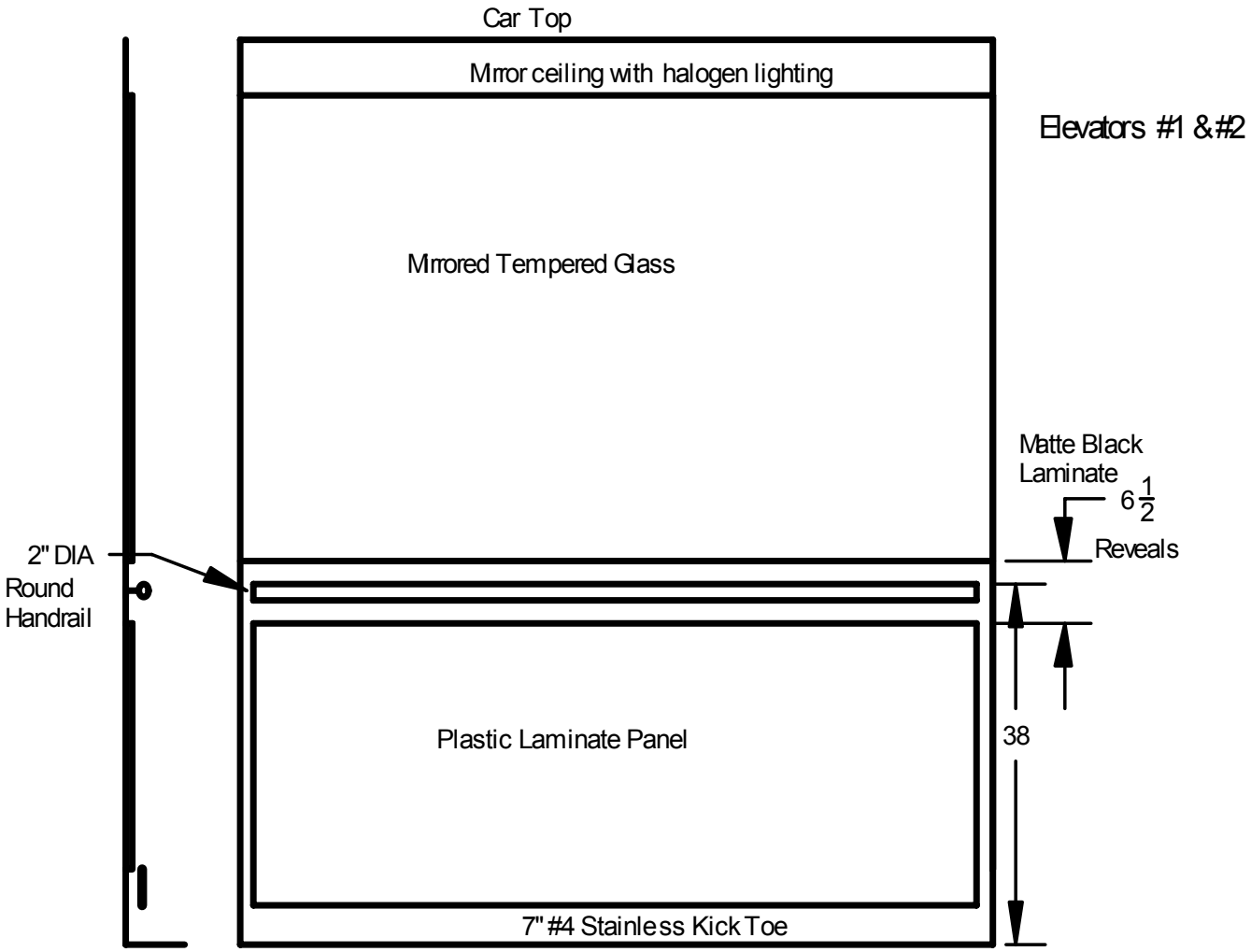
3.4 Wall Panels below the handrail:

3.4.1 Supply new removable ¾ inch horizontal hang-on seamless panels (one panel on each wall of each car) below the handrail with laminate colour matching the main lobby panels, subject to the final approval of the Contract Administrator.

3.4.2 Both sides and all four edges of each panel will be clad in laminates. (See Drawing Figure ESP #1-#2)

Figure ESP #1-#2

ELEVATOR #1 & #2 CAB DETAIL



3.5 Wall Panel Reveals:

3.5.1 Clad in new Stainless steel, Mirror finish reveals between and above the wall panels.

3.5.2 To provide a visual contrast, the area behind the stainless steel handrail will be PLAM #2 Nevamar aged Elements EM-6-1T. (or similar Matte Black Laminate)

3.6 Cab Columns, Front, and Transom Finish:

3.6.1 The car button fixture will be incorporated in one-piece to cover the front returns from floor to ceiling and door frame to cab corner. It is not acceptable to mount the car button fixture as a panel smaller then the front returns.

3.6.2 Clad in new Stainless steel, No. 4 satin finish.

3.7 Frame Finish:

3.7.1 Clad in new Stainless steel, No. 4 satin finish.

3.8 Door Finish:

3.8.1 Clad in new Stainless steel, No. 4 satin finish.

3.8.2 Cab Sills: Retain and Reuse.

3.9 Base: (Kick-Toe)

3.9.1 Clad in new Stainless steel, No. 4, satin finish.

3.10 Finished Floor:

3.10.1 Replace the existing flooring and replace with commercial grade tile in a colour and pattern subject to the City of Winnipeg's final selection.

3.10.2 Provide 12" X12" tile

3.10.3 Insure the tile sits substantially flush with the car doorsill without the use of any metal strips etc.

3.10.4 Insure the safety plank access port in the floor is accessible with out removing flooring.

3.11 Handrails:

3.11.1 One (1) On all non-access walls, Supply and install nominal 50 mm (2") round satin finish stainless steel handrails. Mount the handrails such that the top of the handrail is 920 mm from the finished floor with a space of 35 to 45 mm between the rails and wall. Supply and install handrail support at intervals not greater than 460 mm. The ends of the handrail shall be returned inward to within 6 mm of the wall panels,

3.12 Bumpers:

3.12.1 One (1) on all non-access walls, provide a nominal 1/4" x 4" solid satin finish stainless steel bumpers. Mount the bumper such that the bumper supports attach to the kick toe and the bumper covers the bottom edge of the wall panels. Provide bumper support at intervals not greater than 460 mm. The ends of the bumper-rails shall be returned inward to within 6 mm of the wall panels.

3.13 Cab Ventilation:

3.13.1 Retain, refurbish, clean, lubricate and reuse the existing fan.

4. NORTH ELEVATORS #3 & #4

4.1 Car Cab

4.1.1 Retain and reuse the existing cab shell and cab finishes.

4.1.2 Close openings created during fixture replacement or relocation such that the end result is not detectable by a trained eye.

4.2 Ceiling Lighting/Panels:

4.2.1 Retain, repair and reuse the existing ceiling system.

4.2.2 Paint the ceiling system and lighting trough with not less then two coats of sprayed on, semi-gloss white enamel. Prepare the surface prior to painting by washing with a cleaning solution flowed by a light sanding.

4.2.3 Retain, repair and refurbish the existing light fixtures;

4.2.4 Replace all light bulbs using warm white florescent bulbs.

4.2.5 Remove and legally dispose of the existing direction indicator located on the rear wall ceiling coving and cover the opening with a bolt on plate, painted to match.

4.3 Elevator #3 Ceiling Top Hat:

4.3.1 Retain, repair and reuse the existing ceiling system as described in subsection 4.2.

4.3.2 Modernize the car top by raising the ceiling at the rear ceiling panel to provide a finished floor to finished ceiling clear height of 10’3” the clear width of the cab and the depth of the existing ceil panel joint.

4.3.3 Clad the existing interior car top vertical/horizontal surfaces including the car ceiling extension panels with #4 stainless steel to provide a durable maintenance free finish.

4.3.4 Access to the extend height area will be available at all times without the removal of any panels or other apparatus. Mark the car top above this area in yellow caution tape and the wording “Danger Reduced Overhead”.

4.3.5 Insure any retain and/or new emergency exit hatch complies with the applicable code requirements.

4.4 Handrails:

4.4.1 One (1) On all non-access walls, provide nominal 50 mm (2”) round satin finish stainless steel handrails. Mount the handrails such that the top of the handrail is 920 mm from the finished floor with a space of 35 mm between the rails and wall.

4.4.2 Provide handrail support at intervals not greater than 300 mm. The ends of the handrail shall be returned inward to within 6 mm of the wall panels.

4.4.3 Handrail shall be capable of sustaining a force of 1000 N (225 lb ft) without deforming.

4.5 Finished Floor:

4.5.1 Replace the existing flooring and replace with commercial grade tile in a colour and pattern subject to the Contract Administrator’s final selection.

4.5.2 Provide 12” X12” tile

4.5.3 Insure the tile sits substantially flush with the car doorsill without the use of any metal strips etc.

4.5.4 Insure the safety plank access port in the floor is accessible with out removing flooring.

4.6 Cab Ventilation:

4.6.1 Retain, refurbish, clean, lubricate and reuse the existing fan.

- END OF SECTION -

1. QUANTITY

1.1 Supply and install a total of four (4) new controls with S.E.S., Security, and Independent Service including integrated drive and other miscellaneous devices listed herein.

2. METHODS OF OPERATION

2.1 Provide operating features that will include

2.1.1 Independent Service

2.1.2 Code Blue Service

2.1.3 Car & Hall Call Security

2.1.4 Emergency Power

2.1.5 Fire Fighter's Service

2.1.6 Inspection Operation

3. MOTION CONTROLLER

3.1 The alteration consists of the replacement of existing duplex motion controllers.

3.2 Remove and legally dispose of the existing Controller/selector

3.3 Supply and install a new microprocessor based duplex controllers.

3.4 Locate the controls for elevator #1 and #2 in their existing location facing each other.

3.5 Re-locate the controls for elevator #3 and #4 to the lower machine room level and arrange that the controllers are side by side centered between the machines.

3.6 The drive, microprocessor and controller shall be an integrated system designed for ease of use with diagnostics and parameter adjustments accessible through the same user interface.

3.7 The individual car controller shall have an independent safety processor that learns and monitors the velocity of the car near the terminal landings. Whenever the car encounters the slowdown limit switches, the actual car velocity shall be compared with the learned velocity. If an over speed condition is detected, the car shall be forced to slow down and approach the terminal landing at reduced speed. The safety processor shall perform its velocity monitoring function independently of any other logic or motion control processors in the system.

3.8 A second independent safety processor shall be provided to monitor the car velocity near the terminal landings and shall act as the emergency terminal speed (ETS) limiting device. The ETS monitor shall have an adjustable range that can be modified via software parameters. When an ETS over speed is detected, the car shall come to an immediate stop and then continue at reduced speed into the terminal landing.

3.9 The brake supply shall be capable of providing at least four independently adjustable values of output voltage in order to provide smooth lifting, holding and re-leveling performance. These values shall be adjusted by computer parameters, which control a solid-state brake supply. Adjustment of resistor values is not acceptable.

3.10 All power feed lines to the brake shall be opened by an electro-mechanical switch. A single ground, short circuit or solid-state control failure shall not prevent the application of the brake.

3.11 The control system shall include circuitry to detect insufficient brake current. This failure shall cause the elevator to go out of service at the next stop and remain out of service until the condition is corrected.

3.12 The individual car controller shall have a software program that uses mathematical methods to create an idealized velocity profile. The velocity profile shall minimize car travel time from any floor to any floor. All the system motion parameters including jerk, acceleration and deceleration rates, and so forth, shall be field programmable with parametric limitations for the system dynamics and shall be stored on an EPROM as non-volatile memory.

3.13 The drive control system shall use the optimized velocity profile in a dual-loop feedback system based on car position and speed. A velocity feedback device (tachometer or encoder) shall permit continuous comparison of car speed with the calculated velocity profile to provide accurate control of the acceleration and deceleration right up to and including the final stop, regardless of direction of travel or load in the car. Drive subsystem control parameters shall be digitally adjustable through software and shall be stored on an EPROM as non-volatile memory.

3.14 The system shall provide continuous monitoring of the actual car speed and compare it with the intended speed signal to verify proper and safe operation of the elevator. Should the actual speed vary from the intended by more than a preset amount, the drive shall shut down the elevator and drop the brake.

3.15 A system shall be included for precise closed loop motor field control, for AC applications. This system shall regulate the motor throughout the range of operation via current feedback from the motor. The system shall provide motor sensing which shall shut down the elevator unless sufficient motor control is present.

3.16 The system shall provide adaptive gains for optimum control of the elevator throughout its travel.

3.17 The car controller shall include a minimum of one serial port for display terminal communication. The display terminal shall be used to view and alter the individual car operating parameters such as jerk, acceleration, deceleration, contract speed, leveling distances, etc. Remote configuration of individual car operating parameters shall be permitted when the car controller is attached to a CRT/PC via modem and an established protocol has been followed.

3.18 A special event calendar shall record approximately 500 noteworthy events or faults of a particular car. They shall be displayed in chronological order for examination or review. Data displayed shall include the type of event or fault, the date and time it occurred, the position of the car and the status of various flags at the time of the occurrence.

3.19 Provide a system for pre-torquing of the hoist motor in order to ensure consistently smooth starts using an electronic load cell to implement the pre-torquing feature including:

3.19.1 the common group dispatch control system

3.19.2 digital logic and motor control using the latest technology.

3.19.3 an AC digital power drive system exclusively designed for elevator applications with a rating suitable for the contract speed and rated load

3.19.4 for the rated contract load and rated for continuous and stable operation.

3.19.5 The microprocessor system shall be designed specifically for elevator applications and shall use multiple processors, at least one of which shall be a 32-bit high-performance RISC processor.

3.20 The new controller shall conform to the Change in the System of Control requirements of the B44.

3.21 Mount panels securely on substantial, self-supporting steel frames designed for floor or wall mount.

3.22 Provide completely enclosed controllers with covers.

3.23 Do not mount any equipment on the covers.

3.24 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.

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

3.26 Mark relays contactors, fuses, printed circuit boards and other components clearly and permanently with the designations shown on the schematic. Mount the designations for plug in components on the controller adjacent to the component; do not mount the designation on the plug in component. Penned in labels are unacceptable.

4. POSITION TRANSDUCER

4.1 Remove and legally dispose the existing position transducer(s);

4.2 Supply and install a new position transducer of a rating suitable for the contract speed and rated load for continuous and stable output.

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

4.4 The system shall use a device to establish incremental car position to an accuracy of .1875" (4.76 mm) or better, using a quadrature signal for the entire length of the hoistway.

4.5 Absolute floor number encoding with parity shall be provided at each floor in order for exact floor position to be read by the computer. The system shall not require movement to a terminal landing for the purpose of finding the correct car position.

4.6 The automatic leveling zone shall not extend more than 300 mm above or below the landing level nor shall the doors begin to open until the car is within 300 mm of the landing. In addition, the inner leveling zone shall not extend more than 50 mm above or below the landing. The car shall not move if it stops outside the inner leveling zone unless the doors are fully closed and locked.

4.7 The system shall use an automatic two-way leveling device to control the leveling of the car to within 4 mm or better above or below the landing sill. Over travel, under travel, or rope stretch must be compensated for and the car brought level to the landing sill.

4.8 Transmit the signal from this device either in serial RS232C format or in parallel format using low impedance inputs.

4.9 If the transducer is a relative (pulse counter) type rather than an absolute encoder type;

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

5. CAR UNCONTROLLED LOW SPEED PROTECTION

5.1 The means of protection against the risk of injuries to passengers as a result of uncontrolled movement of the car within a landing zone while the landing door is unlocked shall be provided, if the risk may be caused by any failure in the elevator control system; or the driving-machine brake.

5.2 It shall be assumed that the failure may occur while the car is loaded with any load up to its rated load.

6. CAR UNCONTROLLED LOW SPEED PROTECTIVE MEANS

6.1 The means required shall detect any uncontrolled movement of the car before the car travels away from the landing by more than 500 mm and shall bring the car to a full stop before it travels an additional 750 mm and;

6.2 be capable of performing as required in Item without assistance from any elevator component that solely, without built-in redundancy, controls the car speed or deceleration, or stops the car during normal operation within the leveling zone.

7. INDEPENDENT SERVICE

7.1 Retain independent service operation

7.2 When the elevator is on independent service it shall;

7.2.1 Be activated by an exposed Group 2 key switch in the car fixture;

7.2.2 Disconnect the elevator from the hall calls;

7.2.3 Prevent hall calls from registering;

7.2.4 Cause the elevator to respond only to car calls;

7.2.5 Open the doors automatically on arrival and remain open;

7.2.6 Close the doors by constant pressure of the door close button or any car call button;

7.2.7 Re-open the doors if pressure on the close button or car call is released before fully closed;

7.2.8 Allow the door protection device to remain active;

7.2.9 If emergency service is activated while the car is on independent service, cause the doors to automatically close at reduced speed for recall to the main lobby.

8. CODE BLUE SERVICE # 3, # 4 ONLY

8.1 Provide Code Blue SERVICE on elevators #3 & #4 at every opening/landing that will;

8.1.1 Be activated by a spring-return, momentary exposed Group 4 key switch in every hall fixture with key removable only in the off position and engraved identification as “Code Blue” in blue a minimum of 12 mm in height

8.1.2 terminate all other services, excluding Inspection and S.E.S.

8.1.3 all car calls are canceled;

8.1.4 the hall calls are bypassed;

8.1.5 the car travels to the lobby where Code Blue was initiated;

8.1.6 upon arrival open the doors automatically on arrival and remain open;

8.1.7 Car activation by way of exposed key switch located in the car fixture above the car calls engraved identification as “Code Blue”

8.1.8 Close the doors by constant pressure of the door close button or any car call button;

8.1.9 Re-open the doors if pressure on the close button or car call is released before fully closed;

8.1.10 Car floor buttons will register the call before or after the car doors are closed;

8.1.11 all car call remain registered unless canceled by Call Cancel Button;

8.1.12 a Cancel Calls button, located above the S.E.S. key switch on the front panel may be used to cancel any call registered incorrectly;

8.1.13 after the car arrives at the activated floor, the doors open and remain open until the close button is used;

8.1.14 Code Blue automatically expires after an adjustable 3 to 5 minutes and the last car call is complete;

8.1.15 another Code Blue can not be initiated until the IN USE lamp adjacent to the Code Blue key switch has extinguished, only one elevator can be in Code Blue at a time. Thereafter Code Blue must again be initiated;

8.1.16 If Special Emergency Service (S.E.S.) is activated while the car is on Code Blue, cause the doors to automatically close at reduced speed for recall to the main lobby. An audible and visual message to enunciate above all Code Blue key switches;

8.1.17 when Code Blue is initiated an in-car audible signal and flashing message enunciate a digitized warning.

8.1.18 during Code Blue, after the car leaves the landing where the call was initiated, visual annunciation continues but the audible signal is silenced.

9. SECURITY

9.1 Remove and salvage the existing security equipment and turn materials over to the City of Winnipeg for safe keeping.

9.2 The Contractor will supply and install all necessary wiring, controller inputs and outputs, and complete all testing to insure compliance to security requirements.

9.3 Coordinate the reinstallation, testing of the security equipment.

9.4 Once complete the system must replicate the existing security functions.

10. LOAD-WEIGHING DEVICES

10.1 Load-weighing devices that will prevent operation of the elevator shall be installed;

10.1.1 to prevent starting of the elevator only when the load on the elevator platform is in excess of 110% of minimum rated load as determined by B44.

10.1.2 to provide anti nuisance features to restrict multiple car call registry by with one person in the elevator.

10.1.3 to provide express Hall By-pass once the car is loaded to 75% capacity

10.1.4 to provide reduced Main and 2nd floor lobby time once the car is loaded to 60% capacity.

11. BUILDING EMERGENCY POWER & FIRE SYSTEM WIRING

11.1 Coordinate the Fire Alarm and Emergency Power System the hookup of the elevator circuits to the building systems.

11.2 The existing Fire Alarm and Emergency Power System wiring will be retained and the Contractor will provide necessary additional supplementary, wiring when required, to the elevator hoistway.

11.3 Include sufficient labour and material to allow for the hookup and re-certification of the automatic recall, including alternate recall of the special emergency service feature.

12. EMERGENCY POWER SYSTEM

12.1 Emergency Power is available to operate all elevators simultaneously.

12.2 An illuminated signal marked "ELEVATOR EMERGENCY POWER" shall be provided in each elevator and in the elevator lobby at the designated level to indicate that the normal power supply has failed and the emergency or standby power is in effect.

13. SPECIAL EMERGENCY SERVICES

13.1 Supply and install special emergency service and designated a the Fire Fighter's Elevator.

13.2 Provide special emergency service to include the following;

13.2.1 manual emergency recall operation;

13.2.2 automatic recall operation;

13.2.3 in-car emergency service;

13.2.4 alternate recall floor.

13.2.5 initiated by smoke sensors in the machine room and at every landing in conformance with B-44.

14. PHASE I EMERGENCY RECALL OPERATION

14.1 A three-position key-operated switch shall be

14.1.1 provided only at the designated level for each single elevator or for each group of elevators;

14.1.2 labeled "FIRE RECALL" and its positions marked "RESET", "OFF", and "ON" (in that order), with the "OFF" position as the center position. The "FIRE RECALL" letters shall be a minimum of 5 mm (0.25 in.) high in red or a color contrasting with a red background;

14.1.3 located in the lobby within sight of the elevator or all elevators in that group and shall be readily accessible.

14.1.4 An additional key-operated "FIRE RECALL" switch, with two-positions, marked "OFF" and "ON" (in that order), shall be permitted only at the building fire control station.

14.1.5 The switch(es) shall be rotated clockwise to go from the "RESET" (designated level switch only), to "OFF" to "ON" positions. Keys shall be removable only in the "OFF" and "ON" positions.

14.1.6 Only the "FIRE RECALL" switch(es) or fire alarm initiating device located at floors that are served by the elevator, or in the hoistway, or in the elevator machine room shall initiate Phase I

15. EMERGENCY RECALL OPERATION.

15.1 All "FIRE RECALL" switches shall be provided with an illuminated visual signal to indicate when Phase I Emergency Recall Operation is in effect.

15.2 When a "FIRE RECALL" switch is in the "ON" position all cars controlled by the switch shall operate as follows:

15.3 A car traveling towards the designated level shall continue nonstop to the designated level and power-operated doors shall open and remain open. On cars with two entrances, if both entrances can be opened at the designated level, only the doors serving the lobby where the "FIRE RECALL" switch is located shall open and remain open.

15.4 A car traveling away from the designated level shall reverse at or before the next available landing without opening its doors and proceed to designated level.

15.5 A stopped car shall have the in-car stop switch and the emergency stop switch in the car when provided, rendered inoperative as soon as the car moves away from the landing. A moving car shall have the in-car stop switch and the emergency stop switch in the car when provided, rendered inoperative without delay. Once the emergency stop switch in the car and the in-car stop switch have been rendered inoperative, they shall remain inoperative while the car is on Phase I Emergency Recall Operation. All other stop switches required by the B44 shall remain operative.

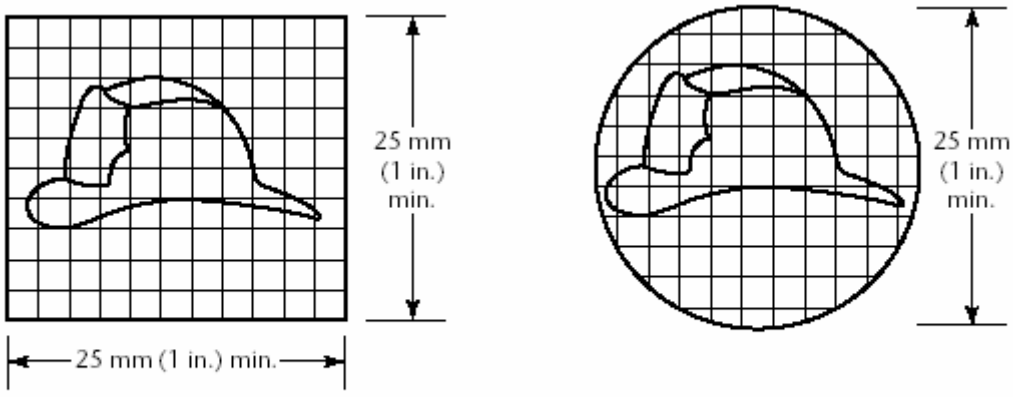
15.6 A car standing at a landing other than the designated level, with the doors open and the in-car stop switch and the emergency stop switch in the car when provided, in the run position, shall conform to the following:

15.7 Elevators having automatic power-operated horizontally sliding doors shall close the doors without delay and proceed to the designated level.

15.8 Door reopening devices for power-operated doors that are sensitive to smoke or flame shall be rendered inoperative without delay. Door reopening devices not sensitive to smoke or flame (e.g., mechanically actuated devices) are permitted to remain operative. Door closing for power-operated doors shall conform to the B44.

15.9 All car and corridor call buttons shall be rendered inoperative. All call registered lights and directional lanterns shall be extinguished and remain inoperative. Car position indicators, where provided, shall remain operative. Where provided, landing position indicators shall be extinguished and remain inoperative, except at the designated level and the building fire control station, where they shall remain operative.

In-Car Visual Signal



GENERAL NOTE: Grid is for scaling purposes only.

15.10 All cars shall be provided with an illuminated visual and audible signal system which shall be activated to alert the passengers that the car is returning nonstop to the designated level. The visual graphic shall be that shown above. The signals shall remain activated until the car has returned to the designated level.

15.11 A car stopped at a landing shall have the in-car door open button rendered inoperative as soon as the car moves away from the landing. The in-car door open button shall remain inoperative when a car stops to reverse direction. Once the in-car door open button has been rendered inoperative, it shall remain inoperative until the car has returned to the designated level.

15.12 Where an additional "FIRE RECALL" switch is provided, both "FIRE RECALL" switches shall be in the "ON" position to recall the elevator to the designated level if the elevator was recalled to the alternate level (see B44 section 2.27.3.2.4).

15.13 To remove the elevator(s) from Phase I Emergency Recall Operation, the "FIRE RECALL" switch shall be rotated first to the "RESET", and then to the "OFF" position, provided that

15.14 the additional two-position "FIRE RECALL" switch, where provided, is in the "OFF" position; and

15.15 no fire alarm initiating device is activated.

15.16 Means used to remove elevators from normal operation, other than as specified in this Code, shall not prevent Phase I Emergency Recall Operation.

15.17 No device, which measures load, shall prevent operation of the elevator at or below the capacity and loading required in the B44.

16. PHASE I EMERGENCY RECALL OPERATION BY FIRE ALARM INITIATING DEVICES

16.1 In jurisdictions enforcing the NBCC, automatic Emergency Recall Operation shall be permitted when the following devices, complying with the requirements in the NBCC, initiate the operation:

16.1.1 smoke detectors installed in each elevator lobby, or the building fire alarm system;

16.1.2 smoke detectors installed in the elevator lobby at the designated level, if that floor area is not sprinklered throughout; and

16.1.3 smoke detectors installed in the machine room if the machine room is sprinklered.

16.2 Phase I Emergency Recall Operation to the designated level shall conform to the following:

16.2.1 The activation of any fire alarm initiating device, other than at the designated level, shall cause all elevators that serve that floor, and any associated elevator of a group automatic operation, to be returned nonstop to the designated level.

16.2.2 The activation of a fire alarm initiating device specified in the designated level or the machine room shall cause all

16.2.3 elevators having any equipment located in that machine room, and any associated elevators of a group automatic operation, to be returned nonstop to the designated level. If the machine room is

located at the designated level, the elevator(s) shall be returned nonstop to the alternate level.

16.2.4 The activation of a fire alarm initiating device specified in the elevator hoistway shall cause all elevators having any equipment in that hoistway, and any associated elevators of a group automatic operation, to be returned nonstop to the designated level, except that initiating device(s) installed at or below the lowest landing of recall shall cause the car to be sent to the upper recall level.

16.3 The Phase I Emergency Recall Operation to the designated level shall conform to the B44.

16.3.1 Phase I Emergency Recall Operation to an alternate level shall conform to the following:

16.3.2 the activation of a fire alarm initiating device at each floor served by the elevator or smoke detectors installed in each elevator lobby, or the building fire alarm system that is located at the designated level, shall cause all elevators serving that level to be recalled to an alternate level, unless a "FIRE RECALL" switch is already in the "ON" position;

16.3.3 the requirements of the B44 except that all references to the "designated level" shall be replaced with alternate level.

16.3.4 The recall level shall be determined by the first activated fire alarm initiating device for that group.

16.3.5 When activated, a fire alarm initiating device in the machine room shall cause the visual signal to illuminate intermittently only in car(s) with equipment in that machine room. When activated, a fire alarm initiating device in the hoistway shall cause the in car visual signal to illuminate intermittently only in car(s) with equipment in that hoistway.

17. PHASE II EMERGENCY IN-CAR OPERATION

17.1 A three-position ("OFF", "HOLD", and "ON", in that order) key-operated switch shall be labeled "FIRE OPERATION"; provided in an operating panel in each car; and shall be readily accessible. The label "FIRE OPERATION" lettering shall be a minimum of 5 mm (0.25 in.) high in red or a color contrasting with a red background. It shall become effective only when Phase I Emergency Recall Operation is in effect and the car has been returned to the recall level. The switch shall be rotated clockwise to go from "OFF" to "HOLD" to "ON".

17.2 The key shall only be removable in the "OFF" and "HOLD" position. The "OFF", "HOLD", and "ON" positions shall not change the mode of operation within Phase II Emergency In-Car Operation until the car is at a landing with the doors in the normal open position, except as required by the B44.

17.3 When the "FIRE OPERATION" switch is in the "ON" position, the elevator shall be on Phase II Emergency In-Car Operation, for use by emergency personnel only, and the elevator shall operate as follows:

17.3.1 The elevator shall be operable only by a person in the car.

17.3.2 The car shall not respond to landing calls. Directional lanterns, where provided, shall remain inoperative. Car position indicators, where provided, shall remain operative. Landing position indicators, where provided, shall remain

inoperative, except at the designated level and the building fire control station, where they shall remain operative.

17.3.3 Door open and close buttons shall be provided for power operated doors. The door open and close buttons shall be labeled "OPEN" and "CLOSE".

17.3.4 The opening of power-operated doors shall be controlled only by a continuous-pressure door open button. If the button is released prior to the doors reaching the normal open position, the doors shall automatically re-close. Requirements for kinetic energy computation do not apply.

17.3.5 On cars with multiple entrances, if more than one entrance can be opened at the same landing, separate door open buttons shall be provided for each entrance.

17.3.6 Open power-operated doors shall be closed only by continuous pressure on the door close button. If the button is released prior to the doors reaching the fully closed position, horizontally sliding doors shall automatically reopen, and vertically sliding doors shall automatically stop or stop and reopen.

17.3.7 On cars with multiple entrances, if more than one entrance can be opened at the same landing, a separate door-close button shall be provided for each entrance.

17.3.8 All door reopening devices except the door open button shall be rendered inoperative. Full speed closing shall be permitted. Landing door opening and closing buttons, where provided, shall be rendered inoperative.

17.3.9 Every car shall be provided with a button marked "CALL CANCEL", located in the same car operating panel as the "FIRE OPERATION" switch, which shall be effective during Phase II Emergency In-Car Operation. When activated, all registered calls shall be canceled and a traveling car shall stop at or before the next available landing.

17.3.10 Floor selection buttons shall be provided in the car to permit travel to all landings served by the car, and they shall be operative at all times, except where allowed by the B-44. Means to prevent the operation of the floor selection buttons or door-operating buttons shall be rendered inoperative.

17.3.11 A traveling car shall stop at the next available landing for which a car call was registered. When a car stops at a landing, all registered car calls shall be canceled.

17.3.12 Means used to remove elevators from normal operation, other than as specified in this Code, shall not prevent Phase II Emergency In-Car Operation. No device, which measures load, shall prevent operation of the elevator at or below the capacity and loading required for the rated load for passenger elevators.

17.4 When the car is at a landing, with the doors open, and the "FIRE OPERATION" switch is in the "HOLD" position, the car shall remain at the landing with the doors open. The door close buttons shall be inoperative, and car calls shall not be registered.

17.5 When the car is at a landing other than the recall level, with the doors in the normal open position, and, the "FIRE OPERATION" switch is in the "OFF" position, power operated doors shall operate as follows:

17.5.1 Horizontal sliding doors shall close automatically. All door reopening devices shall remain inoperative. Door open buttons

shall remain operative. Full-speed closing is permitted. If the "FIRE OPERATION" switch is turned to the "ON" or "HOLD" position prior to the completion of door closing, the doors shall reopen.

17.5.2 Full-speed closing is permitted. If the "FIRE OPERATION" switch is turned to the "ON" or "HOLD' position prior to the completion of door closing, the doors shall reopen.

17.6 When the car is stopped with the doors in the closed position, or in motion, and the "FIRE OPERATION" switch is in the "OFF" position, the elevator remains on Phase II Emergency In-Car Operation and shall return to the designated level in conformance with the B44.

17.7 Elevators shall be removed from Phase II Emergency In-Car Operation only when the "FIRE OPERATION" switch is in the "OFF" position and the car is at the designated level and the doors are in the normal open position.

17.8 The occurrence of an accidental ground or short circuit in elevator electrical equipment located on the landing side of the hoistway enclosure, and in associated wiring, shall not disable Phase II Emergency In-Car Operation once it has been activated.

18. INTERRUPTION OF POWER

18.1 Upon the resumption of power (normal, emergency, or standby), the car shall be permitted to move to re-establish absolute car position. Restoration of electrical power following a power interruption shall not cause any elevator to be removed from Phase I Emergency Recall Operation or Phase II Emergency In-Car Operation.

19. FIREFIGHTERS' EMERGENCY OPERATION — INSPECTION OPERATION

19.1 When an elevator with firefighters' service is on inspection operation or when the hoistway access switch(es) have been enabled, a continuous audible signal, audible at the location where the operation is activated shall sound when the "FIRE RECALL" switch(es) is in the "ON" position or when the fire alarm initiating device is activated to alert the operator of an emergency. The car shall remain under the control of the operator until removed from inspection operation or hoistway access operation. Inspection operation or hoistway access operation shall take precedence over Phase I Emergency Recall Operation and Phase II Emergency In-Car Operation.

20. FIREFIGHTERS' EMERGENCY OPERATION – OPERATING PROCEDURES

20.1 Instructions for operation of elevators under Phase I Emergency Recall Operation shall be incorporated with or adjacent to the "FIRE RECALL" switch at the designated level. They shall include the wording shown below.

PHASE I EMERGENCY RECALL OPERATION INSTRUCTIONS

FIREFIGHTERS' OPERATION

To recall elevators
Insert fire key and turn to "ON"

20.2 Instructions for operation of elevators under Phase II Emergency In-Car Operation shall be incorporated with or adjacent to the switch, in or adjacent to the operating panel in each car. They shall include the wording shown below.

PHASE II EMERGENCY IN-CAR OPERATION

FIRE OPERATION

When 	**Flashes, exit elevator**
To operate car	**Insert fire key and turn to "ON."** **Press desired button.**
To cancel floor selection	**Press "CALL CANCEL" button.**
To close power-operated door	**Press and hold "DOOR CLOSE" button.**
To open power-operated door	**Press and hold "DOOR OPEN" button.**
To hold car at floor	**Turn key to "HOLD."**
To automatically send car to recall floor	**With doors open, turn key to "OFF."**

20.3 Under the requirements of the NBCC, a symbol showing a red firefighters' hat on a contrasting background, as shown in Fig. 2.27.3.1.6(h) (figure not to scale), shall be used exclusively to identify elevators that comply with 2.27.3 and additional NBCC requirements. This identification shall be located on the elevator entrance frame or adjacent to it at each emergency recall level. The identification on the entrance frame, or adjacent to it, shall be a minimum of 50 mm (2 in.) in height.

20.4 In this case the hoistway is not pressurized so the firefighter's hat shall be Yellow not red.

NOTE: For additional NBCC requirements see c2.14.2.1(c).

21. SWITCH KEYS

21.1 The key switches required by Phase I & Phase II Emergency Operation for all elevators in a building shall be operable by the same key. The key=s shall be Group 3 Security. There shall be two key for each switch provided.

21.2 These keys shall be kept on the premises in a location readily accessible to firefighters and emergency personnel, but not where they are available to the public.

21.3 Provided, a lock box with a glass cover above the recall fixture.

NOTE (2.27.8): Local authorities may specify additional requirements for a uniform keyed lock box and its location to contain the necessary keys.

22. ELEVATOR IDENTIFICATION

22.1 Every elevator controlled by the emergency recall switch shall be identified at the level where the switch is located by letters or numbers a minimum of 75 mm in height. The letters or numbers shall be mounted on or adjacent to every elevator entrance.

23. FLOOR NUMBERS

23.1 Floor numbers, not less than 100 mm in height, shall be placed on the interior of walls and/or doors of the hoistway at intervals where a person in a stalled elevator upon opening the car- door can determine the floor position.

24. TOP-OF-CAR INSPECTION OPERATION

24.1 Operating devices for inspection operation shall be provided on the top of the car and shall also be provided in the car and in the machine room. The speed of the car shall not exceed 0.75 m/s (150 ft/min) and not less than 0.5 m/s (100 ft/min).

24.2 Top-of-car inspection operation shall conform to the B44 general requirements of inspection operation and the following:

24.3 A stop switch shall be permanently located on the car top and readily accessible to a person, while standing at the hoistway entrance normally used for access to the car top.

24.4 The inspection/normal transfer switch shall be located on the car top and shall be so designed as to prevent accidental transfer from the "INSPECTION" to "NORMAL" position.

24.5 A separate device of the continuous-pressure type labeled "ENABLE" shall be provided adjacent to the inspection operating devices.

24.6 The inspection operating devices shall become effective only when the "ENABLE" device is activated.

24.7 The inspection operating devices, may be permitted to be of the portable type provided that

24.8 the "ENABLE" device and a stop switch, in addition to the stop switch are included in the portable unit; and

24.9 the flexible cord is permanently attached so that the portable unit cannot be detached from the car top.

24.10 Separate additional devices of the continuous-pressure type shall be permitted to be provided on the car top to make power door opening and closing and automatic car-leveling operative from the top of the car for testing purposes.

25. IN-CAR INSPECTION OPERATION

25.1 Provided in-car inspection operation which shall conform to the B44 general requirements of inspection operation and the inspection/normal transfer switch including

25.1.1 shall be located in the car and marked ``INSPECTION'' with its ``ON'' and ``OFF'' positions clearly identified;

25.1.2 shall be key-operated or placed behind a locked cover. Keys to operate or access the switch shall be Group 1 Security;

25.1.3 shall be rendered ineffective if top-of-car inspection operation is activated; and

25.1.4 when in the "INSPECTION" position, shall not enable hoistway access switch(es). A third switch position shall be permitted to enable the hoistway access switches.

26. MACHINE ROOM INSPECTION OPERATION

26.1 Provided machine room inspection operation which shall conform to the B44 general requirements of inspection operation and the inspection/normal transfer switch

26.2 shall be located in the machine room elevator controller and marked ``INSPECTION'' with its ``ON'' and ``OFF'' positions clearly identified and ;

26.3 rendered ineffective if either the top-of-car inspection operation, or in-car inspection operation, or hoistway access operation is activated.

END OF SECTION -

1. NEW DISPATCHING GENERAL FUNCTIONALITY

1.1 The Group System analyzes many building traffic conditions including, but not limited to the following: hall call demand, number of assigned hall calls, number of cars in operation, number of car calls, number of car stops, car position, car direction, anticipated direction of car travel, car loading, car status, car motion status, car door status, call waiting time, door opening time, door closing time, coincidence calls, and estimated time of car arrival.

1.2 The Group System will use state-of-the-art network of microcomputers linked together through a high-speed data communication link.

1.3 The Group System evaluates real time data and selects the best car to serve any given hall call demand.

1.4 The Group System assignment of cars will provide efficient handling of varying traffic demands in terms of passenger waiting time and passenger transit time.

2. GROUP COMPUTER

2.1 The group system shall be based on a multi-tasking/multi-processing network of microcomputers working seamlessly with the motion controls.

2.2 As a minimum, a 32-bit embedded RISC controller shall be provided which operates at 16 MHZ or faster.

2.3 The group system computer shall have the capacity for 4 megabytes of EPROM plus RAM.

2.4 The group system shall provide industry standard serial communication ports for use with modems and other peripherals.

3. DISPATCHING ALGORITHM

3.1 The dispatching algorithm shall use mathematical modeling and queuing theory to optimize elevator service to the building.

3.2 The dispatching algorithm shall minimize the mean waiting time, the maximum waiting time and the number of late calls.

3.3 This algorithm shall cover all two-way traffic demands such as light, medium, and heavy traffic situations.

3.4 The algorithm shall compile the required physical and statistical data and parameters that are necessary to perform the above minimization tasks.

4. PARKING OPERATION

4.1 The group system software shall include sophisticated parking programs that provide flexible parking options allowing the *City of Winnipeg* to select the most efficient parking configuration for a specific building.

4.2 Parking floors shall be divided into two groups:

4.2.1 Lobby parking floors

4.2.1.1 Lobby parking floors are the floors where a lobby function is performed.

4.2.2 Non-lobby parking floors.

4.2.2.1 Non-lobby parking floors are floors where the car performs a regular parking function.

4.3 Initial settings shall provide for one lobby, South Elevator at the Main floor and North Elevators at the Basement floor.

5. LOBBY OPERATION

5.1 A lobby floor is a floor designated to be a lobby, Main and Basement or other such floors as maybe designated by the Contract Administrator.

5.2 A user programmable option shall allow the car that parks at a lobby to park with its doors open.

6. TIME ACTIVATED DISPATCHING CONFIGURATIONS

6.1 The group system shall allow different system configurations to be programmed by the user.

6.2 The programmable parameters for each configuration shall include

6.2.1 dispatcher mode of operation up peak - down peak

6.2.2 lobby parking floors

6.2.3 non-lobby parking floors

6.2.4 lobby operation

6.2.5 lobby and non-lobby parking delay timers

6.2.6 long wait hall call threshold times.

6.3 The Contractor will invoke these configurations after detailed consultation with the Contract Administrator.

7. TRAFFIC IDENTIFICATION OPERATION

7.1 The group system software shall operate as a dynamically balanced system for two-way traffic.

7.2 Depending upon the traffic pattern in the building, the group system shall modify the mode of operation to include lobby up peak, demand up peak, and demand down peak.

8. EMERGENCY DISPATCH

8.1 In case of a malfunction of the group system communication network, the computers operating the individual car computers shall detect the malfunction and provide emergency dispatching of all in-service cars.

9. EMERGENCY POWER

9.1 All cars are allowed to run under emergency power.

10. OUT-OF-SERVICE

10.1 The system shall automatically remove any car temporarily from the group operation if the car is delayed from responding to its demand within 30 second time period.

10.2 The system shall automatically restore any car back to system operation when the reason for the delay has been corrected.

11. LOAD WEIGHING DISPATCH

11.1 All door dwell time shall be removed from any lobby landing should cars become loaded to a predetermined load level, 60% of full load.

11.2 A load-weighing device mounted on the car will provide dispatch load input.

12. LOAD WEIGHING HALL CALL BYPASS

12.1 Cars shall bypass hall calls if loaded to a predetermined load level 75% of full load. A load-weighing device mounted on the car will provide dispatch load input.

END OF SECTION

1. SUMMARY

1.1 Supply and install a total of four (4) new hoist machine assemblies, AC motor, solid state Drives incorporated into the motion controller and other miscellaneous devices listed herein.

1.2 Optionally retain, refurbish and reuse two (2) machine assemblies (#1 & 2) as defined in sub-section 15.

2. HOIST MACHINES AND SHEAVES

2.1 The alteration consists of the replacement of the hoist machine assemblies.

2.2 Remove and legally dispose the existing hoist machine assembly.

2.3 Provide a new-geared machine of a rating suitable for the contract speed and rated load insuring continuous operation without reduced efficiencies.

2.4 The machine will consists of a bronze gear and steel worm, complete with sheave, electrically released brake, solid and direct coupling to the motor, all in proper alignment on a suitable bedplate or casting.

2.5 Provide a traction sheave suitable for a single wrap drive.

2.6 Dynamically balance the moving parts of the machine to provide no detectable vibration. Adjust gear alignment and thrust bearing so that the endplay and backlash does not exceed .1 mm at the drive sheave groove.

2.7 Mount the machine on sound isolation pads. Arrange the equipment so that any vibration generated is not transmitted directly to the building structure.

2.8 The machine will employ

2.8.1 Sealed or self lubricated roller bearings.

2.8.2 Motor Coupling Bored with Keyway

2.8.3 Fabricated Steel Base

2.8.4 Demountable Traction Sheave

2.8.5 Demountable Bronze Gear

2.8.6 Steel Worm on Integral Shaft

2.8.7 Motor Mounting Pads

2.8.8 Worm Oiling reservoir

2.8.9 Worm Seal Drip Pan

2.8.10 Sheave Guard

2.8.11 Automatic Hoist Rope oilers

2.8.12 Machine Isolation Assembly

2.8.13 Motor Mounting by the Factory

2.8.14 Align the Gears to provide minimal noise and friction.

3. MACHINERY AND SHEAVE BEAMS, SUPPORTS, AND FOUNDATIONS

3.1 Machines, machinery, and sheaves shall be so supported and maintained in place as to prevent any part from becoming loose or displaced under the conditions imposed in service.

3.2 Support shall be provided by means of:

3.2.1 floors designed and installed to support the loads imposed on them; or

3.2.2 steel or reinforced concrete beams.

4. LOADS ON MACHINERY AND SHEAVE BEAMS, FLOORS, OR FOUNDATIONS AND THEIR SUPPORTS

4.1 Overhead beams, floors, and their supports shall be designed for not less than the sum of the following loads:

4.1.1 the load resting on the beams and supports, which shall include the complete weight of the machine, sheaves, controller, governor, and any other equipment together with that portion, if any, of the machine-room floor supported thereon; and

4.1.2 twice the sum of the tensions in all wire ropes supported by the beams where there is a rated load in the car. The tensions are doubled to take care of impact, accelerating stresses, etc.

5. SECURING OF MACHINERY AND EQUIPMENT TO BEAMS, FOUNDATIONS, OR FLOORS

5.1 Machinery or equipment shall be secured to and supported on or from the top of overhead beams or floors except for:

5.1.1 secondary or deflecting sheaves of traction elevators; and

5.1.2 devices and their accessories for limiting or retarding car speed.

5.2 Securing bolts or fastenings are not required where sound isolation is used between bases of machinery or equipment and supporting beams or floors.

6. ALLOWABLE STRESSES FOR MACHINERY, SHEAVE BEAMS OR FLOORS AND THEIR SUPPORTS

6.1 Where stresses due to loads, other than elevator loads, supported on the beams or floor exceed those due to the elevator loads, 100% of the permitted stresses may be used.

7. ALLOWABLE DEFLECTIONS OF MACHINERY, SHEAVE BEAMS AND THEIR SUPPORTS

7.1 The allowable deflections of machinery and sheave beams and their immediate supports under static load shall not exceed 1/1666 of the span.

8. HOIST MOTOR

8.1 Remove and legally dispose the existing hoist motors and generator sets.

8.2 Provide a new AC driving motor suitable for the contract speed and rated load allowing for continuous output which falls well below the 50 degree Centigrade rise maximum. Nominal operating temperature shall be less than 40 degrees Centigrade.

8.3 Dynamically balance the moving parts of the motor, coupling and machine to provide no detectable vibration.

8.4 The motor bearings will be self-lubricating sealed roller bearings with a minimum service life of 20 years.

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

9. DRIVING-MACHINE BRAKE

9.1 Supply and install new driving machine brakes.

9.2 The driving-machine shall be equipped with a friction brake applied by a spring or springs and released electromechanically.

9.3 The driving-machine brake, on its own, shall be capable of

9.3.1 holding the car at rest with its rated load

9.3.2 holding the empty car at rest

9.3.3 decelerating the empty car traveling in the up direction from the speed at which the governor overspeed switch is set.

9.3.4 Any deceleration not exceeding 9.8 m/s2 (32.2 ft/s2) is acceptable provided that all factors such as, but not limited to, system heat dissipation and allowable buffer striking speeds are considered.

9.4 The loss of main line power shall not reduce the braking system capacity below the requirements stated here.

9.5 Marking Plates for Brakes

9.5.1 The brake setting and method of measurement shall be permanently and legibly marked on the driving machine.

9.6 Driving Machine Brake Design

9.6.1 The driving machine brake design shall ensure contact of the friction material on the braking surface consistent with good engineering practice. Means shall be provided to protect the braking surfaces from contamination caused by any driving machine fluid leak.

9.7 Release and Application of Driving-Machine Brakes

9.7.1 Driving-machine brakes shall not be electrically released until power has been applied to the driving-machine motor.

9.7.2 All power feed lines to the brake shall be opened, and the brake shall apply automatically when

9.7.2.1 the operating device of a car-switch or continuous-pressure-operation elevator is in the stop position;

9.7.2.2 a normal stopping means functions;

9.7.2.3 any of the electrical protective devices functions.

9.7.3 The brake shall not be permanently connected across the armature or field of a direct-current elevator driving-machine motor.

10. VVVF SOLID STATE DRIVE

10.1 Provide a new solid-state motor drive of a rating suitable for the contract speed and rated load for continuous stable output.

10.2 Adjust the drive and other performance related equipment to provide an overall flight time, at intermediate floors in both directions with full load, not to exceed 11.5 seconds. The time will be measure from the moment the door starts to close until the car door is ¾ fully open at the next floor.

10.3 Obtain this performance without discomfort and within the parameters described elsewhere.

10.4 Provide solid-state continuous control of the drive motor so that the car can accelerate and slowdown smoothly and swiftly.

10.5 Adjust the drive for a Car speed acceleration greater than 2.9 ft. /sec. and less than 3.6 ft. /sec. and any bump should not exceed 7 ft /s/s.

10.6 Provide a means to limit any line voltage notching of duration greater than 1 millisecond to a maximum of four per cent of the peak sine wave voltage measured from zero reference.

10.7 Provide means to limit the noise level to less than 65 db (A scale).

10.8 Provide complete transformer isolation from the power supply.

10.9 Provide circuits and filters to minimize power line pollution generated by the solid state power device not exceeding 25 % total harmonic current distortion and 10% harmonic voltage distortion when measured at the machine room disconnect switch;

10.10 Include power relay and resistance circuits so that the elevator can be dynamically restrained if the drive fails.

10.11 Provides means to limit the increase in noise level during acceleration to less than 12 db (A scale).

10.12 The noise levels will be measured in the physical centre of the machine room.

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

10.14 Electronic feedback circuits will limit the motor and solid-state power devices current.

10.15 Provide circuits so that maximum current limits are not exceeded during low voltage conditions.

10.16 Provide safety circuits to detect and prevent runaway due to closed loop feedback circuit failure. Arrange these circuits so that:

10.16.1 With a partial or complete loss of the feed back circuit the elevator will come to a stop before the governor jaws are tripped;

10.16.2 If the elevator is in the door zone with the door interlock circuit open, the elevator will come to a stop prior to leaving the leveling zone;

10.16.3 Test these circuits with the elevator leveling up into the floor with no load and while the elevator is running in the up direction with no load.

10.17 Provide sufficient heat sinks on solid-state power devices to insure continuous proper operation without premature failure.

10.18 Provide circuits to:

10.18.1 shut down the elevator in the event of overheating without trapping passengers and prior to equipment damage;

10.18.2 protect the solid-state devices from current surges;

10.18.3 protect the solid-state devices from voltage surges;

10.18.4 absorb regenerated power when the normal drive power is removed from the motor armature;

10.18.5 prevent fuses blowing or equipment damage in the event of power loss or brown out;

11. SOLID STATE FEEDBACK CONTROL

11.1 Supply and install a closed loop negative feedback control system.

11.2 The detection system must provide monitoring by:

11.2.1 Tachometer generator to constantly monitor velocity feedback signals;

11.2.2 Pattern generator to give a velocity signal relative to the position and acceleration of the car movement;

11.2.3 Position transducer.

12. ELECTROMAGNETIC COMPATIBILITY (EMC)

12.1 Electromagnetic disturbances are electromagnetic phenomena, which may degrade the performance of a device, unit of equipment or system. Hence, all electromagnetic frequencies are involved.

12.2 This definition covers:

12.2.1 conducted low-frequency phenomena;

12.2.2 radiated low-frequency phenomena;

12.2.3 conducted high-frequency phenomena;

12.2.4 radiated high-frequency phenomena; and

12.2.5 electrostatic-discharge phenomena.

12.3 It is the responsibility of the Contractor to carrying out the Work to ensure that the modified installation conforms to the regulation requirements. The Contractor will provide a declaration of conformity and affix the CE Mark unless combinations of components tested in accordance with the relevant EMC standards are used.

12.4 The Contractor will supply installation and commissioning instructions, which ensure that EMC effects in the installation are minimized.

12.5 The equipment is not required to be constructed in such a manner to satisfy the protection requirements of other apparatus, which may not reasonably be expected to be in its usual electromagnetic environment.

13. ABSORPTION OF REGENERATED POWER

13.1 Where a power source is used which, in itself, is incapable of absorbing the energy generated by an overhauling load, the means of absorbing sufficient energy shall be provided on the load side of each elevator power supply line disconnecting means, to prevent the elevator from attaining governor tripping speed or a speed in excess of 125% of contract speed, whichever is less.

14. LOAD-WEIGHING DEVICES

14.1 Load-weighing devices that will prevent operation of the elevator shall be installed:

14.1.1 to prevent starting of the elevator only when the load on the elevator platform is in excess of 110% of minimum rated load as determined by the B44;

14.1.2 to provide anti nuisance features to restrict multiple car call registry by with one person in the elevator.

15. OPTIONAL HOIST MACHINE ASSEMBLY REFURBISHMENT #1 & #2

15.1 Delete replacing elevator #1 & #2 hoist machine assembly and retain, refurbish and reuse the existing elevator #1 & #2 hoist machine assembly. If accepted this amount will be "DEDUCTED" from Total Bid Price at the sole discretion of the City of Winnipeg.

15.2 Store elevator #3 & #4 hoist machine assemblies in there existing machine room, to be scavenged for a source of parts for the retained machines.

15.3 Refurbishment of elevator #1 & #2 Hoist Machine Assemblies shall include but is not limited to the following items to provide like new condition to the hoist machine assembly.

15.3.1 Remove upper and lower gear case covers.

15.3.2 Thoroughly inspect gear and worn for wear. Replaces as required using scavenged parts.

15.3.3 Supply and install new machine bearings including but not limited to thrust and pedestal bearings. Arrange that the worm end play, with a balanced load in the car, measures less than .0015"

15.3.4 Drain, flush and scrape out the gear case oil reservoir.

15.3.5 Supply and install new worm gear seals and adjust for seepage of less than 300 ml per 30 days.

15.3.6 Reinstall covers and re-seal all case joints to prevent all leaking.

15.3.7 Replenish with lubricates recommended by the manufacture and suitable to present operation.

15.3.8 Paint machines as designed elsewhere herein.

15.3.9 Supply and install new brake pins and cotter pins.

15.3.10 Supply and install new brake linings.

15.3.11 Supply and install new brake coil.

15.3.12 Supply and install any and all other worn brake components.

15.4 Install the new hoist motor and adjust so that the complete assembly, when operating at full speed, vibrates less than .001” at the motor end of the bed plate.

- END OF SECTION -

1. QUANTITY

1.1 Supply and install a total of four (4) motion protection devices including Governors, Overspeed Switches, Rope Brakes and other miscellaneous devices required by code and/or listed herein.

2. OVER SPEED PROTECTION

2.1 CAR OVER SPEED PROTECTION

2.1.1 The following protection against risk of injury to passengers as a result of car over speed shall be provided if the risk may be caused by any failure in:

2.1.1.1 the elevator control system;

2.1.1.2 the driving-machine components;

2.1.1.3 the driving-machine brake; or

2.1.1.4 any other component on which the speed of the car is dependent, except in the case of the failure of the means of suspension and the failure of the overhead mounted gearless traction sheave.

2.1.1.5 It shall be assumed that any envisioned failure may occur while the car, loaded with any load up to its rated load, may be stationary with its doors closed or traveling at any speed, in any part of the hoistway, between terminal landings.

3. CAR SAFETIES

3.1 SAFETY PLANK

3.1.1 Retain and refurbish the safety plank(s).

3.1.2 Replace the tiller rope wound on the drum and running to the governor rope hitch.

3.1.3 Clean, adjust, repair, modernize and test to insure the device operates like new car safety plank(s) applicable for the new contract speed and existing contract load.

3.1.4 The safety device shall be capable of stopping and sustaining the entire car and its rated load, from governor tripping speed.

3.1.5 Every car safety shall be provided with a switch operated by the car safety mechanism when the safety is applied.

3.1.6 The car safety mechanism switch shall, when operated, remove power from the driving- machine motor and brake when the safety is applied.

3.1.7 Switches operated by the car safety mechanism shall be of a type that cannot be reset until the car safety mechanism has been returned to the ``OFF'' position.

3.1.8 The application of the safety to stop the car, when its rated load is centred on each quarter of the platform symmetrically with relation to the centre lines of the platform, shall not cause the platform to be out of level by more than 30 mm/m in any direction.

3.1.9 When car safeties are applied, no decrease in tension in the neither governor rope nor motion of the car in the down direction shall release the safeties.

3.1.10 The safeties shall be released by the motion of the car in the up direction. The driving machine, unassisted, shall produce such motion with rated load on the car.

4. SPEED GOVERNORS

4.1 SPEED-GOVERNORS AND SHEAVES REQUIRED AND LOCATIONS

4.1.1 Remove and legally dispose the existing speed-governor(s) and sheave(s);

4.1.2 Provide new governor(s) and sheave(s) for the contract speed rated load.

4.1.3 Mount governor(s) and sheave(s) according to manufacture's recommendations.

4.1.4 A metal plate shall be clearly visible, securely attached to each speed governor and shall be marked in a legible and permanent manner with letters and figures not less than 6 mm in height indicating the following:

4.1.4.1 speed in m/s at which the governor is set and sealed to trip the governor-rope retarding means;

4.1.4.2 size, material, and construction of the governor rope on which the governor-rope retarding means was designed to operate;

4.1.4.3 manufacturer's name or trademark;

4.1.4.4 governor rope pull-through force as set; and

4.1.4.5 governor rope lubrication instructions.

4.1.5 The governor shall be arranged to be tripped by hand to facilitate the tests specified in SAFETY CODE FOR ELEVATORS.

4.1.6 The governor shall be located where there is adequate space for full movement of governor parts.

4.2 FACTORS OF SAFETY IN LOAD-BEARING PARTS OF SPEED GOVERNORS

4.2.1 The materials used in the load bearing parts of speed governors shall have a minimum factor of safety of not less than 3-1/2 and the materials used shall have an elongation of not less than 15% in a length of 50 mm when tested in accordance with ASTM Standard E8. Cast iron shall have a minimum factor of safety of 10.

4.3 DESIGN OF SPEED-GOVERNOR SHEAVES AND TRACTION BETWEEN SPEED-GOVERNOR ROPE AND SHEAVE

4.3.1 The arc of contact between the governor rope and the governor sheave shall, in conjunction with a governor-rope tension device, provide sufficient traction to cause the governor to function properly.

4.3.2 Where the rope force imparted to the governor rope necessary to activate the safety or to trip the releasing carrier is dependent upon the tension in the governor rope prior to governor tripping, the means shall be provided to detect a reduction in the required tension and to remove power from the driving-machine motor and brake after the car has stopped at the next floor where passengers may exit.

4.3.3 Governor sheave grooves shall have machine-finished surfaces.

4.3.4 Governor tension sheaves shall have machine-finished grooves.

4.3.5 Machined sheave grooves shall have a groove diameter of not more than 1.15 times the diameter of the governor rope.

4.3.6 The pitch diameter of governor sheaves and governor-tension sheaves shall not be less than the product of the diameter of the rope and the applicable multiplier listed in Table 11 of the B44 based on the contract speed and the number of strands in the rope.

4.4 TRIPPING SPEEDS FOR SPEED GOVERNORS

4.4.1 Speed governors for car safeties shall be set to trip at over speeds as follows:

4.4.2 at not less than 115% of contract speed;

4.4.3 at not more than the maximum tripping speed listed opposite the applicable contract speed listed in the B44;

4.5 SEALING AND PAINTING OF SPEED GOVERNORS

4.5.1 Speed governors shall have their means of tripping speed adjustment sealed by the manufacturer after testing.

4.5.2 If speed governors are painted after sealing, all bearing and rubbing surfaces shall be kept free, or freed of paint, and a tachometer test shall be made to determine that all parts operate freely as intended.

4.5.3 Seals shall be of a type that will prevent readjustments of the governor tripping speed without breaking the seal.

4.5.4 Provision shall be made so that seals may be readily affixed after field tests.

4.6 SPEED-GOVERNOR OVER SPEED SWITCH

4.6.1 A switch shall be provided on every car speed governor.

4.6.2 The switches shall be operated by the over speed action of the governor.

4.6.3 The speed-governor over speed switch shall, when operated, remove power from the driving- machine motor and brake.

4.7 SETTING OF SWITCHES

4.7.1 The setting of the car speed-governor over speed switch shall conform to the following:

4.7.1.1 for rated speeds up to and including 2.5 m/s, the car-speed governor over speed switch shall open when the elevator is descending at not more than 90% of the speed at which the governor is set to trip;

4.7.1.2 the switch, when set as specified shall open when the elevator is ascending at not more than 100% of the speed at which the governor is set to trip when the elevator is descending;

4.7.1.3 the speed-governor over speed switch may be set to open when the elevator is descending at not more than 100% of the speed at which the governor is set to trip subject to the following requirements:

4.7.1.3.1 a speed-reducing switch of the manually reset type shall be provided on the governor to reduce the speed of the elevator in case of over speed; it shall be set to open as specified;

4.7.1.3.2 subsequent to the first stop of the car following the opening of the speed-reducing switch, the car shall remain inoperative until the switch is manually reset; and

4.7.1.3.3 for elevators with static control, the over speed switch shall open at not more than 90% of governor tripping speed.

4.8 RESETTING OF SWITCHES

4.8.1 Over speed switches operated by the speed governor shall remain in the open position until manually reset.

5. ASCENDING CAR OVER SPEED PROTECTION

5.1 ASCENDING PROTECTION

5.1.1 Supply and install new ascending protection.

5.1.2 Provide an auxiliary braking device to prevent uncontrolled ascent of the elevator.

5.1.3 Provide a device separate and independent from the machine brake and car safeties.

5.1.4 The auxiliary braking device to apply when the elevator over speeds and/or the elevator moves from the floor with the doors open.

5.1.5 The rate of deceleration of the auxiliary braking shall be limited to between 25% and 100% of gravity.

5.1.6 Relative to the speed of the elevator, activation of the auxiliary braking device takes place at a sufficient distance from the counter weight buffer to prevent the counter weight from exceeding the rated velocities of the buffer.

5.1.7 Activation of the auxiliary braking device will disconnect power to the elevator motor and main brake.

5.1.8 The device must be manual resetting, only in the machine room, to restore normal operation.

5.1.9 Testing the auxiliary braking device shall not damage the device or other equipment.

5.1.10 Once the device is correctly adjusted, seal the adjustments, in the presence of Manitoba Labour Elevator Inspection Branch, using a numbered seal to prevent unauthorized re-adjustment.

5.1.11 List test information such as serial numbers, installation date, test date, seal number and other such similar information on test data sheets described elsewhere. (See Section 14050 subsection 17.1

5.2 OVER SPEED PROTECTIVE MEANS

5.2.1 The over speed protection device shall conform to the following:

5.2.1.1 It shall detect any uncontrolled movement of the car prior to or, at a minimum, at the time when the car reaches a predetermined over speed, and shall cause the car to stop prior to the time when the car or counterweight strikes its buffers, or at least reduce the car speed to the speed for which the buffer is designed.

5.2.1.2 It shall be capable of performing as required without assistance from any elevator component that solely, without built-on redundancy, controls the speed, or deceleration, or stops the car during normal operation.

Note: A mechanical linkage to the car whether or not such linkage is used for any other purpose may be used to assist in this performance.

5.2.1.3 It shall not develop an average retardation of the car in excess of 9.81 m/s^2 (32.2 ft/s^2) during the stopping phase.

5.2.1.4 It shall prevent dangerous, uncontrolled movement of the car by controlling the speed and acting upon one or more of the following:

5.2.1.4.1 the car;

5.2.1.4.2 the counterweight;

5.2.1.4.3 the suspension or compensating rope system;

5.2.1.4.4 the traction sheave.

5.2.1.5 When activated and during the stopping phase, it shall not impose stress on itself or any elevator component in excess of 30% of the ultimate strength of that component.

5.2.1.6 The slowdown and stopping of the car during its normal operation, when no failure has been detected, shall not be solely dependent on this means.

5.2.1.7 When activated or during the stopping phase, this means or another elevator component shall cause the power supply to the driving machine to be interrupted.

5.2.1.8 All components that require periodic inspection and maintenance to ensure operational reliability must be readily accessible.

5.2.1.9 Its performance shall be checked during the acceptance inspection of the elevator.

5.2.1.10 It shall be provided with a marking plate indicating the range of total masses for which it may be used and the speed at which it is set to operate.

- END OF SECTION -

1. QUANTITY

1.1 Supply and install four (4) set of governor ropes and four (4) set of hoist ropes including hoist rope connections and rope lubricators plus other miscellaneous components, which maybe required by code and/or listed herein for four (4) elevators.

2. SPEED-GOVERNOR ROPES

2.1 Remove and legally dispose the existing governor rope(s);

2.1.1 Replace the tiller rope wound on the drum and running to the governor rope hitch.

2.2 Supply and install new governor rope(s) of the size and type as specified by the governor manufacture.

2.3 Mount governor rope(s) according to manufacture's recommendations.

2.4 Governor ropes shall be of iron, steel, monel metal, phosphor bronze, or stainless steel; they shall be of regular-lay construction and shall be not less than 9.5 mm in diameter.

2.5 Tiller-rope construction shall not be used.

2.6 The factor of safety for governor ropes shall be not less than 5.

2.7 Rope data tags shall be installed at the car hitch of all governor ropes.

2.8 During normal operation of the elevator, the governor rope shall run free and clear of the governor jaws, rope guards, or other stationary parts.

3. SUSPENSION ROPES AND ROPE CONNECTIONS

3.1 HOIST ROPES

3.1.1 Remove and legally dispose the existing hoist ropes(s);

3.1.2 Provide new hoist ropes of suitable size and duty for the new contract speed and existing contract load.

3.1.3 Only steel wire rope constructed for elevator service shall be used for the suspension of elevator cars and counterweights.

3.1.4 The crosshead data plate required by the B44 shall bear the following wire rope data:

3.1.4.1 the number of ropes;

3.1.4.2 the diameter in millimetres; and

3.1.4.3 the manufacturer's rated breaking strength per rope in kilonewtons (kN).

3.1.5 A metal rope data tag shall be securely attached to one of the wire rope fastenings.

3.1.6 The material and marking of the rope data tag shall conform to the requirements of the B44, except that the height of the letters and figures shall be not less than 1.5 mm.

3.1.7 The rope data tag shall bear the following wire rope data:

3.1.7.1 the diameter in millimetres;

3.1.7.2 the manufacturer's rated breaking strength;

3.1.7.3 the grade of material used;

3.1.7.4 the month and year the ropes were installed;

3.1.7.5 whether it is preformed or non-preformed;

3.1.7.6 construction classification;

3.1.7.7 name of the person or firm who installed the ropes;

3.1.7.8 the name of the manufacturer of the wire rope; and

3.1.7.9 lubrication instructions.

4. WIRE ROPE FASTENINGS

4.1 Remove and legally dispose the existing hoist rope fastenings including springs and other ancillary hardware;

4.2 The stationary hitch ends shall be fastened by wedge sockets.

4.3 The dead ends shall be provided with shackle rods of a design that will permit individual adjustment of rope lengths.

4.4 Wire rope fastenings shall conform to the following:

4.4.1 the portion of the rope fastening that holds the wire rope (rope socket) and the shackle rod may be in one piece (unit construction);

4.4.2 where the shackle rod is separate from the rope socket, the fastening between the two parts shall be positive and such as to prevent their separation under all conditions of operation of the elevator; where the connection of the two parts is threaded, the length of the thread engagement of the rod in the socket shall be not less than 1.5 times the root diameter of the thread on the rod, and a cotter pin or equivalent means shall be provided to restrict the turning of the rod in the socket and to prevent the connection from unscrewing during normal operation; eye bolts used as connections with clevis-type sockets shall be of forged steel conforming to Class B (heat treated) without welds of ASTM Standard A668;

4.4.3 rope sockets shall be of such a strength that the rope will break before the socket is materially deformed;

4.4.4 the shackle rod, eye bolt, or other means used to connect the rope socket to the car or counterweight, shall have a strength at least equal to the manufacturer's rated breaking strength of the rope;

4.4.5 rope fastenings incorporating anti-friction devices that will permit free spinning of the rope shall not be used...

4.5 Wedge socket assemblies shall conform to the following:

4.5.1 when the wire rope and wedge socket assembly is tested to destruction in a tensile testing machine, the rope shall fail at a load greater than 80% of the manufacturer's rated breaking load for the rope;

4.5.2 wedge socket assemblies shall be of such a strength that when tested as in Item (a), the rope shall break before the socket or wedge is perceptibly deformed;

4.5.3 suppliers of wedge sockets shall submit certification showing that the sockets, suitably identified, have successfully passed the tests described in Items (a) and (b) at a testing laboratory acceptable to the regulatory authorities;

4.5.4 the wedge socket shall be cast, forged, or welded steel, provided that, where the wedge socket and shackle rod are in one piece (unit construction), the entire fastening shall be of forged steel;

4.5.5 cast or forged steel wedge sockets, eyebolts, shackle rods, and their connections shall have an elongation of not less than 20% in a gauge length of 50 mm when measured in accordance with ASTM Standard E8, and conforming to ASTM Standards A668, Class C for forged steel, and A27, for cast steel and shall be stress relieved;

4.5.6 where the shackle rod is separate from the wedge socket, the fastening between the two parts shall be positive and such as to prevent their separation under all conditions of operation of the elevator;

4.5.7 when the rope has been locked in the wedge socket by the load on the rope, the wedge shall be visible and a clip or other approved means shall be used to retain the wedge and prevent the rope from slipping in the socket should the load on the rope be removed for any reason.

4.6 HOISTING-ROPE HITCH PLATES OR SHAPES

4.6.1 The shackles shall be attached to steel hitch plates or to structural or formed steel shapes.

4.7 SECURING OF HITCH PLATES OR SHAPES

4.7.1 The hitch plates or shapes shall be secured to the underside or to the webs of the support member with bolts, rivets, or welds so located that the tension in the hoisting ropes will not develop direct tension in the bolts or rivets.

5. HOIST ROPE LUBRICATORS

5.1 Supply and install hoist rope lubricators in the machine room on each elevator and lubricate the ropes.

END OF SECTION -

1. QUANTITY

1.1 Supply and install limit switches and other miscellaneous components required by code for four (4) elevators.

2. SWITCH IN PITS

2.1 Remove and legally dispose the existing pit stop switches.

2.2 Supply and install new pit stop switches.

2.3 A manually opened and closed stop switch shall be provided in the pit of every elevator.

2.4 The stop switch shall be located so that it is readily accessible from the lowest landing level and not more than 200 mm below that level.

2.5 If this switch is more than 2000 mm above the pit floor, an additional switch shall be installed not more than 2000 mm above the pit floor.

3. SOLID-STATE LIMIT SWITCHES

3.1 Remove and legally dispose the existing limit switches.

3.2 Provide new limit switches.

3.3 Use Bi-directional, mechanically activated guide rail mounted switches paired with car mounted actuating cams for normal or final terminal-stopping devices and securely mounted in such a manner that the movement of the switch or cam will be as nearly as impossible in a direction at right angles to a vertical plane through the face of the car guide rails.

3.4 No switch will be located below the level of the bottom landing, in an effort to prevent damage due to flooding.

3.5 Notching or stepping switches will be prohibited.

3.6 Normal terminal-stopping devices will conform to the following:

3.6.1 They will be provided and arranged to slow down and stop the car automatically at or near the top and bottom terminal landings, with any load in the car up to and including the rated load and from any speed attained in normal operation.

3.6.2 They will function independently of the operation of the normal stopping means and of the final terminal-stopping device.

3.6.3 They will be so designed and installed that they will continue to function until the final terminal-stopping device operates.

3.7 Normal terminal-stopping devices will be provided. They will be so designed and installed that they will continue to function until the car reaches its extreme limits of travel.

3.8 Stopping switches will be in the hoistway and operated by the movement of the car.

3.9 Prior to the performance of safety tests and checks by the inspecting authorities, fasten, by through bolting or doweling, the final limit switches and final limit switch brackets so as to minimize the possibility of future incorrect adjustment.

4. CAR AND COUNTERWEIGHT BUFFERS

4.1 Retain, refurbish, repair, reuse and test the existing car and counterweight buffer(s) to provide and warrant like new operation for the new contract speed and existing contract load.

4.2 Drain and flush and replenish all buffer oils.

4.3 Perform all testing to insure compliance with the code requirements. When initial test fail to comply with code requirements repair or replace as required to conform.

-END OF SECTION-

1. QUANTITY

1.1 Supply and install a total of four (4) sets of, Travelling Cables, and miscellaneous components and adjustments listed herein.

2. CAR AND HOISTWAY WIRING

2.1 Retain and refurbish all existing wiring unless specifically not listed for replacement.

2.2 When required provide by the alterations, provide new wiring of suitable size and duty for the equipment requirements to insure there remains a minimum of 10% spare wires.

2.3 Except for the requirements of the B44, all electrical equipment and wiring shall conform to CSA Standard C22.1, Canadian Electrical Code, Part I.

2.4 The installation of any new, or the alteration of existing, electrical equipment, wiring, raceways, cables, pipes, or ducts shall conform to the applicable requirements of the B44.

3. CAR TRAVELLING CABLES

3.1 Remove and legally dispose the existing car travelling cable(s) including all hoistway junction boxes and car bottom junction boxes;

3.2 Provide new car travelling cables of suitable size and quantity for the required car equipment and operational features and include a minimum of 10% spare wires.

3.3 In addition the typical elevator control wiring provide the following addition wiring in each elevator running from the car cab to the machine room controls;

3.3.1 One (1) Shielded coax (coiled and labeled on the car top and in the machine room) for a future car cab mounted video cameras in each elevator.

3.3.2 Four (4) twisted pair (coiled and labeled on the right-hand car fixture and in the machine room) for future card swipe in each elevator.

3.4 Travelling cables, between the car and machine room, shall be Type E, except the outer covering shall be of Neoprene;

3.5 Relocate all junction boxes to the car top and/or car station. No electrical connections other than those feeding components mounted beneath the platform are allowed below the bottom of the car station.

3.6 No electrical connections other than those feeding components mounted in the hoistway are allowed below the machine room.

3.7 Any alterations made to a car frame or platform, the frame and platform shall conform to the requirements of the B44.

- END OF SECTION -

1. QUANTITY

1.1 Supply and install a total of four (4) new solid-state controlled D.C. Door Operators with solid-state door-nudging, gates switches, door restrictors, door clutches and miscellaneous components and adjustments listed herein.

2. DOOR OPERATORS

2.1 Remove and legally dispose of the existing Door Operator(s).

2.2 Supply and install ECI 1000 door operator.

2.3 The new door operator(s) shall be solid sate controlled DC motors with car top Open/close cycle testing and simulation.

2.4 Power opening of a car door shall be subject to the following:

2.4.1 power opening shall occur only when the car is at rest at the landing or is leveling, except that

2.4.1.1 on elevators with static control, power shall not be applied to open the car doors until the car is within 50 mm of the landing.

2.4.1.2 In any event the car must be stopped level with the floor before the doors are 50% from fully open.

2.5 For centre opening design, the new Door Operator shall be installed, adjusted and be capable of being maintained at the following performance specification.

2.5.1 Door Close speed 2.5 sec. +/- 5%

2.5.2 Door Close force 17 Ft/Lbs +/- 5%

2.5.3 Door Close Nudging speed 4.5 sec. +/- 5%

2.5.4 Door Close Nudging force 2.5 Ft/Lbs or only that which is required to fully close

2.5.5 Door Close Nudging Activation Time 20 seconds

2.5.6 Door open speed 1.5 sec. +/- 5%

2.6 For two speed design, the new Door Operator shall be installed, adjusted and be capable of being maintained at the following performance specification.

2.6.1 Door Close speed 4.5 sec. +/- 5%

2.6.2 Door Close force 17 Ft/Lbs +/- 5%

2.6.3 Door Close Nudging speed 7.5 sec. +/- 5%

2.6.4 Door Close Nudging force 2.5 Ft/Lbs or only that which is required to fully close

2.6.5 Door Close Nudging Activation Time 20 seconds

2.6.6 Door open speed 2.5 sec. +/- 5%

2.7 The code zone distance shall be

2.7.1 For center-opening doors using single or multiple speed panels, the distance shall be taken from a point 25 mm (1 in.) away from the open jamb to a point 25 mm (1 in.) from the center meeting point of the doors.

2.7.2 For all other doors using single or multiple speed panels, the distance shall be taken from a point 50 mm (2 in.) away from the open jamb to a point 50 mm (2 in.) away from the strike jamb.

2.8 The average closing speed shall be determined by measuring the time required for the leading edge of the door to travel the code zone distance.

2.9 A momentary-pressure button suitably identified shall be provided in the car; the operation of the button shall cause the doors to stop and reopen. The button shall be identified as "Door Open"

2.10 A momentary-pressure button suitably identified shall be provided in the car; the operation of the button shall cause the doors to close. The button shall be identified as "Door Close"

3. DOOR DELAY (PASSENGER SERVICE TIME)

3.1 Set and adjust the car dwell time circuits in the 1.0 to 3.0 second range subject to final approval of the Contract Administrator.

3.2 Set and adjust the hall dwell time circuits to 2.0 to 3.0 seconds range subject to final approval of the Contract Administrator.

3.3 Set and adjust the door reopen time circuits to 0 seconds range subject to final approval of the Contract Administrator.

3.4 Make door reopening available with limited reversal motion and time circuits set to 0 seconds range subject to final approval of the Contract Administrator.

3.5 Set and adjust the Lobby time circuits to 4.0 to 6.0 seconds range subject to final approval of the Contract Administrator. Arrange lobby time to re-set to 0.0 seconds once car is loaded to 60% or the Door Close button is activated.

4. DOOR CLOSE NUDGING

4.1 Supply and install circuitry and wiring necessary to provide nudging on all elevators.

4.2 Door reopening devices (including all optical multiple-beam devices specified herein) may be affected by smoke or hot gases shall be rendered inoperative after the doors have been held open for 20 seconds by such a device, and shall activate a door close nudging circuit (reduced door close force) subject to the Contract Administrator's final approval. (Once the device is rendered inoperative it shall remain inoperative until the elevator has traveled to another floor and reactivated.)

4.3 Once the door close nudging circuit is activated an enunciator located in the car cab shall activate indicating that the door is about to close without door protection.

4.4 Once the enunciator has been activated for 2 seconds, +/- 25%, the door shall close fully with the closing force not exceeding 3.5 J. (2.5 ft/lbs) the actual closing rate time from fully open to fully closed shall be 1.7 times the normal contract specification for the door close speed +/- 5% subject to the Contract Administrator's final approval.

5. CAR-DOOR GATE SWITCH

5.1 Remove and legally dispose the existing car-door gate switches.

5.2 Supply and Install new Car door gate switches.

5.3 The gate switch contacts shall be adjusted to:

5.3.1 prevent operation of the driving machine when the car door or gate is not in the closed position, except under the conditions specified in the B44;

5.3.2 be positively opened by a lever or other device attached to, and operated by, the door or gate, or by a directly connected door operation;

5.3.3 be maintained in the open position by the action of gravity or by a restrained compression spring, or by both, or by positive mechanical means; and

5.3.4 be so designed or located that it is not possible to circumvent the requirements of Item 5.3.1 from inside the car without the use of tools.

6. CAR DOOR RESTRICTORS

6.1 Supply and Install new Car-door restrictors.

6.2 When a car is outside the unlocking zone, the hoistway doors or car doors shall be so arranged that the hoistway doors or car doors cannot be opened more than 100 mm (4 in.) from inside the car. The car doors cannot be opened when the car is outside the unlocking zone.

6.3 The car doors shall be operable from outside the car without the use of a special tool(s).

6.4 The doors shall be operable from within the car when the car is within the unlocking zone.

7. CAR DOOR CLUTCHES

7.1 Remove and legally dispose the existing car door clutches;

7.2 Supply and install a new car door clutch of the appropriate size and type to operate the new hall door locks and existing hall door panels.

7.3 The clutch must insure the door operator is capable of reversal of direction from full speed closing to full speed opening within 0.8 seconds without undue lost motion in the clutch or linkages.

7.4 Adjust the clutch so that the car and hall door operates reliably with the new door operator and locks.

8. CAR DOOR SUNDRIES

8.1 Remove and legally dispose the existing car door rollers, gibs and interconnect cables;

8.2 Supply and Install new car door rollers gibs and interconnect cables of the appropriate size and type to provide like new operation.

- END OF SECTION -

1. QUANTITY

1.1 Supply and install four (4) new full opening Infrared 3-D Door Protection Devices.

2. DOOR PROTECTION DEVICES

2.1 Remove and legally dispose the existing car-door re-opening device(s);

2.2 Supply and install Pana 40 3-D Plus.

2.3 Door(s) shall be provided with an infrared multiple beam door-reopening device(s) that will function to stop and reopen the car door and the adjacent landing door fully, in case the car door is obstructed while closing.

2.4 This reopening device shall also be capable of sensing an object or person in the path of a closing door without requiring contact for activation.

2.5 This reopening device shall also be capable of sensing (3-D) an object or person located in the hall within 30% of the width of the fully open car door.

2.6 The device will provide substantial coverage and be capable of detecting a 2 inch diameter object anywhere in the opening from 25 mm to 1800 mm (1 to 72 inches) above the floor during the complete door close cycle from fully open to fully closed.

2.7 Door reopening devices shall remain effective for a period of not less than 20 sec.

2.8 Cover exposed leading edge of car door with a replacement noising where required.

2.9 The power-operated car door shall be provided with a reopening device that will function to stop and reopen a car door and the adjacent landing door sufficiently to permit passenger transfer in the event that the car door or gate is obstructed while closing. If the closing kinetic energy is reduced to 3.5 J or less, the reopening device may be rendered inoperative. The sensing device used shall be substantially effective for the full vertical opening of the door.

2.10 Elevator door reopening devices, such as photoelectric devices (including the 3-D devices), that may be affected by smoke or hot gases shall be rendered inoperative after the doors have been held open for 20 s by such a device, except that elevators equipped with automatic emergency recall operation (see B44) need not comply with this requirement.

2.11 If the door protection device referred to in the B44 is the sole reopening device and is rendered inoperative, then the closing kinetic energy shall be reduced in accordance with B44.

3. INTERRUPTION OF DOOR PROTECTION DEVICES

3.1 The power supply feeding the door protection device shall be separately fused and labeled at the controller. Fusing on the car or within the device is prohibited.

3.2 Provide means so that the elevator system will not run in the event of power failure to the door-reopening device. The elevator must remain at the floor with the doors fully open until the power failure is restored.

3.3 Under normal automatic service operation, failure of the door protection device, for any reason (including 30% or more loss of detection) should prevent the doors from closing at full speed. The doors shall remain open until such time as the door nudging circuits have activated (20 seconds). The door can then be allowed to close at a rate of 1.75 times the normal close speed.

3.4 Under Fireman's Service operation, the door protection device shall be rendered inoperative and remain inoperative until normal automatic service operation is restored.

--END OF SECTION --

1. QUANTITY

1.1 Supply and install four (4) new stand-alone emergency lighting Alarm unit(s).

2. EMERGENCY LIGHTING UNIT

2.1 Supply and install new stand-alone emergency lighting Alarm unit(s).

2.2 The cars shall be provided with permanently installed emergency lighting and Alarm Bell powered from battery-operated emergency units, and shall conform to the following:

2.3 The Light fixture will be flush mounted and incorporated into the top of the car button panel.

2.4 The emergency system shall provide some general illumination of the car;

2.4.1 the intensity 1200 mm above the car floor and approximately 300 mm in front of the car station shall be not less than 2 lx;

2.4.2 emergency lights shall be automatically turned on not more than 10 s after the normal lighting power failure;

2.4.3 the emergency power system shall be capable of maintaining the above light intensity for a period of at least 4 h;

2.4.4 not less than two lamps of approximately equal wattage shall be used;

2.4.5 and the battery-operated emergency units shall

2.4.5.1 comply with CSA Standard C22.2 No. 141;

2.4.5.2 have a 4 h rating;

2.4.5.3 be permanently connected to the supply; and

2.4.5.4 have an output rating that includes the emergency signal devices (see B44) and the emergency lights.

END OF SECTION

1. QUANTITY

1.1 Supply and install six (6) new car button fixture unit(s) including, eight (8) new car direction arrow fixtures, four (4) Hands Free Telephone in a cabinet, four (4) Digital Position Indicators with Digitized Voice and four (4) Top of Car Inspection Button units.

2. FIXTURE TYPE

2.1 Supply and install all new signal fixtures, such as car and hall push buttons, position indicators, et cetera, using DUPAR fixtures with the finish selection by the *Contract Administrator*.

2.2 Supply and install car position indicators and car registration lights of LED design and having a minimum contrast ratio of 8:1 throughout a life expectancy greater than 100,000 hours.

2.3 Arrange that the variation in intensity and contrast ratio between hall call register lights on one floor and car call registered lights within the car and individual elements of hall and position indicators do not exceed 5 percent.

2.4 Arrange the all car and hall call button lights to function at 50% intensity when not activated. Activation will result in 100% illumination.

2.5 Supply and install fixtures with all controls required by the B44 Appendix E which are readily accessible from a wheel chair upon entering an elevator.

3. ELEVATOR PAGING SPEAKER

3.1 Supply and install the material necessary for a paging speaker in each elevator cab.

3.2 Speaker shall be located behind the car button fixture and project through a series of miniature hole forming a grill. Directly below identify it with engraving "*Paging Speaker*"

3.3 The speaker shall be a 6 ohm 10 watts and not less than 4 inches in diameter.

3.4 Using polarized shielded wiring running from the car speaker to the machine room controller.

3.5 Terminate the wires in the machine room in an enclosed terminal box located on the outside of the controller labeled "*Elevator Paging Speaker*"

4. CAR BUTTON(S)

4.1 Supply and install two new stainless steel car button panels in each elevator #1 & #2 and one new car button panel in each elevator #3 & #4 using DUPAR Type US-90-15 Braille Compact 2 Pushbutton fixtures.

4.2 The buttons will incorporate raised Braille tactile symbols on the button face in stainless steel. Tactile characters and Braille shall be placed immediately on the button to which they apply.

4.3 Symbols as indicated in Figure ESP-F1 shall be used to assist in readily identifying all essential controls.

4.4 The buttons will incorporate raised Braille tactile symbols on the button face in stainless steel with Braille dots located below the tactile symbol.

4.5 The floor registration buttons shall be:

4.5.1 numbered to correspond to the existing floor identification with a star to mark the main floor.

4.5.2 located no higher than 1350 mm.

4.5.3 The depth of flush or recessed buttons when they are being operated shall not exceed 10 mm;

4.5.4 Visual and momentary audible indication shall be supplied and installed to show each call registered and visual indication shall be extinguished when the call is answered.

4.6 Supply and install a visual and electronic audible signal system that shall be activated to alert passengers that the car is on the emergency recall operation; at a minimum the visual signal shall remain operative until the car reaches the recall level;

4.7 The Alarm and Door Open and Door Close operating buttons shall be:

4.7.1 Engraved directly underneath “Door Open” and “Door Close” as required by the S.E.S. section requirements of the B44

4.7.2 Grouped together at the bottom of the control panel;

4.7.3 Have a center line not more than 890 mm and not less than 850 mm from the floor;

4.7.4 when operating in normal mode, momentary pressure on the door open button will cause the doors to open or re-open, unless the doors are closing due to long of a delay, in which case constant pressure on the open button is required to re-open;

4.7.5 Cause the alarm button, when pressed to ring the alarm bell located on the elevator cab, and to operate a distress signal, a buzzer and indicator at the ground floor.

4.8 All subject to Figure ESP-2 and the Contract Administrator’s final acceptance;

4.9 Call buttons shall be 890 mm minimum and 1220 mm maximum above the floor or ground, measured to the centreline of the buttons.

4.10 A clear floor or ground space of 760 x 1220 mm shall be provided immediately in front of the button fixture.

4.11 Call buttons shall be 19 mm minimum in their smallest dimension.

4.12 Buttons shall be raised a minimum of 1.5 mm.

4.13 Objects beneath hall call buttons shall protrude 25 mm maximum into the clear floor or ground space.

5. CAR POSITION INDICATOR

5.1 Remove and legally dispose of the existing car position indicator(s) covering the existing opening with stainless steel by cladding the complete car doorframe header. The end result should be seamless. Achieve this by incorporating the piece into the car doorframe.

5.2 Supply and install one (1) digital segmented car position indicator incorporated into and centered in the car doorframe header of each elevator to display floor levels as currently designated.

5.3 Incandescent and dot matrix devices are unacceptable.

5.4 Arrange the indicator to display corresponding floor designations at least 50 mm (2 inches) high.

5.5 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.

5.6 Supply and install car position indicators with lights of LED Segmented design and having a minimum contrast ratio of 8:1 throughout a life expectancy greater than 100,000 hours

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

6. CAR DIRECTION ARROWS

6.1 Supply and install digital segmented flush mount car direction indicators incorporated into each side of the each car doorframe with a centre line of 1800 mm.

6.2 The primary arrows shall be not less than 70 mm and also project sideways both in and out of the car with side mounted integral auxiliary minor direction arrows.

6.3 Down directions arrows in red and up direction arrows in green.

6.4 Incandescent and dot matrix devices are unacceptable.

6.5 Audible signals shall have adjustable volume level signal that state the word UP or DOWN.

6.6 The verbal intensity signal shall be 10 dBA minimum above ambient, but shall not exceed 80 dBA maximum, measured at the hall call button.

7. TELEPHONE

7.1 Supply and install one (1) vandal resistant flush mounted auto-dial telephones in each elevator incorporated below the right hand car button fixture.

7.2 The international symbol for telephones shall be located on the cabinet door in a contrasting colour and Braille label.

7.3 The compartment door hardware shall be operable with one hand and shall not require tight grasping, pinching, or twisting of the wrist. The force required to activate operable parts shall be 22.2 N maximum.

7.4 A visual indicator shall indicate to the hearing impaired that the call has been placed with a digitized voice relying the elevator number and location.

7.5 The symbol shall be a minimum of 38 mm high and raised a minimum of 0.75 mm. Permanently attached plates are acceptable.

7.6 Arrange that the telephone wires and terminal box are labeled “Elevator Phone” and are located on the outside of the controller located in the machine room.

7.7 Program the telephone to dial the City of Winnipeg’s main switchboard.

8. FLOOR PASSING TONE

8.1 Supply and install a tone having an adjustable volume level of between 55 and 70 db, measure within the elevator cab, which sounds as the elevator is between floors. The tone operation will be field enabled and disabled without software changes.

8. CAR DIGITIZED VOICE

8.1 Supply and install a digitize voice signal incorporated within the right hand car control fixture of each elevator.

8.2 The digitized human voice shall announce floor numbers, direction of travel and special announcements for passengers.

8.3 The digitized human voice shall be 10 dBA minimum above ambient, but shall not exceed 80 dBA maximum, measured at the speaker.

8.4 The device shall have separate volume controls for floor and direction announcements. The direction and emergency announcements shall be set louder than the floor announcements.

8.5 The interface between the device and the motion controller shall be electrically isolated.

8.6 Programmed memory shall be nonvolatile EPROM chips.

8.7 Speaker output shall be a standard 8-ohm amplified at 10 watts.

8.8 Arrange the digitize voice signal to announce the standard service messages at the appropriate times.

8.8.1 Corresponding floor designations.

8.8.2 Going up.

8.8.3 Going down.

8.8.4 There will be momentary delays while the car is on emergency power.

8.8.5 Do not be alarmed. This car is being transferred to emergency power and will return to service momentarily.

8.8.6 Do not be alarmed. This car is now in fireman’s service. When the door opens please exit in a safe and orderly manner.

8.8.7 Do not be alarmed. This car is need for an emergency. When the door opens please exit in a safe and orderly manner.

8.8.8 Please exit the car.

8.8.9 Please allow the doors to close.

8.8.10 Please stand clear of the door.

9. CAR TOP INSPECTION BUTTONS

9.1 Remove and legally dispose the existing car top inspection station(s);

9.2 Supply and install new car top inspection station(s) placed within easy reach of the hall sill.

9.3 The operating means shall conform and include to the following:

9.3.1 an activating switch or switches, especially designed to prevent accidental transfer from the ``maintenance'' to the ``normal'' operation position;

9.3.2 operating buttons shall be of the continuous-pressure type and protected against accidental operation; and

9.3.3 a stop switch which stops a running car and prevents further operation until manually reset.

9.3.4 Fire service buzzer to warn maintenance personnel of emergency.

9.3.5 the tops of all cars shall be provided with a new permanent light controlled by a switch located on top of the car unit;

9.3.6 110 VAC outlets for power tools or auxiliary lighting located on top of the car unit.

9.4 The switch for transferring the control of the elevator to the top-of-car operating device shall be located between the car crosshead and the side of the car nearest the hoistway entrance normally used for access to the car top.

9.5 Separate additional means, of the constant pressure type, may also be provided to make power-door operating devices and automatic car-leveling devices operative from the top of the car for testing purposes.

10. CAB CERTIFICATE FRAME AND LICENSE

10.1 Supply and install a new Stainless Steel License Frame with a Lexan lens incorporated into the left hand car button fixture.

10.2 Arrange that the operating certificate be mounted in the frame.

11. SYMBOLS & DIMENSIONS

11.1 Where reference is made requiring wording to designate a specific function, the symbols as shown below shall be substituted for, or used in conjunction with, the required wording.

11.2 The emergency stop switch shall have the "STOP" and "RUN" positions conspicuously and permanently marked as required

11.3 The Braille shall conform to the following requirements;

SYMBOL IDENTIFICATION

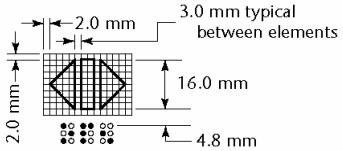
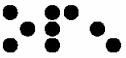
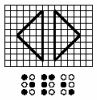
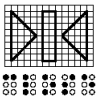
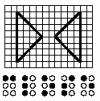
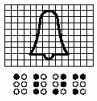
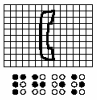
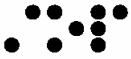
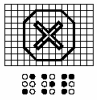
Function	Tactile Symbol	Braille Message Where Provided	Proportions (Open Circles Indicate Unused Dots Within Each Braille Cell)
Door Open		 OP"EN"	
Rear/Side Door Open		 REAR/SIDE OP"EN"	
Door Close		 CLOSE	
Rear/Side Door Close		 REAR/SIDE CLOSE	
Main		 MA"IN"	
Alarm		 AL"AR"M	
Phone		 PH"ONE"	
Emergency Stop		 "ST"OP	

Figure ESP-1

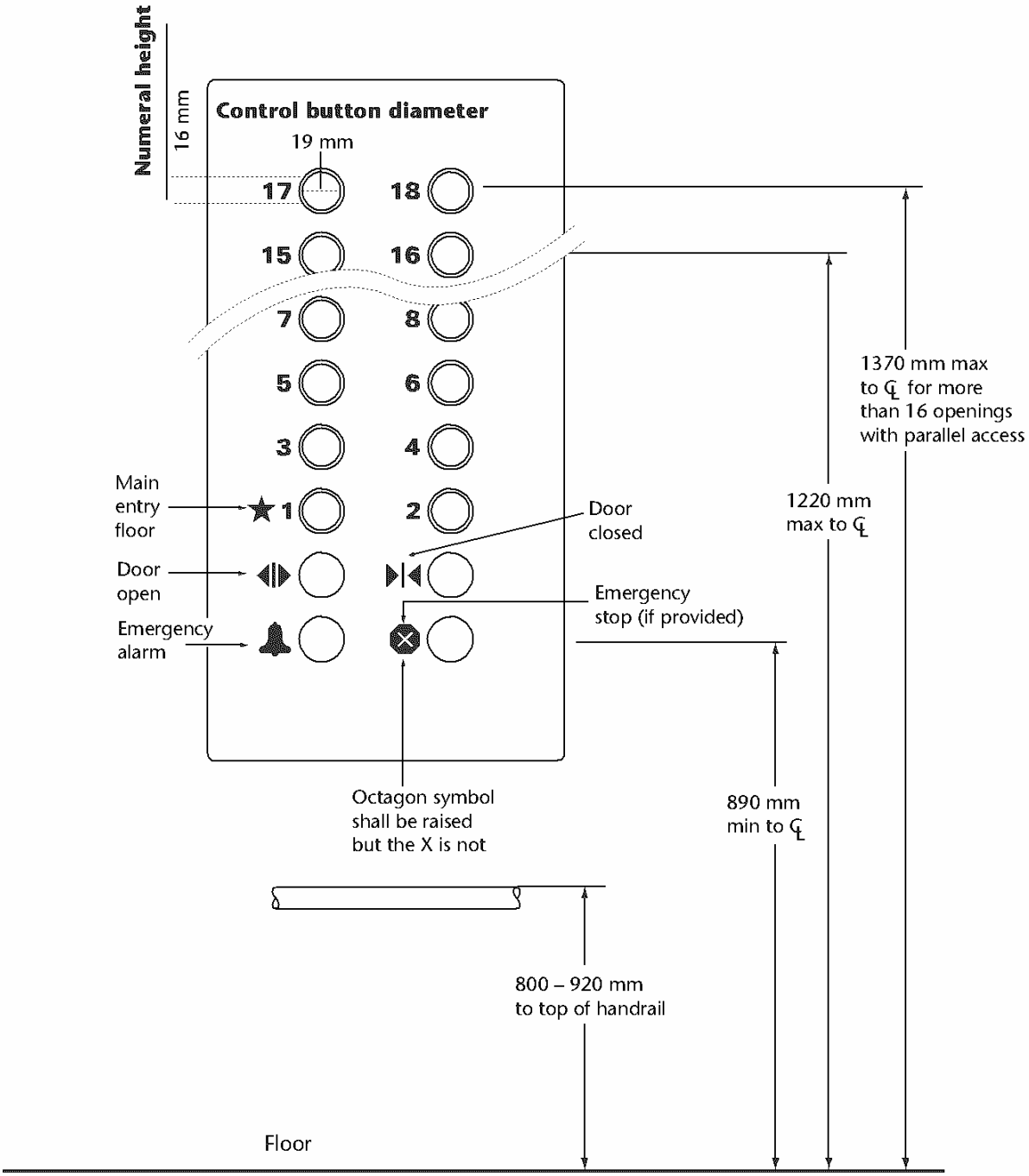


Figure ESP-2

- END OF SECTION -

1. QUANTITY

1.1 Supply and install Thirteen (13) new hall button fixture unit(s) including new hall position indicators incorporated into each button fixture.

2. FIXTURES

2.1 TYPE

2.2 Supply and install all new signal fixtures, such as hall push buttons, position indicators, et cetera, with the finish selection by the *Contract Administrator*.

2.3 The new fixture(s) shall be the DUPAR Type US-90-15 Braille Compact 2 Pushbutton fixtures:

2.4 The buttons will incorporate raised Braille tactile symbols on the button face in stainless steel. Tactile characters and Braille shall be placed immediately on the button to which they apply and;

2.4.1 be readily accessible from a wheel chair at each floor;

2.4.2 duplicate the existing buttons' function;

2.5 Supply and install hall button(s) with lights of LED design and having a minimum contrast ratio of 8:1 throughout a life expectancy greater than 100,000 hours to visually indicate, each call that is registered and extinguish when the call is answered and;

2.5.1 be identical from floor to floor (intermediate floors dual buttons, terminal floor panels one button only);

2.5.2 have buttons;

2.5.2.1 a minimum 25 mm in size;

2.5.2.2 mounted one above the other;

2.5.2.3 when they are operated shall require travel of less than 10 mm;

2.5.2.4 have a center line of between 890 and 1220 mm from the floor;

2.5.2.5 flush mount within the masonry walls covering the existing location with button location at the height listed above, the Contractor is responsible for any and all cutting, patching and painting to restore the surrounding area, making good ay damage.

2.5.2.6 have hidden or tamper proof access fasteners for servicing the light and buttons;

2.5.3 Arrange that the variation in intensity and contrast ratio between hall call register lights on one floor and car call registered lights within the car and individual elements of hall and position indicators do not exceed 5 percent.

2.5.4 Arrange the all hall and call button lights to function at 50% intensity when not activated. Activation will result in 100% illumination.

3. HALL BUTTONS

3.1 Remove and legally dispose of all existing hall button fixtures

3.2 Supply and install a new hall button fixture on each landing for each elevator group which incorporates position/direction indicators for each elevator.

3.3 The new fixture must cover the existing opening and insure the new buttons have a universal access height identical from floor to floor and be located vertically between 890 and 1220

mm above the floor, measured to the centreline of the respective button.

3.4 Hall buttons shall have visual signals to indicate when each call is registered and when each call is answered.

3.5 The hall button that designates the UP direction shall be located above the button that designates the DOWN direction.

3.6 Buttons or surrounding button collar shall be raised a minimum of 1.5 mm.

3.7 Objects located beneath hall buttons shall protrude not more than 25 mm.

4. HALL POSITION INDICATOR (S)

4.1 Remove and legally dispose of the existing hall position indicators and cover the opening with a one piece 16 gauge metal plate which covers the entire the face of the hall door header, all of which is stainless or primed and painted to match the surround door frame.

4.2 Supply and install new digital hall position indicators at each floor landing incorporated into the hall button fixture.

4.3 Arrange the position indicators beside each other with a bold blue arrow engraved below each indicator pointing to the corresponding elevator.

4.4 Arrange the indicator to display corresponding floor designations at least 50 mm (2 inches) high replicating the existing designation.

4.5 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;

4.6 Supply and install hall position indicator(s) with lights of LED segmented design and having a minimum contrast ratio of 8:1 throughout a life expectancy greater than 100,000 hours;

4.7 Overlapping dual indication, when the elevator is between floors is acceptable;

4.8 Center line of the hall position indicator shall be no higher that 1370 mm from the floor

5. HALL DIRECTION LANTERNS/INDICATOR (S)

5.1 Remove and legally dispose of the existing hall direction lanterns and cover the opening with drywall all of which is primed and painted to match the surround wall finish.

5.2 Incorporate into the hall position indicator(s) elements indicating the future direction of the elevator that include;

5.2.1 direction arrows with a visual LED segment a minimum of 80 mm in diameter;

5.2.2 an audible signal provided when the elevator stops at the landing ;

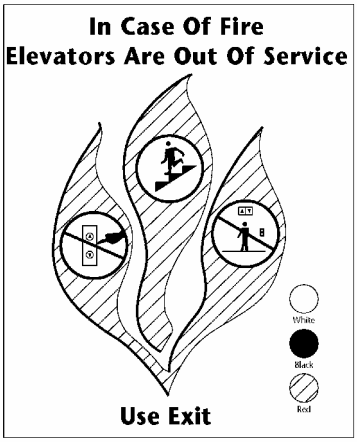
5.2.3 the operation will conform to the disability access requirements.

6. EXISTING HALL CARD SWIPES

6.1 Mount the existing card swipe devices on the new hall button fixture as if an integral unit.

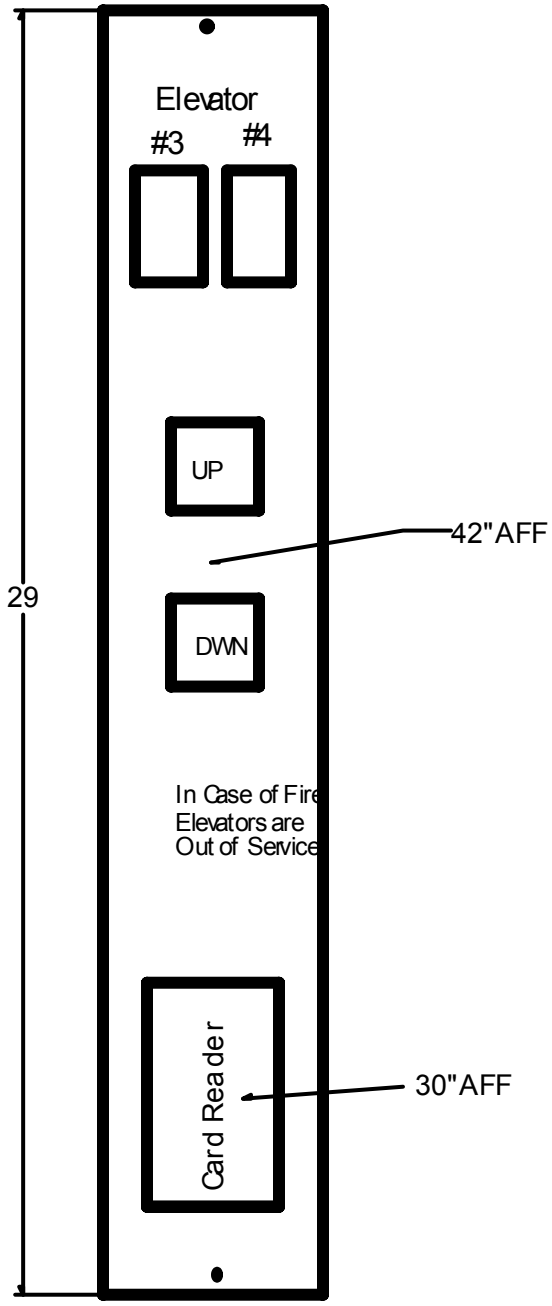
6.2 The car swipe shall be optimally mounted at 30" to centre and attached so as not to interfere with other fixture elements.

7. EMERGENCY EVACUATION LABELS



7.1 Supply and install the Fire evacuation direction label depicted below and firmly attached it upon or directly above each and every hall button fixture.

HALL FIXTURE CAR #1, #2, # 3 & #4



- END OF SECTION -

1. QUANTITY

1.1 Supply and install a total of twenty six (26) door retainer angle sets, miscellaneous hardware, four (4) keyed access switches and twenty six (26) hall door lunar access devices.

2. EXISTING ENTRANCES

2.1 Retain, repair, refurbish and reuse the existing hall door entrances consisting of frames, jambs, sills, sill support angles and brackets, headers, cover plates, fascia and fascia guards.

2.2 Replace all door rollers, door gibs, closers, air cords and other related mechanisms that are worn or damaged and adjust all so that the hall doors operate reliably and quietly with the new door operator, as if all were new.

3. HALL DOOR LOCKS

3.1 Retain, repair, refurbish and reuse the existing door locks.

3.2 Replace all door lock rollers, contacts including miscellaneous components and adjust all so that the hall doors operate reliably with the new door operator, as if new.

3.3 Arrange the door locks to automatically lock the hall door and prevent opening from the hall side without tools.

3.4 Refurbish the means of access (lunar key) to the hoistway at the main and basement landing(s).

4. MAIN FLOOR ENTRANCES ELEVATOR #1 & #2

4.1 Clad the existing hall door panels with laminate colour matching the main lobby panels, subject to the final approval of the *Contract Administrator*.

4.2 Leading edge of laminates shall be held back from the edge to prevent butting and catching.

5. HOISTWAY ACCESS SWITCHES (KEYED)

5.1 Supply and install new hoistway keyed access switch(s).

5.2 The switch shall be installed adjacent to the hoistway entrance at the Lowest and the Top landing.

5.3 The switch shall be of the continuous-pressure spring-return type, and shall be operated by a cylinder type lock having not less than a five-pin or five-disk combination, with the key removable only when the switch is in the "OFF" position. The key shall be Group 1.

5.4 The electric contacts in the switch shall be positively opened mechanically; their openings shall not be solely dependent on springs.

5.5 The operation of the switch shall permit movement of the car with the hoistway door at this landing unlocked or not in the closed position, and with the car door or gate not in the closed position.

5.6 The operation of the switch shall not render ineffective the hoistway-door interlock or electric contact at any other landing, nor shall the car move if any other hoistway door is unlocked.

5.7 The car will be operated at a speed not greater than 0.75 m/s (150 ft/min).

5.8 Automatic operation by a car-leveling device is made inoperative and other automatic operation such as power operation of the hoistway door and/or car door or gate shall be made inoperative by a Key-operated switch within the car. The Key-operated means shall also enable the hoistway access Key switches and shall be the same Group 1 key.

5.9 During access operation, both top-of-car inspection operation and in-car inspection operation are not in effect.

5.10 The movement of the car initiated and maintained by the access switch shall be limited in the down direction to a travel not greater than the height of the car crosshead above the car platform, and limited in the up direction to the distance the platform guard extends below the car platform.

6. HOISTWAY ACCESS FOR INSPECTION, MAINTENANCE, REPAIRS, RESCUE

6.1 Provide means of access to the hoistway on each and every landing(s), irrespective of any hall access switches provided.

6.2 A means of access shall consist of either a door unlocking device conforming to B44 Clause 2.12.9.2 or a hoistway access switch conforming to B44 Clause 2.12.9.3, except that a hoistway access switch shall be provided at the second landing when the distance from secure footing on top of the car exceeds 900 mm when the car platform is level with the first landing.

6.3 Landing door unlocking devices shall conform to the following:

6.3.1 the device shall unlock and permit the landing door to open from the access landing irrespective of the position of the car;

6.3.2 the device shall be installed every landing;

6.3.3 the device shall be designed to prevent the door from being unlocked with common tools;

6.3.4 the operating means for unlocking the door shall be available to and used only by inspectors, maintenance men, and repair men (see B44 Clause 3.15); and

6.3.5 the device shall be installed at a height from the sill that does not exceed 2100 mm.

6.4 Unlocking devices in the shape of a one-piece specially shaped rod or tube shall not be permitted even though a specially shaped escutcheon plate is provided to prevent insertion of other than the designed unlocking device.

6.5 The unlocking device may consist of an arrangement whereby a releasing chain, permanently attached to a door-locking mechanism, is kept under a locked panel adjacent to the landing door, providing such a panel is self-closing and self-locking and has no identifying marking on its face.

6.6 If door unlocking devices are provided on single automatic, attendant-operated or continuous-pressure operation elevators, means shall be provided on the landing side to send the car away from the floor

6.6.1 down only at the first landing above the bottom landing to permit access to the top of the car; or

6.6.2 at the bottom landing, if this landing is the normal means of access to the pit, to permit access to the pit.

6.7 The means specified in B44 Clause 2.12.9.2.4 are not required at landings of single automatic operation elevators provided the car can be sent from the landing, or by a person registering the call in the car, and getting off the car before the doors close.

7. DOOR SAFETY RETAINERS

7.1 Supply and install twenty six (26) sets of hall door fireguard angles.

7.2 When existing equipment does not comply, supply and install new door safety retainers.

7.3 The top and bottom of the landing door shall be provided with the means for retaining the closed door panel in position should the replaceable primary guiding means fail.

7.4 The retainers shall prevent displacement of the door panel top and bottom by more than 20 mm (0.8 in.) when the door panel is subjected to a force of 5000 N (1,125 lb ft) applied at right angles over an area of 300 × 300 mm (12 in. by 12 in.) at the approximate centre of the panel.

7.5 The retaining means shall also withstand, without detachment or permanent deformation, a force of 1000 N (225 lb ft) applied upward at any point along the width of the door panel and, while this force is maintained, an additional force of 1 100 N (250 lb ft) applied at right angles to the door at the center of the panel. This force shall be distributed over an area of 300 mm by 300 mm (12 in. by 12 in.).

7.6 The retaining means shall be so fixed that it is readily identifiable and not subjected to wear and tear during normal use or maintenance of the elevator.

8. IDENTIFICATION OF FLOORS

8.1 Arrange that the hoistway side of all hall doors and all fascia are labeled with the appropriate floor identification.

8.2 Floor numbers, not less than 100 mm (4") in height, shall be placed on the interior of walls and/or doors of the hoistway at intervals, less than 2000 mm (80"), aligned in the 4" window of initial door opening, where a person in a stalled elevator upon opening the car- door can determine the floor position.

9. FLOOR/CAR DESIGNATIONS (HALL DOOR BRAILLE PLATES)

9.1 Metal Plates shall be placed on both sides of the door jambs, with the centreline at 1500 ± 25 mm above the floor to identify the floor level at each and every floor.

9.2 Raised character and Braille floor designations shall be provided on both jambs of elevator hoistway entrances and shall be centred at 1525 mm above the floor, measured from the baseline of the characters.

9.3 A raised star placed immediately to the left of the floor designation shall also be provided on both jambs at the main entry level. Such characters shall be 50 mm high and shall comply with Appendix E of the B44.

- END OF SECTION -

END

1.1 GENERAL

.1 All drawings and all sections of the specifications shall apply to and form an integral part of this section.

1.2 SCOPE OF WORK

.1 Work to include all labour, material and equipment required for installing, testing and placing in initial operation the following systems as detailed in specifications of each section and as shown on drawings.
.1 Section 15051 Acceptable Materials & Equipment
.2 Section 15800 Air Distribution
.3 Section 15900 Controls/Instrumentation
.4 Section 15990 Testing, Adjusting and Balancing

1.3 MISCELLANEOUS REQUIREMENTS

.1 Install work in advance of concrete pouring or similar work. Provide and set pipe sleeves as required.

.2 Install concealed pipes and ducts neatly, close to building structure so furring is minimum size. Pipes, ducts and equipment installed improperly, to be removed and replaced without cost to The City.

.3 Protect and maintain work until building has been completed and accepted. Protect work against damage during installation. Cover with tarpaulins if necessary. Repair all damage to floor and wall surfaces resulting from carrying out of work, without expense to The City.

.4 During welding or soldering ensure structure is protected against fire, shield with fire-rated sheets and galvanized iron sheets. Mount portable fire extinguishers in welding or soldering areas.

.5 Co-ordinate Work with other sections to avoid conflict and to ensure proper installation of all equipment. Review all contract drawings.

.6 On completion of Work, remove tools, surplus and waste material and leave work in clean, perfect condition.

1.4 WELDING REGULATIONS

.1 Do not weld when temp. of base metal is lower than -17 deg. C except with consent of Contract Administrator. At temp. below 0 deg. C, surface of all areas within 75mm (3") of point where weld is to be started to be heated to temp. at least warm to hand before welding is commenced. At all temperatures below +4 deg. C,

operator and work to be protected against direct effect of wind and snow.

.2 Welding shall be performed by welder holding current welder's certificate from Provincial Department of Labour.

.3 Comply with fire protection standard CSA W117.2 "Safety in Welding, Cutting, and Allied Processes".

1.5 MECHANICAL SHOP DRAWINGS

.1 Submit for review a minimum of six sets of detailed shop drawings. Refer to Section 15051 "Acceptable Materials & Equipment" for shop drawings requirements.

.2 Check shop drawings for conformity to plans and specifications before submission.

.3 Each drawing to bear a signed stamp including project name and Contractor's Firm name verifying drawings have been checked prior to submission to Contract Administrator. Signature of stamp shall signify the Contractor has checked and found all dimensions to be compatible with the contract drawings and all capacities, quantities, sizes and other data contained in the contract documents have been listed by the supplier on the drawings and have been checked by the undersigned and found correct.

.4 Clearly show division of responsibility. No item, equipment or description of work shall be indicated to be supplied or work to be done "By Other's or By Purchaser". Any item, equipment or description of work shown on shop drawings shall form part of contract, unless specifically noted to contrary.

.5 Take full responsibility for securing and verifying field dimensions. In case where fabrication must proceed prior to field dimensions being available, check all shop drawings and approve for dimensions only. In this case warranty that dimensions will be worked to and ensure that other sub-trades are aware of these dimensions and shall comply to them.

.6 Review by Contract Administrator shall be mutually understood to refer to general design only. If errors in detailed dimensions or interference with work are noticed, attention of Contractor will be called to such errors of interferences, but Contract Administrator's review of drawings will not in any way relieve Contractor from responsibility for said errors or interferences, or from necessity of furnishing such work, and materials as may be required for completion of work as called for in contract documents.

1.6 MECHANICAL SUB-TRADES

.1 Contractor to have minimum five years experience in field of mechanical contracting and to have successfully performed work of similar nature and approximate size to that indicated in specifications and on drawings. Sub-trades shall employ, on this project, foremen or supervisory personnel who have had similar experience to that required of Contractor.

1.7 SCHEDULING OF WORK

.1 Existing buildings to be in use during construction. Arrange work so that interruption of services is kept to minimum. Obtain permission from Contract Administrator, prior to cutting into mechanical services. Where deemed necessary by Contract Administrator, temporary piping to be installed, and/or work to be carried out at night and on weekends.

1.8 DRAWINGS

.1 Drawings are diagrammatic only and do not show all details. Information involving accurate measurements of building to be taken at building. Make, without additional expense to The City, all necessary changes or additions to runs to accomodate structural conditions. Locations of pipes, ducts and other equipment to be altered without charge to The City, provided change is made before installation and does not necessitate additional materials and that all such changes are ratified by Contract Administrator, recorded on Record Set of Drawings.

.2 Drawings and specifications to be considered as an integral part of Contract Documents. Neither drawings nor specifications to be used alone. Misinterpretation of requirements of plans or specifications shall not relieve Contractor of responsibility of properly completing work to approval of Contract Administrator.

.3 As work progresses and before installing piping, ductwork, fixtures and equipment interfering with interior treatment and use of building, consult Contract Administrator for comments. This applies to all levels and proper grading of piping. If Contractor fails to perform above checking and fails to inform Contract Administrator of such interference, Contractor to bear all subsequent expense to make good the installation.

.4 Drawings indicate general location and route to be followed by pipes and ducts. Where required pipes and/or ducts are not shown on plans or only shown diagrammatically, install in such a way as to conserve head room and interfere as little as possible with free use or space through which they pass.

1.9 MATERIALS

.1 Materials and equipment specified and acceptable manufacturers are named in this specification for the purpose of establishing the standard of materials and workmanship to which Contractor shall adhere. Tender price shall be based on the use of materials and equipment as specified.

.2

.1 Materials of same general type to be of same manufacture (e.g. all air supply units shall be of same manufacturer). Contractor to ensure that all sub-trades provide products of same manufacturer.

.1 Follow manufacturer's recommendations for safety, adequate access for inspection, maintenance and repairs of individual equipment installed.

.2 Permit equipment maintenance and disassembly with minimum disturbance to connecting piping and duct systems and without interference with building structure or other equipment.

.3 Provide accessible lubricating means for bearings, including permanent lubricated 'Lifetime' bearings.

.3 Equipment and materials shown on drawings and not specified herein, or specified herein and not shown on drawings, shall be included in this contract as though both shown and specified.

1.10 REMOVAL AND DISCONNECTION OF THE CITY'S EXISTING EQUIPMENT

.1 All mechanical equipment conflicting with new equipment being installed to be removed or disconnected by Contractor shall remain property of The City. Remove ducts and piping not required in revised systems and interfering with new installation which shall become property of Contractor.

1.11 ELECTRIC MOTORS, STARTERS AND WIRING

.1 Provide electric motors for all equipment supplied in this Division. Motors to operate at 29 r/S (1800 rpm), unless noted otherwise. Motor design shall comply with Canadian Electrical Code requirements. All electric motors supplied shall be capable of being serviced locally.

.2 All three phase motors shall have a service factor of 1.15 times nominal rated horsepower of the motor.

.3 Operating voltages: to CAN3-C235-83, motors, electric heating, control and distribution devices and equipment to operate satisfactorily at 60 Hz within normal operating limits established by above standard. Equipment to operate in extreme operating conditions established in above standard without damage to equipment.

.4 Motors controlled by variable frequency drives (VFDs) shall comply with requirements of CSA Specification C22.2 No. 100-95, Clause 12.4 and shall be permanently marked with the following in addition to the normal marking requirements:
.1 Machine Application (Inverter Duty);
.2 Speed range over which the machine is designed to operate;
.3 Type of torque application for which the machine is designed (e.g. VT (variable torque), CT (constant torque), Chp (constant horsepower) or equivalent;
.4 Type(s) of inverter(s) with which the machine is intended to be used [e.g.: VSI or VVI (6-step voltage source), CSI (6-step current source), VPWM (voltage-source pulse width modulated), LCI (load commutated), cyclonverter, or equivalent].

.5 Motors 0.75 kW (1 hp) and larger shall be high efficiency motors as defined in CSA C390 or IEEE 112B Nominal Standards. Minimum efficiency (%) shall be per the following table.

	Minimum efficiency (%)			
kW	3600 RPM	1800 RPM	1200 RPM	900 RPM
.75	79.0	82.4	81.1	74.4
1.11	81.0	82.8	83.8	76.8
1.50	81.7	83.8	84.4	83.8
2.24	84.6	86.1	86.4	83.6
3.73	86.4	86.9	87.2	85.4
5.60	87.4	88.4	88.2	86.2
7.46	88.4	89.4	88.6	88.6
11.19	89.3	90.1	89.0	88.0
14.92	89.7	90.9	89.8	89.8
18.65	90.0	91.1	90.9	89.6
22.38	90.6	91.5	91.1	90.3
29.84	91.0	92.0	91.6	90.1

List information on shop drawing submittals

.6 Determine from electrical drawings and specifications, voltage characteristics applying to each individual motor. Where motor voltages are mentioned in this specification, confirmation to be made by reference to electrical drawings and specifications ordering motors.

.7 Division 16 - Electrical to provide starters for all motors, except as otherwise noted. Division 16 - Electrical shall wire from starters to motors, and provide power wiring to packaged roof-top A/C units.

.8 Wiring required under Section 15900 to be performed by Section 15900 except as noted otherwise. Refer also to Section 15900 for further requirements.

1.12 HANGERS AND SUPPORTS

.1 General
.1 Piping, ductwork and equipment shall be securely supported from building structure. Perforated strap or wire hangers are not permitted.
.2 Support components shall conform to Manufacturers Standardization Society Specification SP-38.

.2 Installation - Horizontal
.1 Hangers shall adequately support piping system. Locate hangers near or at changes in piping direction and concentrated loads. Provide vertical adjustment to maintain pitch required for proper drainage. Allow for piping expansion and contraction. Piping weight and stresses shall be supported independently of any equipment.
.2 Maximum spacing between pipe supports:
.1 Steel Pipe:
.1 Up to 50mm (2") diam. - 2.4m (8 ft.)
.2 62mm (2-1/2") and larger - 3.6m (12 ft.)
.2 Copper Tubing (Hard):
.1 Up to 25mm (1") diam. - 1.8m (6 ft.)
.2 32mm and larger - 2.4m (8 ft.)

.3 Structural Attachments
.1 To Concrete:
.1 Place inserts in structural floors for support of piping and equipment prior to pouring of concrete. Inserts in concrete slabs shall be Grinnell Fig. 285 Light Weight Concrete Insert for loads up to 182 Kg (400#) or Grinnell Fig. 281 Wedge type concrete insert for loads up to 544 Kg (1200#).
.2 Support hangers in corrugated steel deck by 50mm (2") piece of 3mm (1/8") thick steel plate placed across top of steel deck, secured to hanger rod by washer and nut; prior to pouring of concrete topping.
.3 Where inserts must be placed in existing concrete use Hilti H.D.I. steel anchors as recommended by manufacturer, or if heavy weights must be supported, drill hole through slab and provide 50mm x 50mm (2" x 2") washer and nut above rough slab before floor finish is poured.
.2 To Steel Beams:
.1 Where pipe size is 50mm (2") or less, use Grinnell Fig. 87 Malleable Iron C-Clamp and Retaining Clip, or equal.
.2 Where pipe size is over 50mm (2"), use Grinnell Fig. 229 Malleable Beam Clamp or Fig. 228 Forged Steel Beam Clamp.
.3 To Wooden Ceilings and Beams:
.1 Use Grinnell Fig. 153 Pipe Hanger Flange or Fig. 156 or equal.
.4 Miscellaneous:
.1 Provide suitable attachments equal in quality to above where required.

1.13 FLASHING

.1 Where pipes or ducts go through a roof or wall, they should be boxed-in and flashed per Division 15. Allow for expansion and contraction of pipe. Flashing shall be waterproof.

1.14 ACCESS DOORS

.1 Division 15 - Mechanical Subcontractor and his sub-trades to provide access doors where valves, dampers and/or any other mechanical equipment requiring access are built-in.

.2 In general terms, mechanical sub-trade responsible for supplying the valve, dampers etc. shall provide the access door required to get to the valve, damper etc.

.3 Access door to be 2.5mm (12 ga.) steel, 300mm x 450mm (12" x 18"), finished prime coat only, with concealed hinges, anchor straps, plaster lock and without screws, all equal to Milcor manufacture. Where it is necessary for persons to enter through door, doors to be at least 450mm x 600mm (18" x 24").

.4 In applied tile or exposed glaze or unglazed structural tile, access doors shall take the tile and be sized and located to suit tile patterns. In plaster ceilings, doors shall take the plaster. In masonry walls access doors to be sized and located to suit masonary unit sizes. In lay-in acoustic tile ceilings, no access doors are required, but install an approved coloured marking device in the ceiling tile below all points requiring access.

.5 Access doors located in fire rated ceilings and walls shall be an approved ULC stamped, fire rated door.

1.15 IDENTIFICATION OF EQUIPMENT

.1 Provide manufacturer's nameplate on each piece of equipment.

.2 In addition Mechanical Contractor shall provide equipment I.D. tag minimum size 87mm x 32mm x 2.3mm (3-1/2" x 1-1/2" x 3/32") nominal thickness laminated phenolic plastic with black face and white centre. Engraved 6mm (1/4") high lettering. For motors and controls and for larger equipment such as chillers, tanks, 25mm (1") high lettering; for hot equipment such as boilers and convertors, provide engraved brass or bronze plates with black paint filled identification.

.3 Identify as follows: equipment type and number (e.g. pump no. 2), service or areas or zone building served (e.g. south zone chilled water primary).

.4 Provide manufacturers' registration plates (e.g. pressure vessel, Underwriters' Laboratories and CSA approval plates) as required by respective agency and as specified.

1.16 SCREWS, BOLTS AND FASTENERS

.1 Use standard commercial sizes and patterns with material and finish suitable for service.

.2 Use heavy hex heads, semi-finished unless otherwise specified. Use non-ferrous material throughout for plumbing services. Use type 304 stainless steel for exterior areas.

.3 Bolts used on fan equipment for access to motors, bearings, filters and the like shall be heavy-duty.

.4 Bolts shall not project more than one diameter beyond nuts.

.5 Washers
.1 Use plain-type washers on equipment, sheet metal and soft gaskets, lock-type washers where vibration occurs, and resilient washers with stainless steel.

1.17 OPENINGS IN FIRE SEPARATIONS

.1 Provide firestopping for all openings in fire separations for passage of pipes, ducts, etc. to maintain integrity of fire separations.

.2 Firestopping
.1 Firestopping to be Dow-Corning Fire Stop System.
.2 Material shall be Dow-Corning silicone elastomer Fire Stop penetration Seal and/or Dow-Corning liquid silicone elastomer Fire Stop Foam of density, width and depth to maintain assembly fire resistive rating.
.3 Components shall be ULC listed.

.3 Installation
.1 Prepare all surfaces so they are clean, dry, and frost free, as per manufacturer's published recommendations.
.2 Use Sealant around single pipes and/or ducts.
.3 Use Foam for multiple pipe installation.
.4 Follow manufacturer's published installation instructions precisely including field quality control after installation.
.5 Submit to Contract Administrator, suitable document signed by manufacturer's local representative, stating:
.1 Div. 15 sub-contractor received sufficient installation instruction from manufacturer's representative.
.6 Remove firestopping assembly for random inspection by Contract Administrator and replace at no extra cost to The City.
.7 Issue report to Contract Administrator stating that all mechanical openings have been fire stopped in accordance with

fire stop mfg. methods to maintain integrity of fire separation being penetrated.

1.18 SAFETY DEVICE TESTING

.1 Make complete inspection of all safety devices to ensure:
.1 That safety devices are complete and in accordance with specifications and manufacturer's recommendations.
.2 That the safety devices are connected and operating according to all local regulations.

.2 On completion of inspections, supply to Contract Administrator letters and/or certificates for their record, confirming that inspections have been completed.

1.19 RECORD DRAWINGS

.1 Provide one set of Record Drawings, marked clearly in red pencil, with all changes and deviations from piping and ductwork, etc. shown on Contract Drawings, including all Work Order Changes.

.2 Update Record drawings on a weekly basis to ensure they are accurate.

.3 Provide The City with one set of reproducible mylar sepias with all Record changes noted. Eradicate piping and/or ductwork, etc. shown on original drawing which has been affected by the changes. Invert elevations for all new underground services shall be clearly indicated.

.4 Provide one set of Record prints from Record sepias.

1.20 INSTRUCTIONS TO THE CITY'S PERSONNEL

.1 In addition to start-up supervision and instruction of The City's personnel required of individual equipment manufacturers and systems as noted, Contractor's construction supervisor to instruct The City's personnel in operation and maintenance of all equipment and systems to satisfaction of Contract Administrator.

.2 Provide The City with four copies of manuals incorporating following:
.1 Service instructions - including lists of spare and replacement parts and names and addresses of suppliers.
.2 Maintenance & Operating instructions.
.3 Revised shop drawings.

.3 Forward manuals and sepias to Contract Administrator. Final payment will not be made until all required manuals have been received.

.4 Review instructions with The City's representative to ensure The City's representative has a thorough understanding of equipment and its operation.

.5 Contractor shall submit to Contract Administrator, suitable document signed by The City's representative, stating:
.1 The City has received satisfactory instruction in operation and maintenance of all equipment and systems.
.2 Operation and maintenance manuals have been reviewed with. The City.
.3 Specified spare parts, keys, removable handles and the like, have been turned over to The City.

1.21 PAINTING

.1 Finish painting of mechanical equipment, piping and the like, to be performed by Div. 15.

.2 All colours shall be approved by Contract Administrator.

1.22 IDENTIFICATION OF DUCTWORK

.1 Use black 50mm (2") high stencilled letters (e.g. "Cold", "Hot", "Return", "Sanitary Exhaust", "Kitchen Exhaust") with arrow indicating air flow direction.

.2 Distance between markings 15m (50') maximum.

.3 Identify ducts on each side of dividing walls or partitions and beside each access door.

.4 Stencil only over final finish.

.5 Prior to installation, review general application of identification with Contract Administrator.

1.23 CUTTING AND PATCHING

.1 Cutting, patching and repairs to existing surfaces required as a result of the removal and/or relocation of existing equipment and piping, and/or installation of new equipment and piping in existing building(s) to be included by Div. 15 - Mechanical in tender price. Division 15 - Mechanical to employ and pay appropriate sub-trade whose work is involved, for carrying out work described above.

1.24 HOLES IN PRECAST CONCRETE

.1 Holes in precast concrete sections shall be field cut by Division 15 - Mechanical according to specifications.

1.25 SALVAGE

.1 All usable salvaged equipment and materials shall remain the property of The City unless specifically noted otherwise. Such material shall be neatly stored on site for removal by The City. Contractor shall remove all rejected salvage from the site and legally dispose of it.

END

1.1 GENERAL

.1 Following Appendix of Manufacturers lists manufacturers of equipment and materials acceptable to Contract Administrator, subject to individual clauses under the various sub-sections of Mechanical Work Specifications. See item 'Materials' under this section of specification.

.2 Submit shop drawings for all items marked with asterisk(*).

1.2 EQUIPMENT OR MATERIAL & APPROVED MANUFACTURERS

.1 ELECTRIC MOTORS

.1 C.G.E.; Westinghouse; Tamper; Reliance; Leland; Robbins & Myers; Lincoln; U.S. Electric; Century; Baldor; WEG; Toshiba

.2 AIR DISTRIBUTION

.1 Ducturns, damper hardware, fan connections*	Duro-Dyne
.2 Duct Sealer	Duro-Dyne; 3M; Flexa-Duct; United; Bakelite
.3 Filters*	A.A.F.; Farr; Cambridge; Continental; Airguard
.4 Roof-top package air-conditioners*	Trane; Carrier; Lennox; Keeprite; York; McQuay
.5 Diffusers, registers & grilles*	E.H. Price; Hart & Cooley; Titus; Carnes; Nailor
.6 Acoustic duct insulation*	Manville; Fibreglas; Ultralite; Knauf
.7 Flexible ductwork*	Thermoflex

.3 H.V.A.C. BALANCE AND TESTING

.1 H.V.A.C. Balance & Testing Agency	Airdronics Inc.; DFC; AHS; Air Movement

END

1.1 GENERAL

.1 All drawings and all sections of the specifications shall apply to and form an integral part of this section.

1.2 WORK INCLUDED

.1 Labour, materials, plant, tools, equipment and services necessary and reasonably incidental to completion of air conditioning and/or ventilation work.

1.3 RELATED WORK SPECIFIED ELSEWHERE

.1 Section 15010 Mechanical General Provisions

.2 Section 15900 Controls/Instrumentation

.3 Section 15990 Testing, Adjusting and Balancing

.4 Section 16010 Electrical General Provisions

PART 2 - PRODUCTS

2.1 DUCT OPENINGS

.1 Pack area between ducts and openings with fireproof self-supporting insulation. Seal with 25mm (1") mastic topping.

2.2 DUCT AND EQUIPMENT SUPPORTS, HANGERS AND INSERTS

.1 Support horizontal ducts on maximum 2.4m (8'0") centres by non perforated galv. steel, rivetted strap for ductwork 900mm (36") (either dimension) or less, and minimum 25mm x 25mm x 3mm (1" x 1" x 1/8") galv. angle iron passing under ducts 925mm (37") or over (either dimension) with 9.4mm (3/8") diam. threaded rods suspending angles from structure.

.2 Support vertical ducts at every floor with angle iron collars sized to provide proper bearing.

.3 Use universal concrete type inserts of black malleable iron, for threaded connection with lateral adjustment, top slot for reinforcing rods and lugs for attaching to forms.

.4 Where inserts must be placed in existing concrete use Hilti H.K.D. steel anchors as recommended by manufacturer, or if heavy weights must by supported, drill hole through slab and provide 50mm x 50mm (2" x 2") washer and nut above rough slab before floor finish is poured.

2.3 LOW PRESSURE DUCTWORK

.1 Low Pressure Rectangular Ductwork Schedule

Max. Side	Bracing
.1 Up to 600mm(24")	None
.1 Gauge: .60mm (24 USSG)	
.2 635mm to 750mm (25" to 30")	25mm(1")x 25mm(1") x 3.2mm(1/8") angle, 1.2mm(4'0") from joint.
.1 Gauge: .60mm (24 USSG)	
.3 785mm to 1000mm (31" to 40")	25mm(1")x 25mm(1") x 3.2mm(1/8") angle, 1.2mm (4'0") from joint.
.1 Gauge: .80mm (22 USSG)	
.4 1040mm to 1.5m (41" to 60")	37.5mm(1-1/2") x 37.5(1-1/2") x 3.2mm(1/8") angle, 1.2m(4'0") from joint.
.1 Gauge: .80mm (22 USSG)	
.5 1.525m X 2.25m (61" x 90")	37.5mm(1-1/2") x 37.5mm(1-1/2") x 3.2m(1/8") diagonal angles or 37.5m(1-1/2") x 37.5m(1-1/2") angles 600mm (2'0") from joint.
.1 Gauge: 1.0mm (20 USSG)	
.6 2.31m (91") and up	Similar to above.
.1 Gauge: 1.3mm(18 USSG)	

.2 Ductwork to be galvanized steel unless noted otherwise.

.3 Outdoor ductwork to be two gauges heavier than directed above.

.4 Turning vanes (Ducturns)
.1 Use duct elbows which have throat radius of 1-1/2" times the diameter.
.2 Where use of above specified item is precluded by space limitations, use duct elbows fabricated square throats and backs and fitted with Rovane turning vanes.
.3 Standard of Acceptance: S.E. Rozell & Sons Limited, Kitchener, Ontario.

.5 Provide E.H. Price AE-1 c/w #3 operator at all supply registers.

2.4 MANUAL VOLUME DAMPERS

.1 1.2mm (16 ga.) galv. steel stiffened, blades of louvre type. Maximum of 300mm (12") wide and 1.8m (72") long, with one centre

and two edge crimps. Damper hardware to be Duro-Dyne KS-145, KS-385 or KS-12 as recommended by manufacturer.

2.5 FILTERS

.1 General:
.1 Fan manufacturer to provide filter in filter sections provided with equipment.
.2 Filter supplier to provide all other filters.
.3 Provide one spare set of filter media for each filter bank.

.2 Unless noted otherwise, all fan systems to have AAF AMAIRR 300X extended surface pleated panel filters of 45mm (1-3/4") thick fiberglass pads coated with Intersept (antimicrobial). Media shall have 25-30% average atmospheric dust spot efficiency based on ASHRAE 52.1-1992 Test Method.

2.6 ROOF-TOP PACKAGE HEATING AND COOLING UNITS (2 to 5 tons)

.1 Provide Lennox GCS16 Series cooling only units.

.2 General
.1 Furnish and install packaged air to air DX mechanical cooling system complete with automatic controls. The single package unit shall be a standard product of a firm regularly engaged in the manufacture of cooling equipment. The manufacturer shall have parts and service available throughout Canada.
.2 The equipment shall be shipped completely factory assembled, precharged, piped and wired internally ready for field connections. In addition, manufacturer shall test operate system at the factory before shipment.

.3 Air Distribution
.1 Equipment shall be capable of bottom or side (horizontal) handling of conditioned air.

.4 Approvals
.1 All electrical components shall have U.L. and C.S.A. Listing. All wiring shall be in compliance with NEC and CEC.

.5 Equipment Warranty
.1 Compressors shall have a limited warranty for five years. All other components shall have a limited warranty for one year.

.6 Cooling System
.1 The total certified cooling capacity shall not be less then 60,000 Btuh with an evaporator air volume of 2,000 cfm.
.2 The coils shall be non-ferrous construction with aluminum enhanced fins mechanically bonded to copper rifled tubes. Coils shall be pressure leak tested. Sloped drain pan shall provide positive drainage of condensate.

.3 Compressor shall be resiliently mounted and have overload protection. All models shall have crankcase heater. The refrigeration system shall have suction and liquid line service gauge ports, high pressure switch, loss of charge switch, expansion valve, liquid line strainer, thermometer well, drier, freezestat and full refrigerant charge. Control option available shall consist of low ambient control factory or field installed and timed-off control. Shall be rated in accordance with ARI Standard 210/240-89.

.7 Cabinet

.1 Shall be galvanized steel with a powdered enamel paint finish electrostatically bonded to the metal. Cabinet panels where conditioned air is handled shall be fully insulated to prevent sweating and minimize sound. Openings shall be provided for power entry in bottom and side of unit. Evaporator coil condensate drain extended outside cabinet shall be provided. Lifting holes shall be provided for rigging.

.8 Service Access

.1 All components, wiring and inspection areas shall be completely accessible through removable panels.

.9 Supply Air Blower

.1 Centrifugal supply air blower shall be driven by a multi-speed direct drive motor with sleeve bearings and capable of delivering 2,000 cfm at an external static pressure of 0.50 inches water gauge requiring not more than 3/4bhp (W).

.10 Condenser Fan(s)

.1 Direct drive propeller type condenser fan(s) shall discharge vertically and be direct driven by 360 W motor. Fan motor shall have ball bearings and be permanently lubricated and inherently protected. Fan(s) shall have a safety guard.

.11 Roof Mounting Frame

.1 Where indicated furnish and install a steel roof mounting frame for bottom discharge and return air duct connection. It shall mate to the bottom perimeter of the equipment. When flashed into the roof it shall make a unit mounting curb and provide weatherproof duct connection and entry into the conditioned area. Flashing shall be the responsibility of a roofing contractor.

.12 Economizer Damper Section

.1 Furnish and install complete with re-circulated air dampers, outside air dampers, air filters, damper actuator and controls. Economizer shall have gravity exhaust. The economizer section shall provide for the introduction of 100% outdoor air for free coolin. Damper actuator shall be 24 Volt, fully modulating spring return. Controls shall include fixed 55 deg F (13 deg C) mixed air controller, damper actuator, adjustable outdoor air minimum position on switch and solid-state adjustable out-door air dry bulb control. Cabinet shall be galvanized steel with a powdered enamel paint finish electrostatically bonded to

the metal. Down-flow and horizontal economizer shall be available for factory or field installation.

.13 Horizontal Gravity Exhaust Dampers
.1 Pressure operated dampers shall be installed in return air duct for horizontal applications. Damper blades shall ride in nylon bearings and be gasketted for tight seal and quiet operation.

.14 Air Filters
.1 Refer to Clause "Filters".

.15 Horizontal Filter Kit
.1 Optional kit shall be available for horizontal return air applications and have disposable air filter.

.16 Refer to Air Handling Unit Schedules.

2.7 DIFFUSERS, REGISTERS AND GRILLES

.1 Steel diffusers to have baked enamel finish, unless noted otherwise herein. Aluminum grilles and registers to be of welded construction and to have etched finish with clear lacquer overcoat unless noted otherwise herein.

.2 Grilles and registers to be of one-piece construction with hidden mullions.

.3 Type A Sidewall Supply Double Deflection Register - E.H. Price 520D/F/S/A/B12 c/w integral steel damper. 1-1/4" type F flat border style with front blades @ 3/4" O.C. parallel to short dimension. Type A counter sunk screwholes with oval-head screw fastening. Steel construction. B12 white standard finish.

.4 Type B Sidewall Return/Relief Grille - E.H. Price 530/F/L/A/B12. Steel construction. Fixed louvres @ 45 deg. deflection. Type F 1-1/4" flat border style. Type A counter sunk screwholes with oval-head screw fastening. B12 white finish.

2.8 ACOUSTIC DUCT INSULATION

.1 J-M Linacoustic flexible duct insulation with flame-attenuated glass fibers bonded with thermosetting resin. Black plastic-coated mat finish. Provide where noted on drawings and/or as specified herein.

.2 Insulation to be fungi and bacteria resistant so as not to breed or promote growth. (ASTM G21, ASTM G22).

.3 Round Low Pressure Ducts
.1 Where indicated on drawings use 25mm (1") J-M Linacoustic.

.4 Rectangular Low Pressure Ducts
.1 25mm (1") Thickness
.1 Ducts indicated as being acoustically lined on the drawings, unless noted otherwise.
.2 50mm (2") Thickness
.1 Ductwork indicated as being acoustic lined with 50mm (2") acoustic lining on drawings and specification details.
.2 Outside air intake ductwork from inlet to point 900mm (3'-0") downstream of mixing box. Remainder shown to be 25mm (1") acoustic lining.
.1 Location: Fan Systems AHU-1
.3 All ductwork, noted as having acoustic that is outside building structure.

PART 3 - EXECUTION

3.1 DUCT AND EQUIPMENT SUPPORTS, HANGERS AND INSERTS

.1 Design, Installation
.1 Supports to secure ducts and equipment, prevent vibration and provide for expansion and contraction. Design supports of strength and rigidity in a manner which will not stress the building construction. Use inserts for suspending hangers. Do not use vertical expansion shields without Contract Administrator's approval.

.2 Concrete Inserts
.1 Do not weaken concrete or penetrate waterproofing membrane. Use reinforcing rods through inserts for pipe sizes over 50mm (2"), or equivalent weight. Where concrete slab is finished ceiling, inserts to be flush with surface.

.3 Protect insulation at contact with hangers and support with approved metal shields.

3.2 CO-ORDINATION WITH H.V.A.C. BALANCE AND TESTING AGENCY

.1 Refer to Section 15990 H.V.A.C. Balance and Testing. Co-ordinate work with Section 15990.

.2 As a part of this contract, Section 15800 shall make any changes in pulleys and belts, and add manual dampers for correct balance as recommended by 15990, at no additional cost to The City.

.3 Section 15800 responsible for initial alignment and tension of all fan pulleys and belts, of equipment supplied by Section 15800.

3.3 LOW PRESSURE DUCTWORK

.1 Where duct width exceeds 450mm (18") in largest dimension, stiffen by cross breaking sheets diagonally. Beaded ducts as per SMACNA Catalogue Fig. 1.13 acceptable alternative.

.2 Duct sizes are inside dimensions. If ducts are acoustically lined, outside duct size to be increased as required.

.3 Provide ducturns in all elbows of ducts 1200mm (48") wide and greater, in segments of 600mm (24") maximum.

.4 Single thickness partitions between ducts not accepted.

.5

.1 All ductwork shall have seams and joints sealed watertight with Duro-Dyne S-2 duct sealer and FT-2 fibreglass duct tape. Prior to installation ductwork to be clean, dry and free of grease. Apply duct sealer with stiff brush or trowel. Wrap wet seam or joint with duct tape and apply further coat of duct sealer. Duct sealer and glassfiber to extend 25mm (1") on each side of joint or seam. On outside ductwork construct duct so that top of duct slopes 12mm (1/2") per 300mm (12") minimum to ensure that water does not collect on top.

.2 Ductwork exposed in finished rooms do not require duct tape application, but seams and joints shall be sealed with S-2 duct sealer. Sealer must be capable of accepting finish painting.

.3 Ductwork on roof shall have seams and joints sealed by application of TREMCO MONO black acrylic sealant applied with application gun and levelled with putty knife. Material shall be used in accordance with manufacturer's printed recommendations.

.6 Provide openings for thermostats and controllers by Section 15900.

.7 Where ductwork conflicts with mechanical and electrical piping and it is not possible to divert ductwork or piping to stay within allowable space limitations, provide duct easements. Easements not required on pipes 100mm (4") and smaller outside dimension, unless this exceeds 20% duct area. Irregular or flat shaped piping requires duct easement. Hangers and stays in ductwork to be parallel to air flow. If easement exceeds 20% of duct area, duct to be split into two ducts with original duct area being maintained. Easements to be approved by Contract Administrator before installation.

.8 If ductwork is not adequately braced and/or supported to provide good installation, additional bracing and/or supports to be provided at no extra cost to The City. Contract Administrator to interpret.

.9 Assemble round duct sections using beaded couplings attached with sheet metal screws.

3.4 FILTERS

.1 During construction period, no air system to be started unless air filters function as specified. At time of building acceptance by Contract Administrator, all filter banks to be in perfectly clean operating condition. There shall be no air bypass around or in filter banks.

.2 Install all filters as per mfg. published installation data.

3.5 ROOF-TOP PACKAGE AIR - CONDITIONERS

.1 Installation in strict accordance with manufacturer's published recommendations.

.2 Take into consideration that other manufacturers have different physical configuration. Co-ordinate with Contractor and payment for any necessary roof and duct alterations due to application of all manufacturers equipment. Revised duct layout shall be submitted to and approved by Contract Administrator prior to installation.

.3 Provide wiring diagrams and field wiring supervision. All wiring shall be supplied and installed by Division 16, except for connections to existing thermostat.

.4 Manufacturer to include for checking out units after they are functioning to ensure that all dampers, fans, controls, etc. are functioning properly. Submit report to Contract Administrator. There shall be one check-up for winter operation and a separate check-up for summer cycle.

.5 Provide one year maintenance contract for this equipment. All work shall be performed by qualified servicemen acceptable to the equipment manufacturer. During first year of operation perform maintenance program on equipment consisting of three calls and equipment maintenance, one during winter months, one during summer months, and one during interim weather conditions. Perform any and all emergency service required during the first year of unit operation.

3.6 DIFFUSERS, REGISTERS AND GRILLES

.1 Provide sponge gasket behind each outlet or inlet and adequate fastenings to prevent streaking between outlet and duct, wall or ceiling.

.2 Shop drawings to be accompanied by itemized list indicating unit locations by room number and unit size. Itemized list noted above shall be certified by direct representative.

.3 Submit typical unit c/w all accessories, specified finishes, for all diffusers, grilles and registers, if requested by Contract Administrator. Materials installed on job to be fully equal to samples submitted for approval.

.4 Should there be any confliction in location of grilles, registers and diffusers with lights, etc. matter to be referred to Contract Administrator for directive. If requested by Contract Administrator, re-locate grilles, diffusers and registers and ductwork attached, within 1.2m (48") of locations noted on drawings, without extra cost to the City. Refer to drawings for additional requirements.

.5 Section 15800 to paint, with flat black finish, ductwork exposed to view through inlet or outlet grilles, registers and louvres.

3.7 ACOUSTIC DUCT INSULATION

.1 Duct sizes are free area inside duct dimensions. Where lining is required, actual duct dimensions to be increased to allow for thickness of internal insulation.

.2 Round Low Pressure Ducts
.1 Insulation adhered with No. 3M-29 or BF81.71. Breaks and joints to be painted out with BF-60-30N fire retardent mastic. Exposed edges to be coated with adhesive.

.3 Rectangular Low Pressure Ducts
.1 Impale on welded studs spaced 400mm (16") o.c. Paint breaks and joints with BF-60-30N fire retardent mastic. Coat exposed edges with adhesive. Projecting fasteners and ends cut off vertically flush.

3.8 TESTING OF DUCTWORK

.1 Visually and audibly check for air leaks that can be heard or felt under normal operating conditions. Repair all leaks in ductwork.

END

PART 1 - GENERAL

1.1 GENERAL

.1 All drawings and all sections of the specifications shall apply to and form an integral part of this section.

1.2 WORK INCLUDED

.1 Labour, material, plant, tools, equipment and services necessary and reasonably incidental to completion of temp. control/ instrumentation systems as noted herein and/or on the drawings.

1.3 RELATED WORK SPECIFIED ELSEWHERE

.1 Section 15010 Mechanical General Provisions

.2 Section 15800 Air Distribution

.3 Section 15990 Testing, Adjusting and Balancing

.4 Section 16010 Electrical

1.4 WORK BY OTHER SECTIONS

.1 Division 16 - Electrical to supply and install all conduit, wire and connections from the distribution panels to line side of magnetic starters and thermal overload switches, and from load side of starters and switches to motors.

1.5 ELECTRICAL WIRING PERFORMED BY SECTION 15900

.1 Supply and installation of all conduit, wire, electric relays, connections and other devices required for control circuit wiring for systems as specified in Section 15900, whether line or low voltage, shall be responsibility of Section 15900, except as noted above.

.2 Section 15900 shall either use own electricians, retain and pay for services of successful Division 16, or use an electrical sub-trade acceptable to Contract Administrator to supply and install all conduit and wiring for systems as specified in this Section.

.3 Electrical wiring shall be installed in conformance with CSA, ULC, Manitoba Building Code, National Building Code of Canada 1990 and standards set in Division 16 of this specification.

.4 Ensure that adequate conduit is installed during initial phases of construction, to accommodate total systems requirements.

.5 Section 15900 shall provide all other conduit and wiring required for Section 15900 systems operation, including tie-ins from Section 15900 supplied relays to motor starting circuits.

.6 Refer to Section 16150 for conduit and cable identification requirements.

1.6 CONTROLS FOR NEW RTU-1/2

.1 Connect to existing thermostats to energize the roof-top units on demand for cooling.

END

1.1 GENERAL

.1 All drawings and all sections of the specifications shall apply to and form an integral part of this section.

.2 Testing, Adjusting and Balancing (TAB) Agency shall be an experienced, independent Contractor specializing in the testing, adjusting and balancing of HVAC systems.

.3 TAB Agency shall be a member of the Associated Air Balance Council (AABC) and work shall carry standard AABC Certificate of Guarantee.

.4 Include extended service for 90 days after completion of final balancing work, during which time Contract Administrator at his discretion may request re-check or re-setting of any systems and/or equipment listed in test report

1.2 SCOPE OF WORK

.1 Provide complete testing, adjustment and final balancing of RTU-1/2 air systems.

1.3 RELATED WORK SPECIFIED ELSEWHERE

.1 Section 15010 Mechanical General Provisions

.2 Section 15800 Air Distribution

.3 Section 15900 Controls/Instrumentation

PART 2 - PRODUCTS

2.1 BALANCING REPORTS

.1 Provide two copies of detailed draft balancing report to Contract Administrator for review after completion of all adjustments.

.2 Final balancing report shall incorporate all changes resulting from Contract Administrator's comments and any adjustments undertaken since the draft report was issued.

.3 Provide four copies of final balancing report.

PART 3 - EXECUTION

3.1 GENERAL

.1 All instruments used shall be accurately calibrated and maintained in good working order. If requested, tests shall be conducted in the presence of Contract Administrator.

.2 Schedule all work to comply with completion date.

.3 Work shall not begin until system has been completed and in full working order. Division 15 shall put all heating, ventilating, and air-conditioning systems and equipment into full operation, as season would demand, and shall continue operation of same during each working day of testing, adjusting and balancing.

3.2 AIR BALANCING

.1 Coordinate with Section 15800 to ensure installation of all manual adjusting dampers are as indicated, as specified and as required to allow proper adjustment of air systems.

.2 Section and 15800 to provide initial alignment and tension of all fan pulleys and belts supplied by them.

.3 Testing Procedure:
.1 Test, adjust and record all fan speeds, motor amperes.
.2 Make pitot tube traverse to main supply and obtain cfm at fan.
.3 Test and record static pressure for each system at fan suction and discharge.
.4 Adjust all supply and return air ducts to proper design cfm.
.5 Test and adjust each diffuser, grille, and register to within 5% of design requirements. Balance as per manufacturer's recommendations.
.6 All outlets shall be adjusted to provide proper throw and distribution, in accordance with architectural requirements.
.7 Fan operating conditions tested shall confirm air delivery within 5% of manufacturer's fan curves.
.8 Systems shall be balanced so that fans operate at lowest possible static pressure.
.9 Prepare single line diagrams of duct systems indicating terminal outlets identified by number. List on data sheets all such outlets denoted by the same numbers, including the outlet sizes, 'K' factor, location, cubic feet per minute and jet velocity. Provide this data for all supply, return and exhaust air systems.

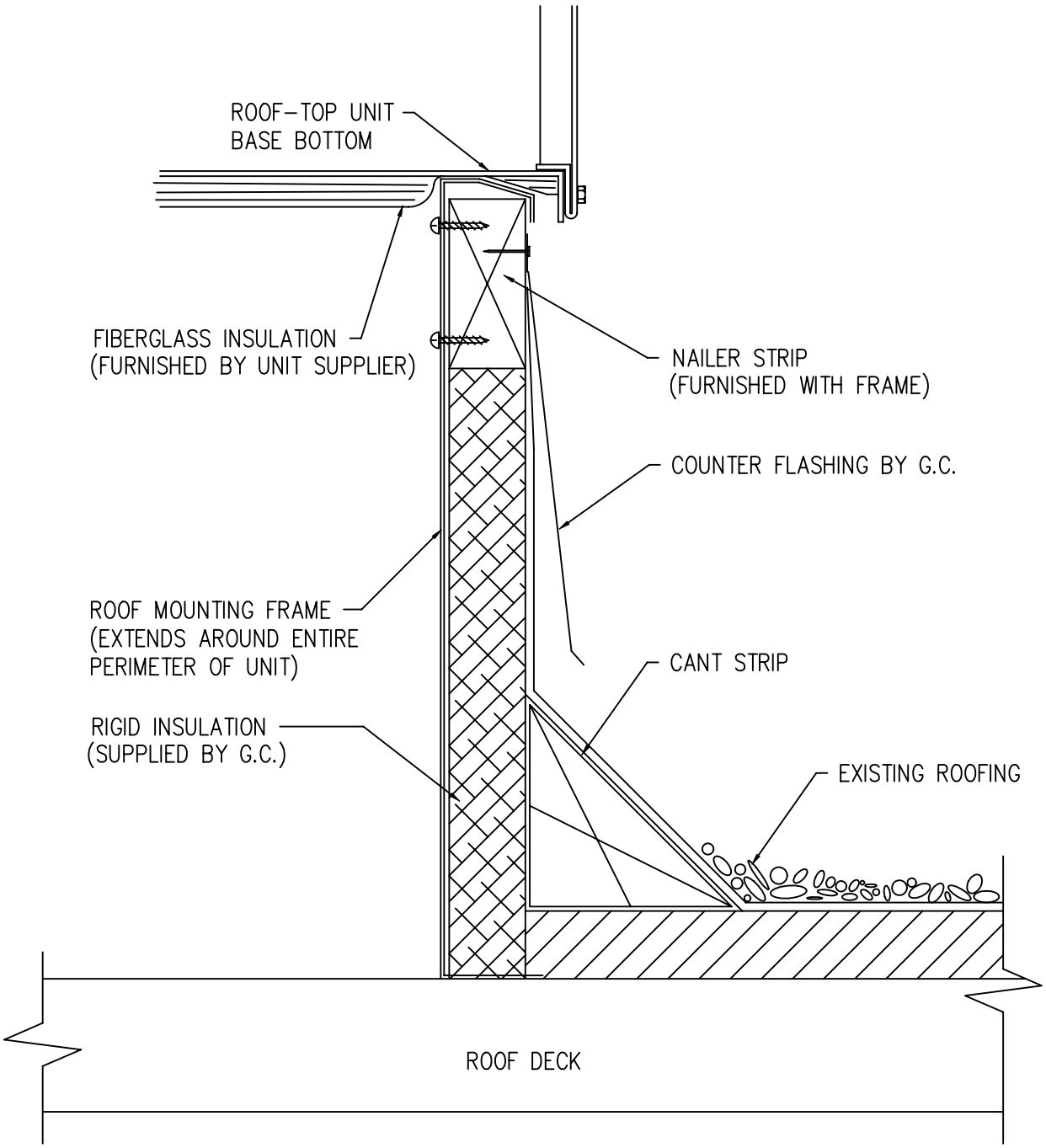
.4 As part of work of this contract, Section and 15800 shall make any changes in the pulleys and belts, and any additional manual dampers for correct balance as recommended by Section 15990, at

no additional cost to The City. Section 15990 shall provide final alignment and tension adjustment of fan pulleys and belts.

3.3 SYSTEM CHECK

.1 Provide spot checks of systems if called upon by Contract Administrator. If capacities, fan speeds, ratings, etc. do not agree with submitted balance report, rebalance system or systems in question, until satisfactory results are received.

END



ROOF MOUNTING FRAME DETAIL

NTS

SMS ENGINEERING

SMS Engineering Ltd. Consulting Engineers
770 Bradford Street Winnipeg MB Canada R3H 0N3
Telephone 204.775.0291 Fax 204.772.2153
sms@smseng.com

SPECIFICATION DETAIL
THE CITY OF WINNIPEG
TENDER 11-2003

ROOF MOUNTING FRAME DETAIL

Drawn By	Approved By	Reference
SMS	SMS	8600
File No.	Date	Detail Sheet
01-188-03	AUG/02	MD-1

1 General

.1 This Section covers items common to Sections of Division 16.

.2 All drawings and all sections of the specifications shall apply to and form an integral part of this section.

2 Time/Date Sensitive Electronic Equipment and Software

.1 All time/date sensitive electronic equipment and software provided on this project shall be year 2000 compatible and shall be based on the use of full, unabbreviated, unambiguous discrete time and date codes.

3 Codes and Standards

.1 Do complete installation in accordance with CSA C22.1 except where specified otherwise.

.2 Abbreviations for electrical terms: to CSA Z85.

.3 The electrical installation shall comply with the requirements of the Electrical Supply Authority, the latest edition of the Canadian Electrical Code, with all Provincial and Municipal Laws, Rules and Ordinances, and to the satisfaction of those persons having jurisdiction over same.

.4 In no instance shall the standard established by these specifications and drawings be reduced by any of the codes, rules or ordinances.

4 Voltage Ratings

.1 Operating voltages: to CAN3-C235.

.2 Motors, electric heating, control and distribution devices and equipment to operate satisfactorily at 60 Hz within normal operating limits established by above standard. Equipment to operate in extreme operating conditions established in above standard without damage to equipment.

5 Permits, Fees and Inspection

.1 Submit to Electrical Inspection Department and Supply Authority necessary number of drawings and specifications for examination and approval prior to commencement of work.

.2 Pay all associated fees for inspection of the work by authorities having jurisdiction.

.3 Notify Contract Administrator of changes required by Electrical Inspection Department prior to making changes.

.4 Furnish Certificates of Acceptance from authorities having jurisdiction on completion of work to Contract Administrator. Copies to be included in Maintenance Manuals.

6 Materials and Equipment

.1 Provide materials and equipment in accordance with Div. 1.

.2 Equipment and material to be CSA certified or certified by an equivalent recognized certifying agency to meet Canadian Standards. Where there is no alternative to supplying equipment which is certified, obtain special approval from local Electrical Inspection Department or authority having jurisdiction.

.3 Factory assemble control panels and component assemblies.

.4 Submit for Contract Administrator's approval, a duplicate list of makes and types of all equipment and materials for this project, prior to placing of orders for same. This shall be done within fourteen (14) days of the award of the contract to the Contractor in order to avoid delays in delivery and completion.

.5 Any material or equipment ordered or installed without the Contract Administrator's prior approval shall, if so directed by the Contract Administrator, be removed and replaced with approved material or equipment without a change in the contract price.

7 Responsibility

.1 Be responsible for any damage caused The City, or their Contractors due to improperly carrying out this work. Make good any damage.

.2 Install all components of this work promptly and where applicable, in advance of concrete pouring, or similar construction. Provide and set in the proper sequence of construction, all sleeves, hangers, inserts, etc. and arrange for all necessary openings, where required to accommodate the electrical installation.

.3 Work shall be arranged in co-operation with other divisions of this specification in such a manner that it doesn't interfere with the progress of the project. In areas where ducts or pipes must be installed along with conduit or cable, co-operate with other divisions so that the finished job will represent the most efficient use of the space.

.4 In no case proceed with any work in uncertainty. Obtain, from the Contract Administrator, any clarification necessary and thoroughly understand all portions of the work to be performed.

8 Electric Motors, Equipment and Controls

.1 Supplier and installer responsibility is indicated in Motor Schedule on electrical drawings, or in this specification and related mechanical responsibility is indicated in Mechanical Equipment Schedule on mechanical drawings.

.2 Control wiring and conduit is specified in Division 16 except for conduit, wiring and connections below 50V which are related to temperature control systems specified in Division 15 and/or shown on mechanical drawings.

9 Finishes

.1 Shop finish metal enclosure surfaces by application of rust resistant primer inside and outside, and at least two coats of finish enamel.
.1 Paint outdoor electrical equipment "equipment green" finish to EEMAC Y1-1-1955.
.2 Paint indoor switchgear and distribution enclosures light grey to EEMAC 2Y-1-1958.

.2 Clean and touch up surfaces of shop-painted equipment scratched or marred during shipment or installation, to match original paint.

.3 Clean and prime exposed non-galvanized hangers, racks, and fastenings to prevent rusting.

10 Workmanship and Materials

.1 The installation shall consist of material and equipment specified unless as provided herein. Electrical equipment provided under this contract shall be built in accordance with EEMAC standards and shall be C.S.A. certified (or certified by an equivalent recognized certifying agency to meet Canadian Standards) and/or locally approved. All equipment supplied under this contract shall be new and the best of its respective kind and of uniform pattern throughout.

.2 Any material or equipment ordered or installed without the Contract Administrator's prior approval shall, if so directed by the Contract Administrator, be removed and replaced with approved material or equipment without a change to the contract.

.3 Replace inferior work if so ordered by Contract Administrator without a change to the contract.

.4 Retain same foreman or superintendent on the job until completed, unless otherwise directed by the Contract Administrator.

.5 All tradesmen shall carry all tools on their person at all times. Any tool not in use shall be under lock and key in an area authorized by the building supervisor.

11 Cleanliness and Cleaning

.1 This division shall maintain a clean tidy job site. All boxes, crates, and construction debris due to this portion of the work shall be neatly piled outside the construction area and shall be removed at least weekly during the construction period. All construction areas shall be kept clear of debris.

.2 Before the work will be accepted by The City, all lighting fixtures, lamps, lens, panelboards, switches, receptacles, cover plates, and other electrical equipment shall be clean and free of dust, plaster, paint, etc. Any equipment which is scratched or damaged shall be refinished or replaced if so designated by the Contract Administrator.

12 Modifications

.1 Locations of all light fixtures, convenience receptacles, outlets, switches, telephone or similar outlets, fire alarm stations, bells, etc. are subject to modification by the Contract Administrator, who reserves the right to move these up to 3000 mm from the position shown, without change to the contract price, provided notice is given before the related work has commenced.

13 Identification of Equipment

.1 Identify electrical equipment with nameplates and labels as follows and as indicated in other specification sections.

.2 Nameplates:

.1 Lamacoid 3mm thick plastic engraving sheet, shall be white with black letters or as directed, mechanically attached with self tapping screws. Nameplates for equipment fed from emergency power or from emergency UPS power (increase nameplate size as required to suit wording) shall be white with red letters.

NAMEPLATE SIZES

Size 1	10 x 50mm	1 line	3mm high letters
Size 2	12 x 70mm	1 lines	5mm high letters
Size 3	12 x 70mm	2 lines	3mm high letters
Size 4	20 x 90mm	1 line	8mm high letters
Size 5	20 x 90mm	2 lines	5mm high letters
Size 6	25 x 100mm	1 line	12mm high letters

Size 7	25 x 100mm	2 lines	6mm high letters

.3 Labels:
.1 Embossed plastic labels with 6mm high letters unless specified otherwise.

.4 Fabrication details of all nameplates labels and wording on nameplates and labels to be approved by Contract Administrator prior to manufacture.

.5 Allow an average of twenty-five (25) letters per nameplate and label.

.6 Room names and numbers used shall be actual room names and numbers that will be used on the project. Division 16 to co-ordinate and confirm with trades involved.

.7 Identification to be English.

.8 Co-ordinate names of equipment and systems with Division 15 to ensure that identical names are used.

.9 Nameplates for terminal cabinets and junction boxes to indicate system and/or voltage characteristics.

.10 Nameplates for disconnects, starters and contactors: Indicate equipment being controlled and voltage.

.11 Nameplates for terminal cabinets and pull boxes: Indicate system and voltage.

.12 Nameplates for transformers: Indicate capacity, primary and secondary voltages.

.13 Nameplates for control devices: indicate equipment controlled.

.14 Adjacent to each breaker in CDP type panelboards, provide and mount lamacoid nameplates identifying the respective load and location.

.15 To match existing where applicable.

.16 All convenience receptacles shall have a lamacoid size 1 plate on which the panel and circuit number from which it is fed, is indicated. The identification shall be mechanically secured to the coverplate on the appropriate outlet. Pressure indented adhesive strip nameplates are not acceptable and shall not be used.

14 Wiring Identification

.1 Identify wiring with permanent indelible identifying markings on both ends of phase conductors of feeders (coloured plastic tapes) and branch circuit wiring (numbered wire markers). Conductor marker identification shall correspond with panel or terminal board directory information.

.2 Maintain phase sequence and colour coding throughout.

.3 Colour Code: To CSA C22.1.

.4 Use colour coded wires in communication cables, matched throughout system. Colour coding used shall be documented by individual systems in Maintenance Manuals.

.5 Insulated grounding conductors shall have a green finish and shall be used only as a grounding conductor.

15 Conduit, Outlet Boxes and Cable Identification

.1 Colour code conduits, boxes and metallic sheathed cable.

.2 Code with plastic tape or paint at points where conduit or cable enters wall, ceiling, or floor, and at 15m intervals.

.3 Colours: 25mm wide prime colour and 20mm wide auxiliary colour.

	Prime	Auxiliary
Up to 250V (normal power)	yellow	
Up to 600V (normal power)	yellow	green
Up to 250V (emergency power)	yellow & red	
Up to 600V (emergency power)	yellow & red	green
Telephone	green	
Other communication systems	green	blue
Fire alarm	red	
Emergency voice	red	blue
Other security systems	red	yellow
Control	blue	

.4 Other conduit systems as directed on site; all conduit systems shall be identified.

.5 Color outlet box covers to color designated and show circuit numbers in black felt marker on inside of covers.

16 Wiring Terminations

.1 Lugs, terminals, screws used for termination of wiring to be suitable for either copper or aluminum conductors.

17 Manufacturers and CSA Certification Labels (or equivalent)

.1 Visible and legible after equipment is installed.

18 Warning Signs

.1 As specified and to meet requirements of Electrical Inspection Department and Contract Administrator.

.2 Decal signs, minimum size 175 x 250mm.

19 Location of Outlets

.1 Do not install outlets back-to-back in wall; allow minimum 150mm horizontal clearance between boxes.

.2 Change location of outlets at no extra cost or credit, providing distance does not exceed 3000mm, and information is given before installation.

.3 Locate light switches on latch side of doors. Locate disconnect devices in mechanical and elevator machine rooms on latch side of door.

20 Conduit and Cable Installation

.1 Install conduit and sleeves prior to pouring of concrete. Sleeves through concrete: Schedule 40 steel pipe, sized for free passage of conduit, and protruding 50mm each side.

.2 If plastic sleeves are used in fire rated walls or floors, remove before conduit installation.

.3 Install cables, conduit and fittings to be embedded or plastered over, neatly and close to building structure so furring can be kept to minimum.

.4 Arrange for holes through exterior wall and roof to be flashed and made weatherproof.

21 Field Quality Control

.1 Conduct and pay for following tests:
.1 Power distribution system including phasing, voltage, grounding and load balancing.
.2 Circuits originating from branch distribution panels.
.3 Lighting and its control.
.4 Motors, heaters, and associated control equipment including sequenced operation of systems where applicable.

.5 Systems: Fire alarm system, security system, communication systems.
.6 Any other electrical systems.

.2 Furnish manufacturer's certificate or letter confirming that entire installation as it pertains to each system has been installed to manufacturer's instructions.

.3 All circuits shall be tested to ensure that the circuit numbers are correct and that the proper neutral conductors have been provided and installed.

.4 Insulation resistance testing:
.1 Megger circuits, feeders and equipment up to 350V with a 500V instrument.
.2 Megger 350V - 600V circuits, feeders and equipment with a 1000V instrument.
.3 Check resistance to ground before energizing.

.5 Advise Contract Administrator of dates and times for all testing with sufficient advance notice to allow Contract Administrator to make arrangements to attend.

.6 Provide instruments, meters, equipment and personnel required to conduct tests during and at conclusion of project.

.7 Submit test results for Contract Administrator's review.

.8 Insert test results and supplier's certifications in Maintenance Manuals.

22 Drawings

.1 Carefully examine all drawings and specifications relating to all work, and all electrical work indicated thereon shall be considered as a part of the work by this section unless indicated otherwise. Prior to the date of the last addendum report at once to the Contract Administrator, any defect, discrepancy, omission or interference affecting the work of this section, or the warranty of same.

.2 Install all equipment as shown or as specified and in accordance with manufacturer's approved shop drawings.

.3 The drawings accompanying these specifications are intended to show the general arrangement and extent of the work to be carried out, but the exact location and arrangement of all parts shall be determined as the work progresses. The location of equipment, outlets, etc., as given on the drawings are approximately correct, but it shall be understood that they are subject to such modifications as may be found necessary or desirable at the time of installation to meet any structural or architectural

requirements. Such changes shall be implemented as directed by the Contract Administrator, without additional charge.

.4 Electrical drawings do not show all structural and other details. Architectural and structural conditions shall govern, and this Section shall make without charge, changes or additions to accommodate these conditions. Check all architectural plans, elevations and details for location of electrical devices, equipment and equipment to be connected.

.5 Where drawings indicate the general location and route to be followed by conduit, cable, etc., these locations must be governed by job conditions. Where the required conduit, cable, an boxes are not shown on drawings or only shown diagrammatically, they shall be installed to conserve maximum head room and interfere as little as possible with free use of space through which they pass. Maximum clearance above floor shall be maintained under all suspended conduit and equipment, unless otherwise shown on the drawings, or approved by the Contract Administrator.

.6 Submit a complete set of drawings for the proposed installation to the Inspection Department having jurisdiction and receive written approval before installation or fabrication of any equipment. No extra compensation will be allowed for any changes or rearrangement of any electrical apparatus or materials necessary due to failure to receive this approval.

.7 Provide the Electric Utility with three copies of a drawing showing the main distribution and the proposed method of metering for approval prior to the manufacture of equipment.

23 Shop Drawings, Product Data and Samples

.1 Submit shop drawings, produce detailed data and samples in accordance with previous sections, as specified herein, and to Contract Administrator's satisfaction.

.2 Indicate details of construction, dimensions, capacities, weights and electrical performance characteristics of equipment or material.

.3 Where applicable, include actual wiring, single line and schematic diagrams. Include all technical data and full details of each component.

.4 Include wiring drawings or diagrams showing interconnection with work of other sections.

.5 Shop drawings of all equipment must be submitted to the Contract Administrator for review in sufficient time to enable him to retain them for at least ten (10) working days.

.6 One print and one reproducible sepia of each shop drawing shall be submitted.

.7 Cross out or eradicate all non-related items.

.8 Bind each system separately eg. P.A., CCTV, Nurse Call, Intercom, Fire Alarm, etc. One common binder from one supplier will not be acceptable.

.9 Shop drawing submission shall include a photocopy of all applicable specification sections showing a complete compliance/ non-compliance listing. Refer to spec. detail sheet "Shop Drawing Compliance List Sample" for example.

.10 Division 16 shall check all shop drawings and make necessary changes, or cause the supplier to make necessary changes, prior to submission to the Contract Administrator. Shop drawings will be reviewed by the Contract Administrator and if re-submission is required, Division 16 shall ensure that the supplier's drawings have been changed to comply before returning them to the Contract Administrator for review again.

.11 Review of the shop drawings by the Contract Administrator shall not relieve the Contractor from responsibility for errors and omissions therein.

.12 Each drawing submission to bear the following signed stamp, and shall include name of project, equipment supplier, and clause number equipment is specified under.

CONTRACTORS CERTIFICATION
This drawing has been reviewed by
(firm name) .
All dimensions have been checked and found compatible with the contract drawings and all capacities, quantities, sizes, and other data contained in the contract documents have been listed by the supplier on this drawing and have been checked by the undersigned and found correct.

Date Per:

.13 Clearly show division of responsibility. No item, equipment or description of work shall be indicated to be supplied or work to be done "By Others" or "By Purchaser". Any item, equipment or description of work shown on shop drawings shall form part of contract, unless specifically noted to the contrary.

.14 Provide field dimensions required by electrical suppliers and sub-subcontractors. In cases where fabrication is required prior to field dimensions being available, check all related drawings and obtain clarification from Contract Administrator if necessary.

.15 Incomplete submissions will be returned for updating and re-submittal without Contract Administrator's review.

24 Mounting Heights

.1 Mounting height of equipment is from finished floor to centre line of equipment unless specified or indicated otherwise.

.2 If mounting height of equipment is not specified or indicated, verify before proceeding with installation.

.3 Install electrical equipment at following heights unless indicated otherwise.
.1 Local switches: 1220mm.
.2 Wall receptacles:
.1 General: 400mm.
.2 Above top of continuous baseboard heater: 200mm.
.3 Above top of counters or counter splashback: 175mm.
.4 In mechanical rooms: 915mm.
.3 Panelboards, annunciators etc.: 2000mm to top.
.4 Voice/data and interphone outlets: 400mm.
.5 Wall mounted telephone and interphone outlets: 1500mm.
.6 Fire alarm stations: 1370mm.
.7 Fire alarm bells: 2290mm.
.8 End-of-line resistors: 1830mm.
.9 Television outlets: 400mm.
.10 Wall mounted speakers: 2100mm
.11 Clocks: 2100mm.
.12 Door bell pushbuttons: 1500mm.
.13 Nurse call and receptacles at bed locations: 1525mm.
.14 Heights as above or at bottom of nearest block or brick course.
.15 Heights to match existing where applicable.

25 Operation and Maintenance Data

.1 Provide operation and maintenance data for incorporation into operation and maintenance manuals specified.

.2 Include in operations and maintenance data:
.1 Details of design elements, construction features, component function and maintenance requirements, to permit effective start-up, operation, maintenance, repair, modification, extension, and expansion of any portion or feature of the electrical installation.
.2 Technical data, product data, supplemented by bulletins, component illustrations, exploded views, technical descriptions of items, and parts lists. Advertising or sales literature alone is not acceptable.
.3 Wiring and schematic diagrams and performance curves.
.4 Names and addresses of local suppliers.
.5 Copy of reviewed shop drawings.

.3 Provide five (5) complete, hard-backed, D-ring loose leaf Maintenance Manuals. These shall consist of typewritten or printed instructions for operating and maintaining all systems and equipment provided under this section of the specification. Manuals shall also contain shop drawings, wiring diagrams, test results and manufacturer's brochures on all equipment, together with typed index tab sheets.

.4 As work progresses, record on one (1) set of white print drawings, installed conduit layout as well as any approved changes and deviations from the original contract and/or working drawings, including outlets, equipment and panel locations. At completion of work, submit to the Contract Administrator, at the contractor's costs, reproducible white print Record Drawings. The contract shall not be considered complete and no final payment shall be made until these drawings are accepted by the Contract Administrator. (Provide separate white print drawings for each system in order not to "crowd" drawings.)

.5 Record Drawings are to be reproducible white prints

26 Temporary Lighting and Power

.1 All temporary and construction lighting and power work and costs for same are not included as part of the scope of the work of this section. Refer to such clauses in other sections of the specification.

27 Testing

.1 Test all circuits and wires for continuity, insulation resistance and high impedance grounds. Those circuits which test non-continuous, with an insulation resistance less than 2 Megohms or with high impedance grounds shall be replaced.

.2 All empty conduits shall be left with an insulated #14 AWG fish wire.

.3 Test all panels under full load and make necessary reconnection of single phase loads from one leg or phase to another to balance the load on legs or phases as nearly as possible. Test results, test values measured, date of each measurement, company name and signature of person making each measurement shall be neatly recorded. Record all changes on Record Drawings.

.4 Test all required ground rods for ground resistance, with standard test equipment.

.5 Keep a record of all final tests, bind, and turn over typewritten results to the Contract Administrator as a part of the maintenance manual. All final test values measured, date of each measurement, company name and signature of person making

each measurement shall be neatly recorded. After all tests have been successfully completed, each test report shall contain a summary which clearly states that all results were satisfactory.

.6 Upon completion of the work and adjustments of all equipment, all systems shall be tested in the presence of the Contract Administrator to demonstrate that all equipment furnished and installed or connected as a part of this section of the contract shall function electrically in the required manner as determined by the Contract Administrator.

.7 All circuits shall be tested to ensure that the circuit numbers are correct and that the proper neutral conductors have been provided and installed.

.8 Voltage tests shall be conducted and transformer taps adjusted or other corrective measures carried out as directed by the Contract Administrator. Refer also to 4.1 Care, Operation and Start-Up.

28 Cutting and Patching

.1 Cutting, patching and repairs to existing surfaces required as a result of the removal and/or relocation of existing equipment and piping, and/or installation of new equipment and piping in existing building(s) to be included by Div. 16 - Electrical in tender price. Division 16 - Electrical to employ and pay appropriate sub-trade whose work is involved, for carrying out work described above.

.2 Perform all cutting and patching required for installing electrical systems.

.3 Division 16 shall retain services of General Sub-trades to carry out actual work involved in cutting wall openings, floor openings and the like, and in patching up after installation has been completed.

.4 Division 16 shall mark all openings required for conduits, cables, ducts, and the like.

.5 Cutting to be 'neat' sizes. Patch all edges such as cover plates, etc. Hide cut edges.

.6 Div. 16 - Electrical to perform all cutting only of existing surfaces as required as a result of the removal and/or relocation of existing equipment and conduit and/or installation of new equipment and conduit in the existing building to be included by the Div. 16 in the tender price.

.7 If, in the opinion of Contract Administrator, cutting of holes has been improperly performed (i.e. too large for conduits or

cables) Division 16 - Electrical to do all patching as per original specifications and all costs will be borne by him.

29 Fireproofing

.1 Where cables or conduits pass through floors, block or concrete walls and fire rated walls, seal openings with 3 M Brand 7900 Series Fire Barrier System or equivalent, to maintain fire rating.

.2 Fireproofing of electrical cables, conduits, trays, etc. passing through fire barriers shall conform to local codes and inspection authorities.

30 Access Doors

.1 Provide and install access doors where electrical equipment requiring access is built-in. Access doors to be 2.5mm (12 ga.) steel, approximately 300mm x 300mm (12" x 12") minimum or as approved, finished prime coat only, with concealed hinges, anchor straps, plaster lock and without screws, all equal to Milcor manufacturer. All locks to be flush type, screwdriver operated. Where it is necessary for persons to enter through door, doors to be at least 600mm x 600mm.

.2 In applied tile or exposed glazed or unglazed structural tile, access doors shall take the tile and be sized and located to suit tile patterns. In masonry walls access doors to be sized and located to suit masonry unit sizes. In removable acoustic tile ceilings, no access doors are required.

.3 Access doors located in fire rated ceilings or walls shall be approved fire rated doors and frames.

.4 Co-ordinate access door types, locations, etc. with Architect.

31 Security Fasteners and Hardware

.1 Refer to other sections of the specifications for Security Fasteners. Division 16 to install security fasteners required for Division 16 work.

.2 This shall also include security tamperproof screws that are exposed such as in light fixtures, coverplates, system devices, outlet covers, etc.

.3 Refer to other sections of the specifications for security hardware.

32 Protection

.1 Protect exposed live equipment during construction for personnel safety.

.2 Shield and mark live parts "LIVE 120 VOLTS", or with an appropriate voltage in English.

.3 Arrange for installation of temporary doors for rooms containing electrical distribution equipment. Keep these doors locked except when under direct supervision of electrician.

33 Scheduling of Work

.1 Existing buildings will remain in use during construction. Arrange work so that interruption of services is kept to a minimum. Obtain permission from The Contract Administrator prior to cutting into electrical services. Where deemed necessary by Contract Administrator, temporary electrical shall be installed and/or work shall be carried out at night and on weekends.

.2 Contractor to maintain continuous and adequate all existing electrical systems and other services during entire time of this contract. Provide temporary conduit, wire, equipment, etc. where necessary to meet this requirement.

34 Demolition of Existing Electrical

.1 Remove all unnecessary existing electrical equipment, wiring, fixtures, in those portions of the existing building which are being remodelled or demolished. All devices/fixtures, etc. are not necessarily shown on the plans. Any electrical equipment in remodelled sections or in structures removed or altered, adjacent to new work, necessary for the operation of existing building, shall be relocated as necessary. All existing equipment re-used shall be made good and warranteed. Power interruptions to be kept to a minimum and shall be at a time suitable to the building occupant.

.2 Drawings do not show all electrical requiring removal to accommodate renovations such as receptacles, switches, lights, starters, motors, nurse call systems, components, heaters, etc. Division 16 shall visit site, refer to architectural and electrical drawings and include all costs for demolition.

.3 Refer to Specification Section 16195 - Work in Existing Building.

END

PART 1 - GENERAL

1.1 Related Work Specified Elsewhere

.1 Electrical General Requirements Section 16010

1.2 Location of Conduit

.1 Drawings do not indicate all conduit runs. Those indicated are in diagrammatic form only.

.2 Produce layout sketches of conduit runs through mechanical and electrical service areas in order to pre-avoid any conflict with other construction elements and to determine the most efficient route to run conduit.

PART 2 - PRODUCTS

2.1 Conduits

.1 Rigid galvanized steel threaded conduit.

.2 Epoxy coated conduit: with zinc coating and corrosion resistant epoxy finish inside and outside.

.3 Electrical metallic tubing (EMT): with couplings. Minimum size shall be 19mm.

.4 Rigid pvc conduit.

.5 Flexible metal conduit and liquid-tight flexible metal conduit.

.6 FRE conduit: Size 75 mm and above.

.7 Flexible pvc conduit.

2.2 Conduit Fastenings

.1 One hole steel straps to secure surface conduits 50 mm and smaller. Two hole steel straps for conduits larger than 50 mm.

.2 Beam clamps to secure conduits to exposed steel work.

.3 U channel type supports for two or more conduits at 1500 mm oc. (Surface mounted or suspended).

.4 Six mm dia. galv. threaded rods to support suspended channels.

2.3 Conduit Fittings

.1 Fittings for raceways: to CSA C22.2 No. 18.

.2 Fittings: manufactured for use with conduit specified. Coating: same as conduit.

.3 Factory "ells" where 90 deg. bends are required for 25 mm and larger conduits.

.4 Steel set screw connectors and couplings. Insulated throat liners on connectors.

.5 Raintight connectors and fittings c/w O-rings for use on weatherproof or sprinklerproof enclosures. Raintight couplings to be used for surface conduit installations exposed to moisture or sprinkler heads.

.6 Explosion proof in hazardous areas to meet requirements of authorities having jurisdiction.

2.4 Expansion Fittings for Rigid Conduit

.1 Weatherproof expansion fittings with internal bonding assembly suitable for 100 or 200 mm linear expansion.

.2 Watertight expansion fittings with integral bonding jumper suitable for linear expansion and 19 mm deflection in all directions.

.3 Weatherproof expansion fittings for linear expansion at entry to panel.

2.5 Fish Cord

.1 Polypropylene c/w 3m spare length at each conduit end.

PART 3 - EXECUTION

3.1 Installation

.1 Install conduits to conserve headroom in exposed locations and cause minimum interference in spaces through which they pass.

.2 Conceal conduits except in mechanical and electrical service rooms.

.3 Use rigid galvanized steel threaded conduit where specified.

.4 Use epoxy coated conduit in corrosive areas.

.5 Use electrical metallic tubing (EMT) except where specified otherwise.

.6 Use rigid pvc conduit or FRE duct for underground installations.

.7 Use flexible metal conduit for connection to motors in dry areas, connection to recessed incandescent fixtures without a prewired outlet box, connection to surface or recessed fluorescent fixtures, transformers and equipment subject to vibration or movement. Provide a separate insulated grounding conductor within flexible conduit.

.8 Use liquid tight flexible metal conduit for connection to motors or vibrating equipment in damp, wet or corrosive locations.

.9 Install conduit sealing fittings in hazardous areas. Fill with compound.

.10 Conduit stubs from floor slabs where exposed to damage to be rigid galv. steel.

.11 The conduit sizes as shown or indicated are the minimum acceptable and shall not be reduced without the approval of the Contract Administrator.

.12 Bend conduit cold. Replace conduit if kinked or flattened more than 1/10th of its original diameter.

.13 Mechanically bend steel conduit over 19 mm dia.

.14 Field threads on rigid conduit must be of sufficient length to draw conduits up tight.

.15 Install fish cord in empty conduits.

.16 Where conduits become blocked, remove and replace blocked section. Do not use liquids to clean out conduits.

.17 Dry conduits out before installing wire.

.18 Conduit to be sized as per Canadian Electrical Code or as shown on drawings. Note that the sizes of branch circuit conductors scheduled and/or specified on the drawings are minimum sizes and must be increased as required to suit length of run and voltage drop in accordance with Canadian Electrical Code. Where conductor sizes are increased to suit voltage drop requirements, increase the conduit size to suit.

.19 Running threads will not be permitted; proper couplings shall be used.

.20 Not less than 900mm (3'-0") of flexible conduit (and of sufficient length to allow the lighting fixture to be relocated to any location within a 6 ft. (1.8m) radius) shall be used for

the connection of recessed lighting fixtures. A separate drop to be used for each fixture unless fixtures are mounted in continuous rows.

.21 No circuits fed from emergency or essential power sources shall be run in the same conduit as other systems.

.22 Provide separate conduit system for emergency distribution.

.23 All conduit runs passing across expansion joints of the building shall be installed utilizing approved expansion fittings, and bonding devices.

.24 Refer to 16010 for identification requirements.

.25 All conduit systems in hazardous areas to be rigid galvanized steel to meet the requirements of the authorities having jurisdiction.

3.2 Surface Conduits

.1 Run parallel or perpendicular to building lines.

.2 Locate conduits behind infrared or gas fired heaters with 1.5 m clearance.

.3 Run conduits in flanged portion of structural steel.

.4 Group conduits wherever possible on suspended or surface channels.

.5 Do not pass conduits through structural members except as indicated.

.6 Do not locate conduits less than 150 mm parallel to steam or hot water lines with minimum of 75 mm at crossovers.

.7 No power driven pins (Ramset) shall be utilized to secure any portion of the conduit.

3.3 Concealed Conduits

.1 Do not install horizontal runs in masonry walls.

.2 Do not install conduits in terrazzo or concrete toppings.

3.4 Conduits in Cast-in-place Concrete

.1 Protect conduits from damage where they stub out of concrete.

.2 Install sleeves where conduits pass through slab or wall.

.3 Where conduits pass through waterproof membrane provide oversized sleeve before membrane is installed. Use cold mastic between sleeve and conduit.

.4 Organize conduits in slab to minimize cross-overs.

END

PART 1 - GENERAL

1.1 Related Work Specified Elsewhere

.1	Electrical General Requirements	Section 16010
.2	Conduits, Conduit Fastenings and Conduit Fittings	Section 16111
.3	Cabletroughs	Section 16114
.4	Fastenings and Support	Section 16191

PART 2 - PRODUCTS

2.1 Materials

.1 Conductors in Conduit:
- .1 Type: RW90
- .2 Conductors:
  - .1 Solid Copper #10 AWG and smaller.
  - .2 Stranded Copper #8 AWG and larger.
  - .3 Sized as indicated (Minimum # 12 AWG).
- .3 Insulation: cross link polyethylene (RW90), (RWU90), 90 deg. C.
- .4 Configuration: Single conductor.
- .5 Voltage Rating: Minimum 600V.
- .6 Certification: CSA C22.22 No. 38 or latest revision.

.2 Armored Cable (BX):
- .1 Type: AC90
- .2 Conductors:
  - .1 Solid Copper #10 AWG and smaller.
  - .2 Stranded Copper #8 AWG and larger.
  - .3 Sized as indicated (Minimum # 12 AWG).
- .3 Insulation: cross link polyethylene (XLPE), 90 deg. C.
- .4 Configuration: Multi-conductor, as required, c/w a separate bare CU ground wire.
- .5 Voltage Rating: Minimum 600V
- .6 Certification: CSA C22.22 No. 51 or latest revision.

.3 Armored Cable (TECK):
- .1 Type: TECK
- .2 Conductors:
  - .1 Solid Copper #10 AWG and smaller.
  - .2 Stranded Copper #8 AWG and larger.
  - .3 Sized as indicated (Minimum # 12 AWG).
- .3 Insulation: cross link polyethylene (RW90), 90 deg. C.
- .4 Configuration: Multi-conductor, as required, c/w a separate bare CU ground wire.

.5 Colour Code: Black, red, blue and white in 4/C cable. Cables of more than 4/C to be number coded.
.6 Voltage Rating: 1KV, 5KV, or 15KV as indicated.
.7 Inner Jacket:
.1 Black polyvinyl chloride (PVC)
.2 Low Flame Spread (LFS)
.3 Low Gas Emission (LGE)
.8 Armor: Inter-locked aluminum
.9 Outer Jacket:
.1 Black polyvinyl chloride (PVC), -40 deg. C
.2 Low Flame Spread (LFS)
.3 Low Gas Emission (LGE)
.10 Flame Rating: FT4
.11 Certification: CSA C22.22 No. 131 or latest revision.

.4 Electronic Cables:
.1 Conductors:
.1 Minimum #18 AWG - STC Solid Copper
.2 Insulation: polyvinyl chloride (PVC)
.3 Configuration: twisted pairs (No. as indicated)
.4 Shielding: Copper braid
.5 Voltage Rating: 300V
.6 Certification: CSA

.5 Fire Alarm Cable:
.1 Conductor: Solid Copper minimum #18 AWG
.2 Insulation: 105 deg. C Flame retardent PVC
.3 Configuration: Multi-conductor, (minimum 4 conductors per cable).
.4 Voltage Rating: 300V
.5 Conductor Identification: Colour coded
.6 Shielding: Aluminum mylar foil
.7 Outer Jacket: 105 deg. C red PVC jacket
.8 Certification: CSA Class #5851-01 File #LR41741
.9 Flame Rating: FT4
.10 Refer to Fire Alarm section for wiring to suit addressable fire alarm systems.

.6 Low Voltage Control Cables:
.1 Type: LVT
.2 Conductor: Solid Copper #18 AWG
.3 Insulation: Thermoplastic, colour coded
.4 Configuration: single, two conductor - parallel, three or more conductors twisted
.5 Voltage Rating: 30V
.6 Outer Jacket: thermoplastic
.7 Certification: CSA C22.22 No. 35
.8 Flame Rating: FT4

.7 Pressure type connectors, fixture type splicing connectors, cable clamps and lugs as required.

.8 RA90 Cables
.1 Single conductor RW90 insulation, minimum 600V, -40°C
.2 Stranded copper, size as indicated.
.3 Liquid and vapour tight corrugated aluminum sheath.
.4 Overall PVC jacket rated FT-4.

.9 Variable Frequency Drive Power Cables
.1 For input power wiring to the VFD and for output wiring to the motor, from the VFD.
.2 Use cable specifically designed for Variable Frequency Drives.
.1 Teck Drive RX cable as manufactured by Alcatel.
.2 PVC jacket rated at FT4.
.3 Continuous corrugated impervious aluminum shield.
.4 CSA approved to standard C22.2 No. 123-96.
.5 Installed as per manufacturer's instructions.

PART 3 - EXECUTION

3.1 General

.1 To Minimize Voltage Drop
.1 All branch circuits including lighting circuits shall be minimum #10 AWG for all circuits longer than 21 metres and shall be minimum #8 for all circuits longer than 35 metres.
.2 All branch circuit wiring and conduit shall be installed to minimize voltage drop. Install additional conduit runs as required to take the most direct and shortest route to outlets, light fixtures, etc.

3.2 Installation in Raceways

.1 Install wiring as follows:
.1 In conduit systems in accordance with Section 16111.
.2 In underground ducts in accordance with Section 16106.
.3 In wireways and auxiliary gutters in accordance with Section 16116.
.4 Ensure conduits are dry and free of debris before pulling cables.
.5 Colour coding and identification as per this section.
.6 Wires in outlet, junction and switch boxes, not having a connection within box shall not be spliced, but shall continue unbroken through the box.

3.3 Installation of Single Conductor Cables

.1 Single conductor cables shall be installed one cable diam. apart on suspended cable tray or channel supports and shall be clamped with aluminum cable clamps. Cables shall be terminated using non-magnetic connectors. Cable armor shall be grounded via an

aluminum plate at the supply end and isolated via an insulating plate, at the load end of the cable. A #3/0 AWG bare (unless otherwise noted) copper ground wire shall be installed with each feeder. Cable bending radius shall be at least twelve times the overall cable diam. and bends shall not damage or distort the outer sheath.

.2 Do not install PVC jacketted cables in circulating air plenums.

3.4 Installation of Flexible Armoured Cable

.1 Type AC90 armoured cable (BX) shall be used for connections from conduit systems to recessed luminaires in accessible ceilings. Cable to be of sufficient length to allow the lighting fixture to be relocated to any location within a 6' (1.8M) radius. Cable shall be clamped before entering the lighting fixture and shall be clipped before entering the conduit system junction box.

.2 Type AC90 armoured cable (BX) shall be used for connections from conduit systems to wiring devices in steel stud partitions and for interconnection of wiring devices within steel stud partitions, cable to be clipped before entering junction or outlet boxes. Cable to be clamped within partitioning with steel galvanized tie-wire.

3.5 Installation in Equipment

.1 Group and lace-in neatly wire and cable installed in switchboards, panelboards, cabinets, wireways and other such enclosures.

3.6 Terminations

.1 Terminate wires and cables with appropriate connectors in an approved manner.

3.7 Identification

.1 Wire in conduit #2 AWG and smaller shall have solid coloured insulation, color coded as listed below.

.2 Wire in conduit 1/0 AWG and larger and single conductor cables for normal power feeders shall be identified at each outlet box and termination with a 150 mm band of coloured vinyl tape of the appropriate colour. Emergency power feeders shall be provided with an additional 75 mm band of red vinyl tape installed adjacent to the 150 mm band of the coloured phase identification tape, as listed below. Neutral and ground conductors shall be identified. Paint or other means of colouring the insulation shall not be used.

.3 Color code wire in conduit and single conductor cables as follows:

Phase A - red
Phase B - black
Phase C - blue
Neutral - white
Ground - green

.4 Maintain phase sequence and colour coding throughout project.

.5 Use colour coded wires in communication cables, matched throughout system.

.6 Identify control conductors in motor control equipment, contactors, fire alarm panels, etc. with mylar/cloth wire markers.

.7 Refer to 16010 for additional requirements.

END

PART 1 - GENERAL

1.1 Related Work Specified Elsewhere

.1 Electrical General Requirements Section 16010

.2 Conduits, Conduit Fastenings and Conduit Fittings Section 16111

.3 Fastenings & Supports Section 16191

1.2 Location

.1 Locate splitters, junction and pull boxes as indicated or as needed for each system.

PART 2 - PRODUCTS

2.1 Splitters

.1 Sheet metal enclosure, welded corners and formed hinged cover suitable for locking in closed position. Sprinklerproof

.2 Main and branch lugs to match required size and number of incoming and outgoing conductors as indicated.

.3 Minimum three spare terminals on each set of lugs in splitters.

.4 Explosion proof in hazardous areas to suit the hazardous classification.

.5 Weatherproof where installed outdoors.

.6 Enclosures in other areas to suit environment.

2.2 Junction and Pull Boxes

.1 Welded steel construction with screw-on flat covers for surface mounting.

.2 Covers with 25 mm minimum extension all around, for flush-mounted pull and junction boxes.

.3 Cast type with gasketted covers where exposed to weather.

.4 Explosion proof in hazardous areas to suit the hazardous classification.

2.3 Cabinets

.1 Type E: sheet steel, hinged door and return flange overlapping sides, handle, lock and catch, for surface mounting.

.2 Type T: sheet steel cabinet, with hinged door, latch, lock, 2 keys, containing 19 mm G1S fir plywood backboard. Cabinets to be flush or surface mounted as indicated.

.3 Provide other systems cabinets as specified and located on drawings.

PART 3 - EXECUTION

3.1 Splitter Installation

.1 Install splitters and mount plumb, true and square to the building lines.

.2 Extend splitters full length of equipment arrangement except where indicated otherwise.

3.2 Junction, Pull Boxes and Cabinets Installation

.1 Install pull boxes in inconspicuous but accessible locations.

.2 Mount cabinets with top not higher than 2 m above finished floor.

.3 Install terminal block as indicated.

.4 Install pull boxes so as not to exceed 30 m of conduit run between pull boxes.

.5 Install junction and pull boxes clear of all mechanical ductwork and piping.

3.3 Identification

.1 Provide equipment identification in accordance with Section 16010 - Electrical General Requirements.

.2 Identify splitters with size 7 nameplates.

.3 Identify junction and pull boxes with size 3 nameplates.

.4 Identify cabinets with size 5 nameplates.

END

PART 1 - GENERAL

1.1 Related Work Specified Elsewhere

.1 Electrical General Requirements Section 16010

.2 Conduits, Conduit Fastenings and Conduit Fittings Section 16111

PART 2 - PRODUCTS

2.1 Outlet and Conduit Boxes General

.1 Size boxes in accordance with CSA C22.1.

.2 Sectional boxes shall not be used without specific approval of the Contract Administrator.

.3 Gang boxes where wiring devices are grouped.

.4 Blank cover plates for boxes without wiring devices.

.5 347 V outlet boxes for 347 V switching devices c/w holes on centres to reject all other switches.

.6 Combination boxes with barriers where outlets for more than one system are grouped.

.7 In finished areas switch, convenience receptacle, voice/data and blank cover plates shall be stainless steel. In finished area ceilings, junction and pull box covers shall be solid covers, painted to match the finish of the adjacent surface.

.8 In moist or dusty areas, gasketted watertight or dust tight boxes and covers shall be provided.

.9 Explosion proof in hazardous areas to suit requirements of authorities having jurisdiction.

2.2 Sheet Steel Outlet Boxes

.1 Electro-galvanized steel device boxes for flush installation, minimum size 102 mm square outlet boxes with extension and plaster rings as required.

.2 Electro-galvanized steel device boxes for flush installation in drywall and minimum size 102mm square outlet boxes with extension and square cornered tile covers as required.

.3 Electro-galvanized steel utility boxes for outlets connected to surface-mounted EMT conduit, sized as required for the installation.

.4 102 mm square or octagonal outlet boxes for lighting fixture outlets.

2.3 Masonry Boxes

.1 Electro-galvanized steel masonry single and multi gang boxes for devices flush mounted in exposed block walls.

2.4 Concrete Boxes

.1 Electro-galvanized sheet steel concrete type boxes for flush mount in concrete with matching extension and plaster rings as required.

2.5 Floor Boxes

.1 Concrete tight electro-galvanized sheet steel floor boxes with gasket, floor plate, levelling screws and adjustable finishing rings to suit floor finish with brass faceplate. Device mounting plate to accommodate short or long ear duplex receptacles.

2.6 Conduit Boxes

.1 Cast FS or FD feraloy boxes with factory-threaded hubs and mounting feet for surface wiring of switches and receptacle where exposed to moisture.

2.7 Fittings - General

.1 Bushing and connectors with nylon insulated throats.

.2 Knock-out fillers to prevent entry of debris.

.3 Conduit outlet bodies for conduit up to 32 mm and pull boxes for larger conduits.

.4 Double locknuts and insulated bushings on sheet metal boxes.

2.8 Service Fittings

.1 Pedestal type 'high tension' receptacle fitting, 5" square low profile, 2 piece; steel frame with black plastic housing for two

duplex receptacles. Bottom plate with knockout and BX connector for centered installation.

.2 Pedestal type 'low tension' fitting 5" square low profile, 2 piece steel frame with black plastic housing to accommodate two amphenol jack connectors. Bottom plate with slot for conduit entry.

.3 Pedestal type 'Combination Telephone/Receptacle Fitting 5" x 10", low profile, 2 piece; steel barriered frame with black plastic housing to accommodate two duplex receptacles and two amphenol jack connectors. Bottom plate with BX connector in power section and slot for conduit entry in telephone section.

PART 3 - EXECUTION

3.1 Installation

.1 Support boxes independently of connecting conduits.

.2 Fill boxes with paper, sponges or foam or similar approved material to prevent entry of debris during construction. Remove upon completion of work.

.3 For flush installations mount outlets flush with finished wall using plaster rings to permit wall finish to come within 6 mm of opening.

.4 Provide correct size of openings in boxes for conduit, mineral insulated and armoured cable connections. Reducing washers are not allowed.

.5 Maintain continuity of vapor barrier where boxes are installed in exterior walls and ceilings. Use air/vapor barrier boxes for outlets installed in walls or ceilings with a vapor barrier.

.6 Boxes to be mounted plumb and square with building lines.

.7 Where outlet boxes are shown on the drawings as being "back-to-back" shall have a minimum offset of 200 mm (8") between boxes to reduce sound transmission. In no case shall "thru-wall" boxes be used.

.8 Install pull boxes, or fittings, in conduit runs where more than four bends are necessary.

.9 Install pull boxes where run exceeds 23.0 (75 feet) in length.

.10 All junction, outlets and pull boxes shall be so installed that they are always readily accessible.

.11 No power driven pins (Ramset) shall be utilized to secure boxes without specific approval from Contract Administrator.

.12 Check opening provided for each recessed outlet box and if it is not completely covered by cover plate, report discrepancy to the division responsible and ensure that it is rectified.

.13 All concealed junction boxes, conduit fittings, etc. to be c/w galv. steel covers, secured with two bolts.

.14 Co-ordinate boxes in masonry with brick or block configuration, boxes to be saw cut in bottom of appropriate brick or block. They shall be of sufficient depth to allow conduit to pass through center of block.

.15 No more than two extension rings shall be used in sequence.

.16 For installations in hazardous areas, meet all requirements of authorities having jurisdiction.

END

PART 1 - GENERAL

1.1 Related Work Specified Elsewhere

.1 Electrical General Requirements Section 16010

.2 Outlet Boxes, Conduit Boxes and Fittings Section 16132

1.2 Submittals

.1 Submit shop drawings and product data in accordance with Section 16010.

PART 2 - PRODUCTS

2.1 Switches

.1 Toggle operated general purpose AC Switches 15A and 20A 120Vac and 347Vac single pole, double pole, three-way and four-way switches as indicated, with the following features:
.1 Terminal holes approved for No. 10 AWG wire.
.2 Silver alloy contacts.
.3 Urea molding.
.4 Suitable for back and side wiring.
.5 Brown toggle for normal power; red toggle for emergency power.
.6 Fully rated for tungsten filament and fluorescent lamps, and up to 80% of rated capacity of motor loads.

.2 Switches of one manufacturer throughout project.

.3 Switches to be premium specification grade.

.4 Acceptable manufacturers:

Manufacturer	120 Volt	347 Volt
Hubbell	1200 Series	18200 Series
Bryant	4800 Series	6800 Series
Leviton	1200 Series	18200 Series
Pass & Seymour	AG-1 Series	3700 Series
Smith & Stone	4-4800 Series	1-3700 Series
Slater	710 Series	3400 Series

2.2 Receptacles

.1 Duplex receptacles, CSA type 5-15 R, 125 Vac, 15 A, U ground, with following features:
.1 Nylon face, brown or ivory for normal power, red for emergency power.
.2 Suitable for No. 10 AWG for back and side wiring.
.3 Break-off links for use as split receptacles.
.4 Double wipe contacts and rivetted grounding contacts.

.2 Single receptacles CSA type 5-15 R, 125 VAC, 15 A, U ground with following features:
.1 Nylon face, brown or ivory for normal power, red for emergency power.
.2 Suitable for No. 10 AWG for back and side wiring.

.3 Receptacles to be orange face isolated ground type where indicated. Provide a separate insulated ground wire and a separate neutral for each isolated ground circuit.

.4 Receptacles of one manufacturer throughout project.

.5 Acceptable manufacturers: Hubbell, Arrow Hart, Bryant, Pass & Seymour, Slater. Catalogue No. 5262 for all manufacturers.

.6 Acceptable manufacturers for ground fault receptacles shall be:
.1 Arrow Hart - GF 5242
.2 Bryant - GFR 52FT
.3 Hubbell - GF 5252
.4 Pass & Seymour - 1591-R

2.3 Cover Plates

.1 Cover plates from one manufacturer throughout project.

.2 Stainless steel cover plates for wiring devices mounted in flush-mounted outlet boxes to be minimum plate thickness of 1.0mm.

.3 Sheet steel utility box cover for wiring devices installed in surface-mounted utility boxes.

.4 Cast gasketted cover plates for wiring devices mounted in surface-mounted FS or FD type conduit boxes.

.5 Weatherproof double lift spring-loaded cast aluminum cover plates, complete with gaskets for duplex receptacles as indicated.

.6 Weatherproof cover plates complete with gaskets for single receptacles or switches as indicated.

PART 3 - EXECUTION

3.1 Installation

.1 Switches:
.1 Install single throw switches with handle in "UP" position when switch closed.
.2 Install switches in gang type outlet box when more than one switch is required in one location.
.3 Mount toggle switches at height specified in Section 16010 or as indicated.
.4 Where pilot lights are required, or shown on the drawings, install flush neon pilots in outlet box grouped with associated switch.
.5 Where finished construction of walls consist of a symmetrical pattern of finish materials, install wall switches where directed by the Contract Administrator.
.6 Switches shall be mounted 1.4m (4'-6") above finished floor on the strike side of the door.

.2 Receptacles:
.1 Install receptacles in gang type outlet box when more than one receptacle is required in one location.
.2 Mount receptacles horizontally at height specified in Section 16010 or as indicated.
.3 Where switch and convenience outlets are shown close to one another, mount receptacles below and in line with the switch.
.4 Where finished construction of walls consist of a symmetrical pattern of wood or other panels, install and locate receptacles and switches as directed to suit the pattern.
.5 Suitably ground all receptacles with #12 green insulated wire to outlet box.

.3 Coverplates:
.1 Install suitable common cover plates where wiring devices are ganged.
.2 Do not use cover plates intended for flush outlet boxes on surface-mounted boxes.
.3 Provide a coverplate on each outlet.

3.2 Identification

.1 Identify receptacles with size 1 nameplate indicating panel and circuit number. Nameplates to be mechanically fastened. Refer to Section 16010.

END

PART 1 - GENERAL

1.1 References

.1 CSA C22.2No.65-1956(R1965) Wire Connectors.

.2 EEMAC 1Y-2, 1961 Bushing Stud Connectors and Aluminum Adapters (1200 Ampere Maximum Rating).

PART 2 - PRODUCTS

2.1 Materials

.1 Pressure type wire connectors: with current carrying parts of copper sized to fit copper conductors as required.

.2 Fixture type splicing connectors: with current carrying parts of copper sized to fit copper conductors 10 AWG or less.

.3 Clamps or connectors for armoured cable, aluminum sheathed cable, mineral insulated cable, flexible conduit, non-metallic sheathed cable as required.

PART 3 - EXECUTION

3.1 Installation

.1 Remove insulation carefully from ends of conductors and:
.1 Install pressure type wire connectors and tighten.
.2 Install mechanical pressure type connectors and tighten screws with appropriate compression tool recommended by manufacturer. Installation shall meet secureness tests in accordance with CSA C22.2 No.65.
.3 Install fixture type connectors and tighten. Replace insulating cap.
.4 Install bushing stud connectors in accordance with EEMAC 1Y-2.

END

PART 1 - GENERAL

1.1 Related Work Specified Elsewhere

.1	Basic Products/Workmanship	Section 01600
.2	Electrical General Requirements	Section 16010
.3	Conduits, Conduit Fastenings and Conduit Fittings	Section 16111
.4	Cabletroughs	Section 16114
.5	Wires and Cables	Section 16122

PART 2 - PRODUCT

2.1 Support Channels

.1 U shape, size 41 x 41 mm, 2.5 mm thick, surface mounted, suspended or set in poured concrete walls and ceilings or as required.
.1 Manufacturers: B-Line, Burndy, Electrovert, Unistrut, Pilgrim, Pursley.

PART 3 - EXECUTION

3.1 Installation

.1 Secure equipment to solid masonry, tile and plaster surfaces with lead anchors.

.2 Secure equipment to poured concrete with cast in or expandable inserts.

.3 Secure equipment to hollow masonry walls or suspended ceilings with toggle bolts.

.4 Secure surface mounted equipment with twist clip fasteners to inverted T bar ceilings. Ensure that T bars are adequately supported to carry weight of equipment specified before installation. Provide additional support as required.

.5 Support equipment, conduit or cables using clips, spring loaded bolts, cable clamps designed as accessories to basic channel members.

.6 Fasten exposed conduit or cables to building construction or support system using straps.
.1 One-hole malleable iron straps to secure surface conduits and cables 50 mm and smaller.
.2 Two-hole steel straps for conduits and cables larger than 50 mm.
.3 Beam clamps to secure conduit to exposed steel work.

.7 Suspended support systems.
.1 Support individual cable or conduit runs with 6 mm dia threaded rods and spring clips.
.2 Support 2 or more cables or conduits on channels supported by 6 mm dia threaded rod hangers where direct fastening to building construction is impractical.

.8 For surface mounting of two or more conduits use channels at 1500 mm oc spacing.

.9 Provide metal brackets, frames, hangers, clamps and related types of support structures where indicated or as required to support conduit and cable runs.

.10 Ensure adequate support for raceways and cables dropped vertically to equipment where there is no wall support.

.11 Do not use wire lashing or perforated strap to support or secure raceways or cables.

.12 Do not use supports or equipment installed for other trades for conduit or cable support except with permission of other trade and approval of Contract Administrator.

.13 Install fastenings and supports as required for each type of equipment cables and conduits, and in accordance with manufacturer's installation recommendations.

.14 Threaded rod to be minimum 6 mm diam. galv. or nickel plated. Black steel rod is not acceptable.

END

PART 1 - GENERAL

1.1 Related Work Specified Elsewhere

.1	Mechanical Specifications	Division 15000
.2	Electrical General Requirements	Section 16010
.3	Conduits, Conduit Fastenings and Conduit Fittings	Section 16111
.4	Wires and Cables	Section 16122
.5	Outlet Boxes, Conduit Boxes and Fittings	Section 16132
.6	Disconnect Switches - Fused and Non-Fused up to 1000V	Section 16440
.7	Motor Starters to 600V	Section 16811

1.2 System Description

.1 Provide complete electrical power and control connections for mechanical equipment, except as noted herein.

PART 2 - PRODUCTS

2.1 Materials

.1 Include motor starters, disconnects, conduit, wire, fittings, interlocks, outlet boxes, junction boxes, and all associated equipment required to provide power wiring for mechanical equipment, unless otherwise indicated.

.2 Include pushbutton stations, motor protective switches, interlocks, conduit, wire, devices and fittings required to provide control wiring for mechanical equipment except for temperature/humidity control systems.

.3 Unless otherwise noted, motors and control devices shall be supplied by Div. 15. Motor horsepower ratings shall be as shown in the Div. 15 specifications. Motor voltage and phase ratings shall be as shown on the Div. 16 drawings.

2.2 Exterior Equipment

.1 All equipment mounted on the exterior of the building shall be weatherproof.

PART 3 - EXECUTION

3.1 Power Wiring

.1 Install power feeders, starters, disconnects and associated equipment and make connections to all mechanical equipment.

.2 Install branch circuit wiring for mechanical systems control panels, time clocks and control transformers. Control panels for equipment on emergency power to be connected to emergency branch circuits.

.3 Install main power feeders to starter/control panels furnished by Div. 15. Install branch circuit wiring for motors, electric coils, etc.

3.2 Controls

.1 Install all electrical controls except controls supplied under Division 15, unless otherwise noted herein. Controls which have both electrical and mechanical connections shall be installed by the trade supplying the control.

.2 Wire and connect remote thermostats, control panels, P/E switches, etc. for furnaces, condensing units, force flows, gas-fired unit heaters, electric heaters and rooftop HVAC units. Interlock rooftop units to condensing units as required.

.3 Wire and connect float switches, pressure switches, alternators, alarms, etc. for sump pumps, sewage pumps, domestic hot water recirculating pumps, booster pumps, jockey pumps and compressors.

.4 Install, wire and connect controls which are an integral part of any packaged unit and are supplied by the trade supplying the packaged unit. Include wiring for controls for such items as roof-top air handling units, boilers, etc.

.5 Section 15900 shall supply and install all conduit, wire, devices and fittings required to wire and connect control systems specified in 15900. Control wiring shall be installed in conduit.

.6 Wire and connect electrical interlocks for starters supplied by Div. 16.

3.3 Coordination

.1 Refer to mechanical drawings for the exact location of motor control devices, and other mechanical equipment requiring an electrical connection.

.2 Obtain full information from Div. 15, regarding wiring, controls, overload heaters, equipment ratings and overcurrent protection. Notify the Div. 15 subcontractor, at once, if any information provided is incorrect or unsatisfactory.

.3 Coordinate control wiring requirements with Div. 15 and provide all control wiring and connections as required to make the control systems operate as specified.

.4 Refer to Div. 15 specifications for any further electrical requirements.

3.4 Shop Drawing Review

.1 Review Div. 15 equipment shop drawings and adjust breaker/feeder sizes as required.

END

PART 1 - GENERAL

1.1 Related Work Specified Elsewhere

.1	Electrical General Requirements	Section 16010
.2	Conduits, Conduit Fastenings and Conduit Fittings	Section 16111
.3	Cabinets, Junction, Pull Boxes and Cabinets	Section 16131
.4	Outlet Boxes, Conduit Boxes and Fittings	Section 16132
.5	Wiring Devices	Section 16141
.6	Fastenings and Supports	Section 16191

1.2 Coordination

.1 The building shall remain open and in normal operation during the construction period.

.2 Where existing services such as electrical power, fire alarm system, sound system, etc. are required to be disrupted and/or shut down, coordinate the shut-downs with the Contract Administrator and carry out the work at a time and in a manner acceptable to them. Carefully schedule all disruption and/or shut-downs and ensure that the duration of same is kept to the absolute minimum. Submit for approval a written, concise schedule of each disruption at least 120 hours in advance of performing work and obtain The City's written consent prior to implementing.

.3 Should any temporary connections be required to maintain services during work in the existing building, supply and install all necessary material and equipment and provide all labour at no extra cost. Should any existing system be damaged, make full repairs without extra cost, and to the satisfaction of The City and Contract Administrator.

.4 If existing equipment shown on drawings is defective it should be brought to the Contract Administrator and The City's attention prior to work completion.

.5 Refer to General Conditions for phasing and staging of work and adhere to that schedule. Comply with instructions regarding working hours necessary to maintain the building in operation.

.6 Coordinate complete installation of relocated utility services, if required, with Utilities to ensure minimum interruption of service. Coordinate the transfer of the existing hydro service

point to the new service point with the Hydro utility in order to keep power interruptions to a minimum.

1.3 Existing Devices in New Construction

.1 Where existing devices (receptacles, switches, etc.) presently mounted on a wall which will be covered with a new finish, provide an extension ring, coverplate, etc. or relocate as required to mount the device to the new wall.

.2 Where existing conduits pass vertically through a floor area, relocate those conduits to be installed concealed in a new wall or surface mounted in a service area. Extend conduit, wiring, etc. as required.

.3 Existing junction boxes in walls and ceiling spaces required to maintain existing circuits shall remain accessible.

.4 Where services are concealed within walls, floors or ceilings and cannot be visually identified, Contractor shall provide electronic scanning devices or other approved means to locate and identify concealed services prior to drilling.

PART 2 - PRODUCTS

2.1 Materials

.1 Provide all materials required for the complete interface and reconnection installation as herein described and as indicated on the drawings.

.2 New fire alarm devices, speakers, starters, panelboards,circuit breakers etc. required to be tied in to existing systems shall match the existing devices.

.3 New wiring required to interconnect new devices to existing systems shall be provided to suit the manufacturers requirements and instructions.

PART 3 - EXECUTION

3.1 Installation

.1 Install boxes, conduit and wiring through existing areas as required for the new installation.

.2 Add modules, switches, etc. in existing control panels, as required, to extend existing systems to new or renovated areas.

.3 Patch and repair walls and ceilings in existing areas that have been damaged or cut open due to the new electrical installation.

.4 Where new cables or conduits have been installed through existing fire rated walls, seal opening around cables and conduit to maintain fire rating.

.5 Install new circuit breakers in existing panelboards where noted in drawings. Update existing panel directories.

END

PART 1 - GENERAL

1.1 Product Data

.1 Submit product data in accordance with Section 16010.

PART 2 - PRODUCTS

2.1 Disconnect Switches

.1 Fusible and non-fusible disconnect switch in CSA Enclosure and size as indicated. To suit the environment (i.e. weatherproof, watertight, dust-tight, general purpose, etc.)

.2 Provision for padlocking in on-off switch position by three locks.

.3 Mechanically interlocked door to prevent opening when handle in ON position.

.4 Fuses: size as indicated, to Section 16478 - Fuses - Low Voltage.

.5 Fuseholders: suitable without adaptors, for type and size of fuse indicated.

.6 Quick-make, quick-break action, heavy duty industrial grade.

.7 ON-OFF switch position indication on switch enclosure cover.

.8 Disconnects used for service entrances shall be approved service entrance switches.

.9 Disconnects for two speed motors to be six pole. Refer to motor schedule and drawings for two speed motors and provide a six pole disconnect switch for each two speed motor.

2.2 Equipment Identification

.1 Provide equipment identification in accordance with Section 16010 - Electrical General Requirements.

.2 Indicate name of load controlled and voltage on size 6 nameplate.

PART 3 - EXECUTION

3.1 Installation

.1 Install disconnect switches complete with fuses as indicated.

.2 Install additional brackets, supports, etc. required for mounting the disconnect switches.

.3 Install six pole disconnects at all two speed motors.

END

PART 1 - GENERAL

1.1 Related Work Specified Elsewhere

.1	Electrical General Requirements	Section 16010
.2	Wires and Cables	Section 16122
.3	Service Entrance Board	Section 16421
.4	Dry Type Transformers up to 600V Primary	Section 16461

1.2 References

.1 Ground equipment to: CSA C22.2 No. 41.

.2 Copper grounding conductors to: CSA G7.1.

PART 2 - PRODUCTS

2.1 Equipment

.1 Grounding conductors system, circuit and equipment, grounding to be bare (or green insulated if indicated/required) stranded copper sized in accordance with the Canadian Electrical Code.

.2 Clamps for grounding of conductor, size as required to electrically conductive underground water pipe.

.3 System and circuit, equipment, grounding conductors, bare stranded copper, tinned, soft annealed, size as indicated.

.4 Insulated grounding conductors: green, type RW-90.

.5 Ground bus: copper, size 50 mm by 6 mm by 300 mm long complete with insulated supports, fastenings, connectors.

.6 Non-corroding accessories necessary for grounding system, type, size, material as indicated, including but not necessarily limited to:
.1 Grounding and bonding bushings.
.2 Grounding or bonding clamps. All grounding and bonding clamps shall be brass where attached to copper pipes. Clamps for other applications shall be of a type and material that will minimize deterioration from galvanic action due to dissimilar metals.
.3 Bolted type conductor connectors.
.4 Thermit welded type conductor connectors.
.5 Bonding jumpers, straps.

.6 Pressure wire connectors.

PART 3 - EXECUTION

3.1 Installation General

.1 Install complete permanent, continuous, system and circuit, equipment, grounding systems including, electrodes, conductors, connectors, accessories, as indicated, to conform to requirements of local authority having jurisdiction over installation.

.2 Install connectors in accordance with manufacturer's instructions.

.3 Protect exposed grounding conductors from mechanical injury.

.4 Use mechanical connectors for grounding connections to equipment provided with lugs. Soldered joints not permitted.

.5 Install bonding wire for flexible conduit, connected at both ends to grounding bushing, solderless lug, clamp or cup washer and screw. Neatly cleat bonding wire to exterior of flexible conduit.

.6 Install flexible ground straps for bus duct enclosure joints, where such bonding is not inherently provided with equipment.

.7 Install separate ground conductor to outdoor lighting standards.

.8 Connect building structural steel and metal siding to ground by welding copper to steel.

.9 Bond single conductor, metallic armoured cables to cabinet at supply end, and provide non-metallic entry plate at load end.

.10 Provide separate ground conductors in PVC conduit, plastic or fibreglass raceways.

3.2 System and Circuit Grounding

.1 Install system and circuit grounding connections to neutral points of 600V and 208 V system.

3.3 Equipment Grounding

.1 Install grounding connections to typical equipment included in, but not necessarily limited to following list. Service equipment, transformers, frames of motors, motor control centres, starters,

control panels, building steel work, generators, elevator distributions, panels, outdoor lighting.

3.4 Communication Systems

.1 Install grounding connections for telephone, data, sound, fire alarm, intercommunication systems, etc. as follows:
.1 Telephones: make telephone grounding system in accordance with telephone installer's requirements.
.2 Sound, fire alarm, intercommunication systems, etc. as per manufacturers installation instructions.

3.5 Field Quality Control

.1 Perform tests in accordance with Section 16010.

.2 Perform ground continuity and resistance tests using method appropriate to site conditions and to approval of the local inspection authority. A report shall be submitted to the Contract Administrator from the testing agency.

.3 Perform tests before energizing electrical system.

.4 Disconnect ground fault indicator, if provided, during tests.

END

PART 1 - GENERAL

1.1 Related Work Specified Elsewhere

.1 Electrical General Requirements Section 16010

.2 Conduits, Conduit Fastenings and Conduit Fittings Section 16111

.3 Moulded Case Circuit Breakers Section 16477

1.2 Shop Drawings

.1 Submit shop drawings in accordance with Section 16010.

.2 Drawings to include electrical detail of panel, branch breaker type, quantity, ampacity and enclosure dimension.

1.3 Plant Assembly

.1 Install circuit breakers in panelboards before shipment.

.2 In addition to CSA requirements manufacturer's nameplate must show fault current that panel including breakers has been built to withstand.

PART 2 - PRODUCTS

2.1 Panelboards

.1 Panelboards: to CSA C-22.2 No. 29.

.2 Panelboards: product of one manufacturer.

.3 250V branch circuit panelboards: bus and breakers rated for 10kA (RMS symmetrical) interrupting capacity minimum or as indicated and 347/600V panels: bus and breakers rated for 14 ka (RMS symmetrical) or as indicated.

.4 Sequence phase bussing such that circuit breakers will be numbered in consecutive order, with each breaker identified by permanent number identification as to circuit number and phase.

.5 Panelboards: mains, number of circuits, and number and size of branch circuit breakers as indicated.

.6 Provide panel covers for all panelboards and supply two keys for each panelboard and key panelboards alike.

.7 Aluminum bus with neutral of same ampere rating as mains.

.8 Mains: suitable for bolt-on 25mm wide breakers.

.9 Trim and door finish: baked grey enamel, padlockable door.

.10 Sprinkler proof to meet code requirements when located in sprinklered areas.

2.2 Breakers

.1 Breakers: to Section 16477 - Moulded Case Circuit Breakers.

.2 Breakers with thermal and magnetic tripping in panelboards except as indicated otherwise.

.3 Lock-on devices for 5% of 15 to 30 A breakers installed as indicated. Turn over unused lock-on devices to The City.

.4 Lock-on devices for fire alarm, emergency lighting, door supervisory, intercom, paging, stairway, exit, night light circuits and similar circuits.

.5 Branch circuit breakers to be 15A single pole unless otherwise indicated on drawings.

2.3 Equipment Identification

.1 Provide equipment identification in accordance with Section 16010 - Electrical General Requirements.

.2 Nameplate for each panelboard size 5 engraved as indicated.

.3 Complete circuit directory with typewritten legend showing location and load of each circuit.

2.4 Manufacturers

.1 Acceptable Manufacturers: Cutler Hammer, Schneider, Square D and Siemens.

PART 3 - EXECUTION

3.1 Installation

.1 Locate panelboards as indicated and mount securely, plumb, true and square, to adjoining surfaces.

.2 Except in public areas, install surface mounted panelboards on U-channels. Where practical, group panelboards on common U-channels.

.3 Mount panelboards to height specified in Section 16010 - Electrical General Requirements or as indicated.

.4 Connect loads to circuits.

.5 Connect branch circuit neutral conductors to common neutral bus. Common neutrals shall be shared by vertically adjacent breakers except for GFI protected branch circuits and dimmer circuits which shall not share neutrals with other circuits. Neutral conductors shall be identified with mylar/cloth wire markers showing the circuit numbers of the circuits sharing the neutral.

.6 Trims of recessed panelboards to be flush with wall. Coordinate installation with wall installer to ensure that walls with recessed equipment will be deep enough to accept the equipment.

.7 Finish parking lot panel enclosures to match site lighting poles.

.8 Locate all panelboards as shown on the drawings, an arrow indicating the front.

.9 Wiring in panelboards shall be neat and set in as if laced. All neutral conductors shall be identified in the panel with their associated circuit numbers by means of Brady Markers.

.10 All panelboards throughout the building shall be phased together such that the left-hand, centre and right-hand panelboard busses represent phases A, B and C respectively. All indicating meters shall be identified to this sequence.

END

PART 1 - GENERAL

1.1 Related Work Specified Elsewhere

.1	Electrical General Requirements	Section 16010
.2	Service Entrance Board	Section 16421
.3	347/600V Main Distribution Switchgear (Air Ckt Brkrs (Main & tie) with CDP Dist'n)	Section 16422
.4	Secondary Switchgear (120/208V & 347/600V)	Section 16426
.5	Panelboards Breaker Type	Section 16471

1.2 Product Data

.1 Submit product data in accordance with Section 16010.

.2 Include time-current coordination characteristic curves for breakers.

PART 2 - PRODUCTS

2.1 Breakers General

.1 Moulded case circuit breakers: to CSA C22.2 No. 5.

.2 Bolt-on moulded case circuit breaker: quick- make, quick-break type, for manual and automatic operation with temperature compensation for 40 deg. C ambient.

.3 Common-trip breakers: with single handle for multi-pole applications.

.4 Magnetic instantaneous trip elements in circuit breakers to operate only when value of current reaches setting. Trip settings on breakers with adjustable trips to range from 5-10 times current rating.

.5 Circuit breakers with interchangeable trips as indicated.

.6 Minimum Interrupting Ratings (RMS Symmetrical) unless otherwise indicated:
.1 120/208 Volts - 10,000 Amps
.2 347/600 Volts - 14,000 Amps

2.2 Thermal Magnetic Breakers

.1 Moulded case circuit breaker to operate automatically by means of thermal and magnetic tripping devices to provide inverse time current tripping and instantaneous tripping for short circuit protection.

2.3 Solid State Trip Breakers

.1 Moulded case circuit breaker to operate by means of a solid-state trip unit with associated current monitors and self-powered shunt trip to provide inverse time current trip under overload condition, and long time, short time, instantaneous and ground fault tripping.

.2 Breakers feeding transformers 30 kVA and larger shall have solid state trips, fully and independently adjustable LSIG settings.

2.4 Manufacturers

.1 Acceptable manufacturers: Cutler Hammer, Schneider, Square D, Siemens.

PART 3 - EXECUTION

3.1 Installation

.1 Install circuit breakers as indicated.

END

PART 1 - GENERAL

1.1 Related Work Specified Elsewhere

.1 Electrical General Requirements Section 16010

1.2 Shop Drawings and Product Data

.1 Submit shop drawings and product data in accordance with Section 16010.

.2 Submit fuse performance data characteristics for each fuse type and size above 30 A. Performance data to include: average melting time-current characteristics, I^2t (for fuse coordination), and peak let-through current.

1.3 Maintenance Materials

.1 Provide maintenance materials in accordance with Section 16010.

.2 Three spare fuses of each type and size installed above 600 A.

.3 Six spare fuses of each type and size installed up to and including 600 A.

1.4 Delivery and Storage

.1 Ship fuses in original containers.

.2 Do not ship fuses installed in switchboard.

.3 Store fuses in original containers in storage cabinet.

PART 2 - PRODUCTS

2.1 Fuses General

.1 Plug and cartrige fuses: to CSA C22.2 No. 59.

.2 Fuse type references L1, L2, J1 etc. have been adopted for use in this specification.

.3 Fuses: product of one manufacturer.

2.2 Fuse Types

.1 HRC-L fuses (formerly Class L), motor loads:
.1 Type L1, time delay, capable of carrying 500% of its rated current for 10 s minimum.
.2 Type L2, fast acting.

.2 HRCI-J fuses (formerly Class J), Panel loads:
.1 Type J1, time delay, capable of carrying 500% of its rated current for 10 s minimum.
.2 Type J2, fast acting.

PART 3 - EXECUTION

3.1 Installation

.1 Install fuses in mounting devices immediately before energizing circuit.

.2 Ensure correct fuses fitted to physically matched mounting devices.
.1 Install Class R rejection clips for HRCI-R fuses.

.3 Ensure correct fuses fitted to assigned electrical circuit.

END

PART 1 - GENERAL

1.1 Related Work Specified Elsewhere

.1 Electrical General Requirements Section 16010

1.2 Shop Drawings and Product Data

.1 Submit shop drawings in accordance with Section 16010.

.2 Submit complete photometric data prepared by independent testing laboratory for luminaires where specified, for approval by Contract Administrator.

.3 Submit list of replacement lamp data for each luminaire. Include lamp type, voltage, base type and order code.

1.3 Warrantee

.1 Replace:
.1 Incandescent and tungsten halogen lamps burnt out within 3 months of takeover.
.2 Fluorescent and HID lamps burning out within 12 months of takeover.
.3 Ballasts that fail or exceed their labelled noise level rating within 12 months of takeover.

1.4 Co-ordination

.1 Co-ordinate luminaire locations with work of other trades.

.2 Co-ordinate luminaire types with ceiling finishes to ensure compatability.

.3 Luminaires to be c/w lamps, suspension devices, plaster rings and other attachments required for best appearance and proper mechanical installation.

.4 Every light outlet in the building shall be provided with a suitable fixture. In the event that the fixture type is not designed for any particular outlet, supply a suitable fixture for the application, as approved by the Contract Administrator.

PART 2 - PRODUCTS

2.1 Materials

.1 Incandescent and electric discharge fixtures: to CSA C22.2 No. 9.

.2 Socket screw-shell lampholders: to CSA C22.2 No. 43.

.3 Electric discharge lampholders: to CSA C22.2 No. 74.

.4 Incandescent lamps to: CSA C10 and CSA C22.2 No. 84.

.5 Tungsten halogen lamps: to CSA C22.2 No. 84.

.6 HID lamps: to ANSI C78 series.

.7 Fluorescent lamps: to ANSI C78 series.

.8 Ballasts: to CSA C22.2 No. 74.

.9 Plastic lenses and diffusers ULC labelled.

2.2 Luminaire Details

.1 Luminaires shall carry the CSA label.

.2 Provide supporting devices, plaster frames, junction boxes and outlet boxes where required.

.3 Provide lenses or diffusers of glass or acrylic material as indicated. Acrylic lenses used with fluorescent luminaires shall be a K-12 pattern with a minimum of .125" (3mm) thickness.

.4 Include finishes to Section 16010 and as indicated.

.5 Provide gasketting, stops and barriers to prevent light leaks.

.6 Recessed luminaires shall be suitable for mounting in the particular type of ceiling where the luminaires are to be mounted.

2.3 Lamps

.1 Provide lamps as indicated.

.2 Incandescent lamps to be extended service type rated 2500 hours, 130 volts, inside frosted unless indicated otherwise.

.3 Fluorescent lamps (T12) shall be rapid start, 3100 lumens, rated 20,000 hours, cool white unless other indicated.

.4 Fluorescent lamps (T8) shall be rapid start, 2850 Lumens rated 20,000 hours, 3500 K.

.5 HID lamps shall be rated 20,000 hours with coating as designated and universal mounting.

.6 Metal Halide lamps shall be coated unless otherwise indicated.

2.4 Ballasts and Accessories

.1 Provide ballasts and accessories as indicated.

.2 Provide ballasts with non-PCB type capacitors with pressure sensitive devices to prevent rupturing.

.3 Provide fluorescent ballasts of 120 and 347 V design, automatic reset thermal protected, 90% power factor, group A noise rating. Ballasts to be Phillips/Advance Mark III.

.4 Fluorescent ballast: CBM certified, energy efficient electronic type, design. (Hybrid type not acceptable).
.1 Rating: 60 Hz, voltage as indicated, for use with 2-32 W, T-8, rapid start lamps.
.2 Totally encased and designed for 40 deg C ambient temperature.
.3 Power factor: minimum 90% with 95% of rated lamp lumens.
.4 Capacitor: non PCB, thermally protected.
.5 Thermal protection: non-resettable auto reset on coil.
.6 Sound rated: A.
.7 Mounting: remote integral with luminaire.
.8 Total harmonic distortion less than 20%.
.9 Ballast must be listed by Manitoba Hydro as acceptable by their "Power Smart" rebate program.
.10 Line amperes for ballast with two 4-foot T-8 lamps to be 0.6 Amps at 120 V maximum, 68 VA. volt-amperes for ballast with four 4-foot T-8 lamps to be 1.0 Amps at 120V maximum.

.5 Ballasts for high intensity discharge lamps shall be, HPF, auto-regulator type.

.6 Ballasts used in exterior luminaires shall be rated at -20 deg. C starting.

PART 3 - EXECUTION

3.1 Installation

.1 Install luminaires at locations indicated, c/w lamps, all wiring, connections, fittings, hangers, aligners, box covers and accessories, as required.

.2 Install luminaires and lens materials in architectural details, as indicated.

.3 Install luminaires parallel with building lines. Wall mounted luminaires to be installed plumb.

.4 Review all ceiling types, construction details and mounting arrangements before placing luminaire orders and ensure that all mounting assemblies, frames, rings and similar features are included for and match the required installation.

.5 All luminaires and assemblies shall be properly secured and supported. Support luminaires independent of the ceiling construction c/w all fasteners, framing and hangers as may be required. Do not secure luminaires to mechanical ductwork or other vibration producing apparatus, unless specifically detailed on the drawings.

.6 Where luminaires are suspended from ceilings using self-aligning box covers and additional ground wire from the outlet box to the luminaires shall be provided.

.7 Co-ordinate the installation of luminaires with the work of other trades, ensuring that the necessary depths and mounting spaces are provided. Luminaires which cannot be installed due to a conflict with structural members, pipes or ductwork shall be relocated to a more suitable location, as directed by the Contract Administrator.

3.2 Wiring

.1 Connect luminaires to lighting circuits as indicated.

3.3 Lamps

.1 Adjust lamp position in adjustable lampholder type luminaires to produce the proper beam distribution for the specified lamp.

3.4 Tests

.1 Perform tests in accordance with Section 16010.

3.5 Cleaning

.1 Prior to take-over of the project, clean the lenses and reflectors of all luminaires with a damp cloth to remove dust, smudges and fingerprints.

END

PART 1 - GENERAL

1.1 Related Work Specified Elsewhere

.1 Electrical General Requirements — Section 16010

1.2 Design Criteria

.1 Modify exist TTI transfer switch by adding pre-transfer relay to signal elevator to stop prior to transfer from emergency power back to utility power. Elevator shall resume normal operation after transfer to utility power.

1.3 Shop Drawings

.1 Submit shop drawings in accordance with Section 16010.

.2 Include:
.1 Single line diagram and wiring schematics showing controls, relays, etc.
.2 Description of equipment operation including:

1.4 Operation and Maintenance Data

.1 Technical data:
.1 Schematic diagram of components, controls and relays.
.2 Illustrated parts lists with parts catalogue numbers.
.3 Certified copy of factory test results.

1.5 Source Quality Control

.1 Complete equipment, including transfer mechanism, controls, relays and accessories factory assembled and tested.

.2 Tests:
.1 Operate equipment both mechanically and electrically to ensure proper performance.

PART 2 - PRODUCTS

2.1 Accessories

.1 For each elevator controller, provide the following auxiliary contacts:
.1 One auxiliary contact that is closed except for an adjustable period of time (0 to 50 seconds adjustment, set initially at 15 seconds) prior to power supply transfer in either direction, from normal to emergency or from emergency to normal.

PART 3 - EXECUTION

3.1 Installation

.1 Locate, install and connect pre-transfer relay.

3.2 Field Quality Control

.1 Factory trained and authorized technician of the transfer switch manufacturer shall set up, test and commission the automatic transfer switch pre-tender controls.

.2 Perform tests in accordance with Section 16010 - Electrical General Requirements.

END

PART 1 - GENERAL

1.1 Related Work Specified Elsewhere

.1 Electrical General Requirements — Section 16010

.2 Conduit — Section 16111

.3 Wire and Cable — Section 16122

.4 Outlet Boxes and Fittings — Section 16132

1.2 References

.1 CAN/ULC-S524-M86 Installation of Fire Alarm Systems

.2 ULC-S525-1978 Audible Signal Appliances, Fire Alarm

.3 CAN/ULC-S527-M87 Control Units, Fire Alarm

.4 ULC-S528-1978 Manually Actuated Signalling Boxes, Fire Alarm

.5 CAN/ULC-S529-M87 Smoke Detectors, Fire Alarm

.6 ULC-S530-1991 Heat Actuated Fire Detectors, Fire Alarm

.7 CAN/ULC-S531-M87 Smoke Alarms

.8 CAN/ULC-S536-M86 Inspection and Testing of Fire Alarm Systems

.9 CAN/ULC-S537-M86 Verification of Fire Alarm Systems

1.3 Description of System

.1 Existing Simplex fire alarm system to remain. Extend existing system as required.

1.4 Requirements of Regulatory Agencies

.1 Manitoba Building Code.

.2 Local & Municipal By-laws.

.3 Authorities having jurisdiction.

1.5 Shop Drawings

.1 Submit shop drawings in accordance with Section 16010.

.2 Include:
  .1 Layout of equipment.
  .2 Zoning.
  .3 Complete wiring diagram, including:
    .1 Connections to devices
    .2 Connections to sprinkler system
    .3 Schematics of modules

PART 2 - PRODUCTS

2.1 Materials

.1 Equipment and devices: ULC listed and labelled and supplied by Simplex, to match existing.

.2 Power supply: to CAN/ULC-S524.

.3 Audible signal devices: to ULC-S525.

.4 Control unit: to CAN/ULC-S527.

.5 Manual fire alarm stations: to ULC-S528.

.6 Thermal detectors: to ULC-S530.

.7 Smoke detectors: to CAN/ULC-S529.

.8 Smoke alarms: to CAN/ULC-S531.

2.2 As-Built Riser Diagram

.1 Update existing system riser diagrams.

PART 3 - EXECUTION

3.1 Installation

.1 Install systems in accordance with CAN/ULC-S524.

.2 Locate and install manual alarm stations and connect to alarm circuit wiring.

.3 Locate and install detectors and connect to alarm circuit wiring. Do not mount detectors within 1 m of air outlets. Maintain at least 600 mm radius clear space on ceiling, below and around detectors. Locate duct type detectors in straight portions of ducts and as recommended by manufacturer.

.4 Connect alarm circuits to main control panel.

.5 Install end-of-line devices at end of alarm and signalling circuits mounted 1800 mm AFF.

.6 Update exist remote annunciator panels and connect to annunciator circuit wiring.

.7 Sprinkler system: wire alarm and supervisory switches and connect to control panel.

.8 This contact shall install in EMT conduit the complete fire alarm system as specified and as indicated on the drawings.

.9 Signal circuits shall be wired in parallel with (min) #14 AWG conductors.

3.2 Field Quality Control

.1 Perform tests in accordance with Section 16010 - Electrical General Requirements and CAN/ULC-S537.

.2 Fire alarm system:
.1 Test each device and alarm circuit to ensure manual stations, thermal and smoke detectors sprinkler system transmit alarm to control panel and actuate first stage alarm general alarm ancillary devices.
.2 Check annunciator panels to ensure zones are shown correctly.
.3 Simulate grounds and breaks on alarm and signalling circuits to ensure proper operation of trouble signals.

END

PART 1 - GENERAL

1.1 Related Work Specified Elsewhere

.1 Basic Electrical Materials and Methods — Section 16010

.2 Conduit — Section 16111

.3 Wire and Cables — Section 16122

.4 Motor Control Centres — Section 16820

1.2 Shop Drawings and Product Data

.1 Submit shop drawings in accordance with Section 01300 - Submittals.

.2 Indicate:
.1 Mounting method and dimensions.
.2 Starter size and type.
.3 Layout of identified internal and front panel components.
.4 Enclosure types.
.5 Wiring diagram for each type of starter.
.6 Interconnection diagrams.

1.3 Operation and Maintenance Data

.1 Provide operation and maintenance data for motor starters for incorporation into manual specified in Section 01300 - Submittals.

.2 Include operation and maintenance data for each type and style of starter.

1.4 Maintenance Materials

.1 Provide maintenance materials in accordance with Section 16010.

.2 Provide listed spare parts for each different size and type of starter:
.1 4 contacts, stationary.
.2 4 contacts, movable.
.3 2 contacts, auxiliary.
.4 2 control transformers.
.5 2 operating coils.
.6 2 fuses.
.7 10 indicating lamps.
.8 1 HOA kit.

PART 2 - PRODUCTS

2.1 Materials

.1 Starters: EEMAC E14-1.
.1 Half size starters not acceptable.
.2 Provide NEMA rated starters only; IEC rated starters are not acceptable.

2.2 Manual Motor Starters

.1 Single and Three phase manual motor starters of size, type, rating, and enclosure type as indicated, with components as follows:
.1 Switching mechanism, quick make and break.
.2 Overload heaters, manual reset, trip indicating handle.

.2 Accessories:
.1 Toggle switch labelled as indicated.
.2 Indicating light: type and colour as indicated.
.3 Locking tab to permit padlocking in "ON" or "OFF" position.
.4 Flush mounted type in public areas or as indicated.

2.3 Full Voltage Magnetic Starters

.1 Magnetic of size, type, rating and enclosure type as indicated with components as follows:
.1 Contactor solenoid operated, rapid action type.
.2 Motor overload protective device in each phase, manually reset from outside enclosure.
.3 Power and control terminals.
.4 Wiring and schematic diagram inside starter enclosure in visible location.
.5 Identify each wire and terminal for external connections, within starter, with permanent number marking identical to diagram.
.6 Control transformer.
.7 Starters to be two speed where required; type to match requirement of motor provided by Division 15.

.2 Accessories:
.1 Pushbuttons and Selector switches: labelled as indicated.
.2 Indicating lights: type and color as indicated.
.3 2-N/O and 2-N/C spare auxiliary contacts unless otherwise indicated.
.4 HOA selector switch.
.5 Two speed single winding starters shall have individual Red run pilot lights for LOW and HIGH speed run indication.
.6 An adjustable 20 sec. - 3 min. time delay relay (set at 30 sec.) shall be installed in two speed starters. It shall function only during the transition from HIGH SPEED to LOW SPEED where the

motor will be in a de-energized state for a period of 30 seconds after initiation of this switching.
.7 Provide and install time delay relay (to sequence starting after power failure) adjustable 0 - 120 seconds for motors 15 horsepower and larger.

2.4 Control Transformer

.1 Single phase, dry type, control transformer with primary voltage as indicated and 120V secondary, complete with secondary fuse, installed in starter as indicated.

.2 Size control transformer for control circuit load plus 20% spare capacity.

2.5 Finishes

.1 Apply finishes to enclosure in accordance with Section 16010 - Electrical - General Provisions.

2.6 Equipment Identification

.1 Provide equipment identification in accordance with Section 16010 - Electrical - General Provisions.

.2 Manual starter designation label, white plate, black letters, size 1, engraved as indicated.

.3 Magnetic starter designation label, white plate, black letters, size 4 engraved as indicated.

2.7 Manufacturers

.1 Acceptable manufacturers: Allen Bradley Canada Ltd.; Cutler Hammer Canada Ltd.; "System 89" Siemens Electric Limited; Square D.

.2 All manufacturers shall provide their industrial quality product line; commercial quality starters are not acceptable.

PART 3 - EXECUTION

3.1 Installation

.1 Install starters, connect power and control as indicated.

.2 Ensure correct fuses and overload devices elements installed.

.3 All starters for two speed motors to be provided with six pole disconnect switches and wired with six conductors. Refer to motor schedule and drawings for two speed motors.

3.2 Tests

.1 Perform tests in accordance with Section 16010 - Electrical - General Requirements and manufacturer's instructions.

.2 Operate switches, contactors to verify correct functioning.

.3 Perform starting and stopping sequences of contactors and relays.

.4 Check that sequence controls, interlocking with other separate related starters, equipment, control devices, operate as indicated.

.5 Ensure motor rotation corresponds with the direction required by the driven equipment.

END

PART 1 - GENERAL

1.1 Card Access Control System (CACS)

.1 The existing card access control system (CACS) as herein specified shall be modified/added to by the card access control subcontractor (Servo Electronics). Alternate techniques, modifications, or changes to any aspect of these specifications are not acceptable.

1.2 Scope

.1 The existing CACS herein specified shall be modified/added to and installed by the card access control subcontractor. The CACS shall include all computer software and hardware, operator input/output devices, door processing units and readers. (Type to match existing).

.2 The existing south bank of elevators has an existing single card reader located in the main floor elevator lobby to allow staff with appropriate reader card to enable the elevator hall call buttons on weekends and after normal business hours. This section shall supply and install nay required relays at the new elevator controllers and extension of existing card reader controller inputs, etc. as required to maintain present system function.

.3 The existing north bank of elevators has an existing single card reader located in each elevator lobby to allow staff with appropriate reader card to enable the elevator hall call buttons. This section shall supply and install any required relays at the new elevator controllers and extension of existing card reader controller inputs, etc, as required to maintain present system function.

END