PART 1 GENERAL

1.1 RELATED SECTIONS

.1 Include in electrical section, provision of labour, new materials, tools, transportation, services and facilities for a complete electrical installation. The installation shall be left complete in all respects and ready for operation to the complete satisfaction of the responsible Professional Engineer.

.2 The electrical scope of work includes, but is not necessarily limited to the following provisions:

- .1 Provisions of new normal building distribution system including metering, panelboards, disconnect switches, and wiring devices.
- .2 Provision of a complete coordinated telephone system extension including a complete conduit raceway system. Provide BIX field and wiring from BIX field to voice patch panel. Include outlet covers, jacking testing and all associated utility contribution charges.
- .3 Provision of lighting, associated control and branch circuitry. (See Luminaire Schedule for details).
- .4 Provision of code conforming exit signage and emergency lighting fed from emergency battery banks. Interlock with normal lighting in the area to activate upon loss of normal lighting.
- .5 Provision of receptacles and branch circuitry as indicated on the drawings and as per code.
- .6 Provision of power supply to all mechanical equipment. Mechanical equipment to be supplied by others. Provide all line voltage control wiring. (See Motor Schedule and Mechanical drawings for details).
- .7 Provision of power connections to owners equipment including shop equipment, auto lift, air compressor, washers, dryers, and all other appliances and equipment.
- .8 Provide complete electrical demolition of the affected existing space. Refer to architectural for extent. Visit site prior to tender close to confirm extent of electrical demolition.
- .9 Co-ordinate all utility work. Provide mounting accessories, cabinets and meter sockets. Owner to pay all utility contribution charges.

PART 1 GENERAL

1.1 CODES AND STANDARDS

.1 Do complete installation in accordance with the latest edition of CSA C22.1 as amended by the Manitoba Building Code and all local Electrical by-laws, except where specified otherwise.

.2 Comply with CSA Electrical Bulletins in force at time of tender submission, while not identified and specified by number in this Division, are to be considered as forming part of related CSA Part II standard.

.3 Do overhead and underground systems in accordance with C22.3No.1-M1979 except where specified otherwise.

.4 Do complete installation in accordance with latest Electrical Bulletins of the supply authority and local inspection authority. Comply with all additional requirements of local inspection authority.

.5 Abbreviations for electrical terms: to CSA Z85-1963

1.2 PERMITS, FEES

.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 associated fees.

.3 Architect will provide drawings at no cost.

1.3 SHOP DRAWINGS, PRODUCT DATA AND SAMPLES

.1 Submit shop drawings, product data and samples as requested by Engineer.

.2 Indicate details of construction, dimensions, capacities, weights and electrical performance characteristics of equipment or material.

.3 Where applicable, include wiring, single line and schematic diagrams.

.4 Include wiring drawings or diagrams showing interconnection with work of other Sections and Divisions.

.5 Include shop drawings for all electrical items and equipment including wiring devices, motor starters, distribution equipment, luminaires, etc.

1.4 OPERATION AND MAINTENANCE DATA

.1 Provide operation and maintenance data for incorporation into maintenance manual.

.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 installation.

.2 Technical data, product data, supplemented by bulletins, component illustrations, exploded views, technical descriptions of items, and parts lists. Advertising or sales literature not acceptable.

.3 Wiring and schematic diagrams and performance curves.

.4 Names and addresses of local suppliers for items included in maintenance manuals.

1.5 MAINTENANCE MANUALS

.1 Provide 3 maintenance manuals which include fire alarm verification inspection report and local inspection authority Certificate of Inspection.

1.6 CARE, OPERATION AND START-UP

.1 Installer to be certified in performing work of this section, and have at least 5 years successful experience in this size and type of project, qualified to standards of TIAC.

1.7 VOLTAGE RATINGS

.1 Operating voltages: to CSA C235-1969(R1979).

.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.

.3 Where appliances such as stoves are supplied by other sections, advise the General Contractor in writing of the voltage at the outlet.

1.8 INSPECTION

.1 Furnish a Certificate of Inspection from Inspection Department on completion of work.

1.9 MATERIAL AND EQUIPMENT

.1 Shall be new and CSA approved.

.2 Shall be manufactured in accordance with current CEMA, NEMA, or CSA standards.

.3 Submit a quotation only on the material and equipment specified and as shown on the drawings. Refer to bid instructions in Division 1 of Specification.

.4 Distributers submitting prices to Electrical Contractors shall not group products and materials. Refer to bid instructions in Division 1 of Specification.

.5 Requests for approval of material and equipment, other than those specified on the drawings, refer to bid instructions in Division 1 of Specification. Requests for approval shall be submitted with complete details of the construction and performance of the materials and equipment. Requests submitted without sufficient supporting information shall be rejected.

.6 Materials and equipment of the same classification, type of function, shall be provided by the same manufacturer.

1.10 ELECTRICAL MOTORS, EQUIPMENT AND CONTROLS

.1 Power wiring to all equipment, motors or control panels to be performed by Electrical Contractor. Refer to mechanical section.

.2 Mechanical and electrical contractors are responsible for the mutual co-ordination of all electrical requirements of mechanical equipment. Co-ordination is to include the communication of all final electrical nameplate information from the mechanical contractor to the electrical contractor, the communication of the detailed control information as well as any ancillary information required for the final systems to operate as intended by the responsible professional engineer. The co-ordination is to occur prior to the ordering of equipment by either trade. No extra compensation will be allowed due to failure to carry out this coordination. Report at once to the consultant any defect, discrepancies omission or interference affecting the satisfactory completion of work.

1.11 FINISHES

.1 Shop finish metal enclosure surfaces by removal of rust and scale, cleaning, application of rust resistant primer inside and outside, and at least two coats of finish enamel.

.2 Clean and touch up surfaces of shop-painted equipment scratched or marred during shipment or installation, to match original paint.

.3 Clean, prime and paint exposed hangers, racks, fastenings to prevent rusting, unless equipment is constructed of galvanized steel.

1.12 EQUIPMENT IDENTIFICATION

.1 Identify electrical equipment with lamacoid nameplates with black face and white lettering sized to the approval of the Engineer.

.2 Wording on nameplates to be approved prior to manufacture.

.3 Allow for average of twenty-five (25) letters per nameplate.

.4 Identification to be English.

.5 Nameplates for terminal cabinets and junction boxes to indicate system and/or voltage characteristics.

.6 Identify all electrical equipment such as motor starters, panelboards, distributions, distribution circuit breakers with nameplates.

.7 Identify panel and circuit number on all outlets with lamacoid nameplates.

1.13 WIRING IDENTIFICATION

.1 Identify wiring with permanent indelible identifying markings, either numbered or coloured plastic tapes, on both ends of phase conductors of feeders and branch circuit wiring.

.2 Maintain phase sequence and colour coding throughout.

.3 Colour code: to the latest edition of CSA C22.1.

.4 Use colour coded wires in communication cables, matched throughout system.

.5 For each conductor identify at each termination and junction box, the panel and circuit number for power circuits and zone for fire alarm.

1.14 WIRING TERMINATIONS

.1 Lugs, terminals, screws used for termination of wiring to be suitable for either copper or aluminum conductors.

1.15 MANUFACTURERS AND CSA LABELS

.1 Manufacturers nameplates and CSA labels to be visible and legible after equipment is installed.

1.16 WARNING SIGNS

.1 Provide warning signs, as specified or to meet requirements of Inspection Department and Engineer.

1.17 LOCATION OF OUTELTS

.1 Make all necessary adjustments after interior finishes are completed.

.2 Do not install outlets back-to-back in wall; allow minimum 150 mm horizontal clearance between boxes.

.3 Change location of outlets at no extra cost or credit, providing distance does not exceed 4m and information is given before installation.

.4 Locate light switches on latch side of doors. Locate disconnect devices in mechanical rooms on latch side of door. Confirm direction of door swing on Architectural drawings prior to installation.

1.18 MOUNTING HEIGHTS

.1 Mounting height of equipment is from finished floor to centreline of equipment unless specified or indicated otherwise.

.2 If mounting height of equipment is not indicated verify before proceeding with installation.

.3 Confirm luminaire locations with Architect prior to rough-in.

.4 Install electrical equipment at the following heights unless indicated otherwise.

- .1 Local switches: 1200 mm.
- .2 Wall receptacles:
  - .1 General: 400 mm.
  - .2 Above top of counters or splash back: 200 mm.
  - .3 In mechanical rooms: 1400 mm.
- .3 Panelboards: 1200 mm or as required by Code.
- .4 Telephone outlets: 400 mm.
- .5 Fire alarm stations: 1200 mm.
- .6 Fire alarm audible devices: 2000 mm.
- .7 Fire alarm silencable audible devices: 1200mm.
- .8 Television outlets: 400 mm (unless wall mounted - refer to architectural)
- .9 Clocks: 2000 mm.
- .10 In accordance with accessibility guidelines.

1.19 PROTECTION

.1 Protect exposed live equipment during construction for personnel safety.

.2 Shield and mark live parts "LIVE 120 VOLTS", or with 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.

1.20 LAOD BALANCE

.1 Measure phase current to panelboards with normal loads (lighting) operating at time of acceptance. Adjust branch circuit connections as required to obtain best balance of current between phases and record changes.

1.21 CONDUIT AND CABLE INSTALLATION

.1 All penetrations through exterior walls are to be made water and weatherproof.

1.22 FIRE PROOFING

.1 Where cables or conduits pass through floors and fire rated walls, complete integrity of wall type to the satisfaction of the Engineer and local inspection authority.

.2 All emergency feeders and control wires to be 2 hour rated via use of mineral insulated cables or equivalent fireguard application by electrical section.

1.23 TEST/STUDIES

.1 Conduct and pay for tests and studies of the following where applicable:

.1 Power distribution system including GenSet (to CSA C282), 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, communications, security systems.

.2 Furnish manufacturer's, certificate or letter confirming that entire installation as it pertains to each system has been installed to manufacturers instructions.

.3 Carry out tests in presence of Engineer. Notify Engineer two days prior to testing.

.4 Provide instruments, meters, equipment and personnel required to conduct tests during and at conclusion of project.

.5 Submit test results.

1.24 INSULATION RESISTANCE TESTING

.1 Megger circuits, feeders and equipment up to 350 V with a 500 V instrument.

.2 Megger 350-600 V circuits, feeders and equipment with a 1000 V instrument.

.3 Check resistance to ground before energizing.

1.25 CO-ORDINATE OF PROTECTIVE DEVICES

.1 Ensure circuit protective devices such as overcurrent trips, relays, fuses, are installed to values and settings as indicated. Co-ordinate overcurrent protection short circuit interrupting capacity with utility. Ratings to the satisfaction of the Engineer.

1.26 CLEANING

.1 Clean all outlets, cabinets, enclosures, tubs and similar electrical equipment of all construction dust and dirt.

.2 At time of final cleaning, clean lighting reflectors, lenses, and other lighting surfaces that have been exposed to construction dust and dirt.

.3 Clean all coverplates and insure all paint is removed from wiring devices, panels, luminaires and other electrical equipment.

1.27 EXCAVATING AND BACKFILLING

.1 Not used.

1.28 GUARANTEE

.1 The Electrical Contractor shall guarantee the satisfactory operation of all work and apparatus included and installed under this section of the specification.

.2 Replace forthwith at no additional material, or labour cost any part which may fail or prove defective within a period of twelve (12) calendar months after the final acceptance of the complete building, provided that such failure is not due to improper usage, or ordinary wear and tear.

.3 No certificate given payment made, partial or entire use of the equipment by the Owner, shall be construed as acceptance of defective work.

.4 This general guarantee shall not act as a waiver of any specified guarantee for any greater length of time

1.29 CUTTING AND PATCHING

.1 Pay all costs for cutting and patching required for the installation of electrical work, unless otherwise noted.

.2 Assume full responsibility for laying out electrical work and for any damage caused by incorrectly located equipment or improper performance of this work.

.3 Study the architectural plans and co-operate with other trades so that the elevation of all outlets shall not necessitate any unnecessary cutting of dados, mirrors, tiles or other construction material. If this is not done, the Electrical Contractor may be required by the Engineer to move these outlets at no additional cost to Owner (including repair).

1.30 CO-OPERATION

.1 Schedule execution of work with associated work specified in other Divisions. Check shop drawings of other sections prior to electrical rough-in to co-ordinate physical and electrical requirements. Adjust as required.

1.31 DRAWINGS

.1 Carefully examine all drawings and specifications relating to the work to be certain that the work under this contract can be satisfactorily carried out, examine the work of the other trades and report at once to the Engineer, any defect, discrepancy, omission or interference affecting the work of section or the warranty of same. Refer to bid instruction in Div 1 of Specification.

.2 The drawings accompanying these specifications are intended to show the general arrangement and extent of the work to be done, but the exact location and arrangement of all parts shall be determined as the work progresses. The location of the outlets, equipment, 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, mechanical or architectural conditions. Such changes shall be made by the Electrical Contractor, as directed by the Engineer without additional charge.

.3 .At completion of project, provide a complete print of revisions, changes and conduit location as-built drawings to the satisfaction of the responsible Professional Engineer. Provide AutoCAD .dwg files of all changes, revisions, and conduit layouts suitable for printing drawing size reproductions of electrical drawings. Engineer will provide .dwg copies of original electrical drawings.

1.32 SPARE PARTS

.1 Provide the following spare parts:

.1 .Lighting: 10% of all lamps, 5% of all ballasts.

.2 Fire alarm: (1) manual pull station c/w cover, (1) audible/visual device, (1) smoke detector (1) heat detector.

1.33 EXISTING CONDITIONS

.1 the Electrical Contractor shall visit the site and ascertain that all work indicated can be carried out without additional cost to the Owner.

.2 The Electrical Contractor shall take into account items which he is responsible for due to the changes and alterations to the existing building and allow for such items that may occur in his tendered price. The Electrical Contractor is to notify the supply utility of all load increases to existing service.

.3 Rewire, alter, modify, divert and extend existing wiring as herein specified and as may be required to provide a complete, approved, and fully operative installation to the satisfaction of the Engineer.

.4 In all areas where existing walls, ceilings, etc. are required to be cut into or removed, or other similar construction or alterations are required, existing wiring in the areas required to remain in use for any reason, this contractor shall reroute, alter, and/or divert all such wiring in these areas in an approved manner, concealed in the building structure where required in such a manner that the original electrical capacity or characteristics of the existing wiring is maintained to the complete satisfaction of the engineer.

.5 Conduits and boxes shall be installed exposed (surface mounted) only in areas specified.

.6 Cutting and patching necessary for conduit work, etc., shall be as specified in another section of this contract. Routes of conduits, etc. shall be coordinated with the owner and engineer in order to keep such cutting and patching to a minimum. All existing wiring that is required to remain in use and required to be diverted and extended to appropriate existing panelboards, etc., shall be installed in conformance with this specification.

.7 Existing branch circuit wiring within the areas of the renovations which are substandard or do not meet normal requirements, shall be noted and owner advised. All existing

circuits which are required to be reconnected shall be free from interconnection (cross connected circuits, i.e. accidentally connected to the conductors of another circuit) and shall conform to the installation tests described elsewhere in this section of the specification. The responsibility for existing wiring which is not required to be altered in any way is beyond the area of this contract and is not included in this scope of work unless such wi is specifically affected due to work carried out in this contract.

.8 Existing branch circuit wiring and outlets, etc. for any electrical systems no longer required to remain in use shall be removed, or if this is not possible, rendered permanently inaccessible and completely disconnected from the electrical distribution system. Existing branch circuit wiring which unnecessarily extends into the construction area shall be terminated (deadened) in an approved manner.

.9 Disconnect and remove all existing lighting fixtures as specified and noted on drawings. All fixtures shall be neatly stored on the premises at the location as directed by the owners. Once the new ceiling is complete, the electrical subcontractor shall clean and reinstall fixtures to the location specified. Provide all mounting hardware as required.

.10 Disconnect and remove existing ceiling mounted electrical devices for the construction of new ceiling. Once new ceiling is complete, reinstall and reconnect to original locations and circuits.

PART 1 GENERAL

1.1 RELATED WORK

.1 Wire and Cable: Section 26 05 21.

.2 Outlet Boxes: Section 26 05 32.

PART 2 PRODUCTS

2.1 MATERIALS

.1 Connectors complete with locking bushings for armoured cable.

.2 Aluminum "wet" type or "dry" type for aluminum sheathed cable depending on application.

.3 Wet type connectors for sealtite flexible conduit

PART 3 EXECUTION

3.1 INSTALLATION

.1 Remove insulation carefully from ends of conductors and:

.1 Install connector in box.

.2 Install conductor in connector and tighten. Complete joints inside box using Marrette type connectors.

PART 1 GENERAL

1.1 RELATED WORK SPECIFIED ELSEWHERE

.1 Conduit: Section 26 05 34.

PART 2 PRODUCTS

2.1 MATERIALS

.1 Conductors: stranded for 8 AWG and larger.

.2 Copper conductors sized as indicated with minimum size to be #12 AWG rated R75: to CSA C22.2 No. 0.3-M96.

.3 Copper conductors with minimum size #18 AWG for fire alarm initiating circuits only

2.2 ARMOURED CABLES

.1 Insulated conductors copper, sizes as indicated.

.2 Type AC75: to CSA C22.2 No.51-1968.

.3 Armour: interlocking type fabricated from aluminum strip.

.4 Minimum size: 12 AWG

2.3 ALUMINUM SHEATHED CABLE

.1 Conductors: copper sized as indicated.

.2 Insulation: type RA75 rated 75°C at 600 V.

.3 Sheath: aluminum applied to form continuous corrugated seamed sheath.

.4 Outer jacket of pvc applied over sheath for direct burial and wet locations.

2.4 FASTENINGS

.1 Two hole aluminum straps to secure surface cables.

.2 Channel type supports for two or more conductors.

.3 6 mm diam threaded rods to support suspended channels

PART 3 EXECUTION

3.1 INSTALLATION

.1 Pressure testing of equipment and adjacent piping systems complete, witnessed and certified.

.2 Surfaces clean, dry, free from foreign material.

3.2 INSTALLATION

.1 Install wiring as follows:

.1 In conduit systems in accordance with Section 26 05 34.

.2 Armoured Cables shall be installed only where permitted in lieu of flexible conduit as indicated in Section 26 05 34.

.3 Armoured cable shall not be surface run.

.4 Home runs to panelboards shall not be armoured cable.

.5 Group aluminum sheathed cables wherever possible on channels.

.6 Terminate cables in accordance with manufacturers instructions and to the satisfaction of the local inspection authority.

.7 In conformance with wire manufacturers recommendations.

PART 1 GENERAL

PART 2 PRODUCTS

2.1 MATERIALS

.1 Grounding equipment to: CSA C22.2No.41 1950(R1967).

.2 Copper grounding conductors to: ASA G7.1- 1964.

2.2 EQUIPMENT

.1 Clamps for grounding of conductor, size as required to electrically conductive underground water pipe or ground rods as required by inspection authority.

.2 System and circuit, equipment, grounding conductors, bare stranded copper, soft annealed, size as required.

.3 Insulated grounding conductors to Section 26 05 21 - Wires and Cables (0-1000V).

.4 Non-corroding accessories necessary for grounding systems, type, size, material as required, including but not necessarily limited to:

.1 Grounding and bonding bushings.
.2 Thermit welded type conductor connectors.
.3 Bolted type conductor connectors.
.4 Bonding jumpers, straps.

2.3 MANUFACTURERS

.1 Acceptable manufacturers: Burndy, Cadweld.

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 Engineer and local authority having jurisdiction over installation. Where EMT is used, run ground wire in conduit.

.2 Install connectors to manufacturers instructions.

.3 Protect exposed grounding conductors from mechanical injury.

.4 Make buried connections, and connections to conductive water main, electrodes, using copper welding by thermit process

.5 Use mechanical connectors for grounding connections to equipment provided with lugs.

.6 Soldered joints not permitted.

.7 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.

.8 Install separate ground conductor, to outdoor lighting standards.

3.2 ELECTRODES

.1 Make ground connections to ground grid.

.2 Install rods as required by local inspection authority. Provide all grounding as per local inspection authority requirements.

3.3 TESTS

.1 Perform tests in accordance with Section 260501.

.2 Perform ground continuity and resistance tests using method appropriate to site conditions and to approval of Engineer and local authority having jurisdiction over installation.

.3 Perform tests before energizing electrical system.

.4 Disconnect ground fault indicator during tests.

PART 1 GENERAL

1.1 RELATED WORK

.1 Electrical General Requirements: Section 26 05 01.

PART 2 PRODUCTS

2.1 SUPPORT CHANNELS

.1 U shape, size 38mm x 38mm, 25mm thick, surface mounted, suspended, set in poured concrete walls and ceilings as required.

2.2 MANUFACTURERS

.1 Acceptable manufacturers: Burndy, Electrovert, Unistrut.

2.3 FASTENING

.1 Lead anchors or nylon shields to secure equipment and conduit straps.

PART 3 EXECUTION

3.1 INSTALLATION

.1 Secure fastenings and supports as required for each type of equipment, cables and conduits and to manufacturers installation recommendations.

PART 1 GENERAL

1.1 SHOP DRAWINGS AND PRODUCT DATA

.1 Submit shop drawings and product data for cabinets in accordance with Section 26 05 01.

PART 2 PRODUCTS

2.1 SPLITTERS

.1 Sheet metal enclosure, welded corners and formed hinged cover suitable for locking in closed position.

.2 Main and branch lugs to match required size and number of incoming and outgoing conductors as indicated.

.3 At least three spare terminals on each set of lugs in splitters less than 400 A.

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 Provide cast junction boxes for all exterior/weatherproof and surface installations.

PART 3 EXECUTION

3.1 SPLITTER INSTALLATION

.1 Install splitters as indicated 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 Provide pull boxes so as not to exceed 30 m of conduit run between pull boxes.

3.3 IDENTIFICATION

.1 Install size 2 identification labels indicating system name voltage and phase in accordance with Section 26 05 01.

PART 1 GENERAL

1.1 RELATED WORK

.1 Box connectors: Section 26 05 20.

PART 2 PRODUCT

2.1 OUTLET AND CONDUIT BOXES GENERAL

.1 Size boxes in accordance with the latest edition of CSA C22.1, Section 12-3042.

.2 102 mm square or larger outlet boxes as required for special devices.

.3 Gang boxes where wiring devices are grouped.

.4 Blank cover plates for boxes without wiring devices.

2.2 SHEET STEEL OUTLET BOXES

.1 Electro-galvanized steel single and multi gang flush device boxes for flush installation, minimum size 76 x 50 x 38 mm or as required. 102 mm square outlet boxes when more than one conduit enters one, side with extension and plaster rings as required.

.2 Electro-galvanized steel utility boxes for outlets connected to surface-mounted EMT conduit, minimum size 102 x 54 x 48 mm.

.3 102 mm square or octagonal outlet boxes for lighting fixture outlets.

.4 102 mm square outlet boxes with extension and plaster rings for flush mounting devices in finished plaster or tile walls.

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 CONDUIT BOXES

.1 Cast FS boxes with factory-threaded hubs and mounting feet for surface wiring of switches and receptacle in exterior or wet or Class 1 areas.

2.6 FITTINGS – GENERAL

.1 Bushing and connectors with nylon insulated throats.

.2 Knock-out fillers to prevent entry of foreign materials.

.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.

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 construction material.

.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 not allowed.

.5 Provide continuous vapour barrier for outlet boxes located on exterior walls or ceilings.

PART 1 GENERAL

1.1 LOCATION OF CONDUIT

.1 Drawings do not show all conduits. Those shown are in diagrammatic form only.

PART 2 PRODUCTS

2.1 CONDUITS

.1 Rigid galvanized steel threaded conduit: size as indicated or required; to CSA C22.2 No.45

.2 Electrical metallic tubing (EMT), with couplings to CSA22.2 No.83

.3 Rigid pvc conduit: size as indicated; to CSAC22.2 No.136

.4 Flexible metal conduit and liquid-tight flexible metal conduit: size as indicated; to CSAC22.2 No. 56.

2.2 CONDUIT FASTENINGS

.1 One hole steel straps to secure surface conduits 50 mm and smaller (except where otherwise noted). Two hole steel straps for conduits larger than 50 mm.

.2 Beam clamps to secure conduits to exposed steel work.

.3 Channel type supports for multiple conduits.

.4 6 mm dia threaded rods to support suspended channels.

2.3 CONDUIT FITTINGS

.1 Fittings manufactured for use with conduit specified.

.2 Factory "ells" where 90° bends are required for 25 mm and larger conduits.

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, and in unfinished areas or as otherwise noted.

.3 Use electrical metallic tubing (EMT) unless otherwise noted.

.4 Use rigid pvc conduit underground, unless otherwise prohibited or noted.

.5 Use flexible metal conduit or AC75 for connection to motors in dry areas, connection to recessed incandescent fixtures without a prewired outlet box, connection to surface or recessed fluorescent fixtures, work in movable metal partitions.

.6 Use liquidtight flexible metal conduit for connection to motors in damp or wet locations.

.7 Bend conduit cold. Replace conduit if kinked or flattened more than 1/10th of its original diameter.

.8 Mechanically bend steel conduit over 19 mm dia.

.9 Field threads on rigid conduit must be of sufficient length to draw conduits up tight.

.10 Install polypropylene fish cord in empty conduits.

.11 Run 2-25mm spare conduits up to ceiling space and 2-25mm spare conduits down to ceiling space from each flush panel. Terminate these conduits in 150mm x 150mm x 100mm junction boxes in ceiling space or in case of an exposed concrete slab, terminate each conduit in a flush concrete surface type box.

.12 Where conduits become blocked, remove and replace blocked section.

.13 Dry conduits out before installing wire.

.14 Minimum conduit size to be 19mm.

3.2 SURFACE CONDUITS

.1 Run parallel or perpendicular to building lines.

.2 Run conduits in flanged portion of structural steel.

.3 Group conduits wherever possible on suspended surface channels.

.4 Do not pass conduits through structural members except as indicated.

3.3 CONCEALED CONDUITS

.1 Do not install horizontal runs in masonry walls.

.2 Do not install conduits in terrazo or concrete toppings.

3.4 CONDUITS IN POURED CONCRETE

.1 Locate to suit reinforcing steel. Install in centre one third of slab.

.2 Protect conduits from damage where they stub out of concrete.

.3 Install sleeves where conduits pass through slab or wall.

.4 Where conduits pass through waterproof membrane provide oversized sleeve before membrane is installed. Use cold mastic between sleeve and conduit.

.5 Encase conduits completely in concrete.

.6 Co-ordinate electrical work and requirements in poured construction with General Contractor and insure installation is complete prior to pour.

3.5 CONDUITS IN POURED SLABS ON GRADE

.1 Run conduits 25mm and larger below slab and encased in 75mm concrete envelope. Provide 50mm of sand over concrete envelope below floor slab.

3.6 CONDUITS UNDERGROUND

.1 Slope conduits to provide drainage.

.2 Waterproof joints (pvc excepted) with a heavy coat of bituminous paint.

PART 1 GENERAL

1.1 SHOP DRAWINGS

.1 Submit shop drawings in accordance with Section 26 05 01.

.2 Drawings to include electrical detail of panel, branch breaker type, quantity, ampacity and enclosure dimension.

1.2 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 C22.2No.29-1955.

.2 Panelboards to be product of one manufacturer.

.3 250 and 600 V panelboards: bus and breakers rated for available (symmetrical) interrupting capacity or as indicated.

.4 Sequence phase bussing with breakers numbered as shown on drawings, with each breaker identified by permanent number identification as to circuit number.

.5 Panelboards: mains, number of circuits, and number and size of branch circuit breakers as indicated.

.6 Two keys for each panelboard and key panelboards alike.

.7 Copper bus with full size neutral.

.8 Mains suitable for bolt-on breakers.

.9 Finish trim and door baked grey enamel.

.10 Sprinkler proof.

2.2 CUSTOM BUILT PANELBOARDS

.1 Upstream circuit breaker on mains as indicated.

.2 Double stack panels as indicated

2.3 BREAKERS

.1 Breakers to Section 26 28 21.

.2 Breakers with thermal magnetic tripping in panelboards except as indicated otherwise.

.3 Main breaker: separately mounted on top or bottom of panel to suit cable entry.

.4 Lock-on devices for receptacles, fire alarm, emergency, door supervisory, intercom, stairway, exit and night light circuits.

2.4 EQUIPMENT IDENTIFICATION

.1 Provide equipment identification in accordance with Section 26 05 01.

.2 Nameplate for each panelboard size 4 engraved as indicated.

.3 Nameplate for each circuit in distribution panelboards size 2 engraved as indicated.

.4 Complete circuit directory with typewritten legend showing location and load of each circuit.

2.5 MANUFACTURERS

.1 Acceptable manufacturers: Cutler-Hammer, Siemens, GE, or to match existing.

PART 3 EXECUTION

3.1 INSTALLATION

.1 Locate panelboards as indicated and mount securely, plumb true and square, to adjoining surfaces.

.2 Install surface mounted panelboards on fireguard backboards. Where practical, group panelboards on common backboard.

.3 Mount panelboards to height given in Section 26 05 01 or as indicated.

.4 Connect loads to circuits as indicated.

.5 Connect neutral conductors to common neutral bus with respective neutral identified.

.6 For flush mounted panelboards, the general contractor is to provide adequate wall depth at no additional cost.

PART 1 GENERAL

1.1 RELATED WORK

.1 Contactors: Section 26 29 01.

1.2 SHOP DRAWINGS AND PRODUCT DATA

.1 Submit shop drawings and product data in accordance with Section 26 05 01.

PART 2 PRODUCTS

2.1 SWITCHES

.1 15 A, 120 V, single pole, double pole, three-way, four-way switches as indicated or required.

.2 Manually-operated general purpose ac switches as indicated and with following features:

- .1 Terminal holes approved for No. 10 AWG 5 mm² wire.
- .2 Silver alloy contacts.
- .3 Urea or melamine molding for parts subject to carbon tracking.
- .4 Suitable for back and side wiring.
- .5 Brick - grey with stainless steel coverplate. Drywall - white with white coverplate.
- .6 Decora Rocker.
- .7 2 year warranty.

.3 Rocker operated fully rated for tungsten filament and fluorescent lamps, and up to 80% of rated capacity of motor loads.

.4 Switches of one manufacturer throughout project.

.5 Devices to be specification grade.

.6 Acceptable manufacturers: Leviton

2.2 RECEPTACLES

.1 Duplex receptacles, CSA type 5-15 R, 125 V, 15 A, U ground, with following features:

- .1 Urea molded housing.
- .2 Suitable for No. 10 AWG 5 mm² for back and side wiring.
- .3 Break-off links for use as split receptacles.
- .4 Eight back wired entrances, four side wiring screws.
- .5 Double wipe contacts and rivetted grounding contacts.

.6 Tamper-resistant (in areas with children).

.7 10 year warranty.

.8 Decora style.

.9 Brick - grey with stainless steel coverplate. Drywall - white with white coverplate. .

.2 Other receptacles with ampacity and voltage as indicated.

.3 Receptacles of one manufacturer throughout project.

.4 Devices to be commercial grade.

.5 Acceptable manufacturers: Leviton .

2.3 SPECIALTY EQUIPMENT

.1 Complete installation shall be to the satisfaction of the Departmental Representative.

.2 Electrical section shall wire and connect all specialty equipment as shown and/or required so as to leave all equipment in an operating condition to the satisfaction of the Engineer, the local inspection authority. Any equipment that is supplied with a cord and cap and is not deemed portable by the Engineer, shall be direct wired at no additional subsequent cost. Electrical section shall supply and install all disconnects, magnetic starters and matching receptacles for equipment not supplied with same. Ampacity, number of conductors of cord and receptacle configuration to match nameplate rating of equipment.

2.4 COVER PLATES

.1 Provide cover plates for all wiring devices.

.2 Cover plates from one manufacturer throughout project.

.3 Sheet steel utility box cover for wiring devices installed in surface-mounted utility boxes.

.4 Stainless steel Decora, for wiring devices mounted in a flush-mounted outlet box.

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 260501 or as indicated.

.2 Receptacles:

.1 Install receptacles in gang type outlet box when more than one receptacle is required in one location.

.2 Mount receptacles at height specified in Section 260501 or as indicated.

.3 Where split receptacle has one portion switched, mount vertically and switch upper portion.

.4 Mount receptacles located in laboratory millwork and above laboratory countertops horizontally.

.3 Cover plates:

.1 Protect cover plate finish with paper or plastic film until painting and other work is finished.

.2 Install suitable common cover plates where wiring devices are grouped.

.3 Do not use cover plates meant for flush outlet boxes on surface-mounted boxes.

PART 1 General

1.1 PRODUCT DATA

.1 Submit product data in accordance with Section 26 05 01.

PART 2 PRODUCTS

2.1 BREAKERS GENERAL

.1 Bolt-on moulded case circuit breaker, quick- make, quick-break type, for manual and automatic operation.

.2 Common-trip breakers with single handle for multipole applications.

.3 Magnetic instantaneous trip elements in circuit breakers, to operate only when the value of current reaches setting.

.4 Integrated instantaneous interrupting capacity to be as required by Engineer and coordinated with utility, but not less that 22KA.

.5 Moulded case circuit breakers: to CSA C22. No. 5 -1963.

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 under overload conditions and instantaneous magnetic tripping for short circuit protection.

2.3 MANUFACTURERS

.1 Acceptable manufacturers; Cutlet Hammer, Siemens, GE, or to match existing.

PART 3 EXECUTION

.1 Install circuit breakers as indicated.

PART 1 General

1.1 PRODUCT DATA

.1 Submit product data in accordance with Section 26 05 01.

PART 2 PRODUCTS

2.1 EQUIPMENT

.1 Enclosed manual air break switches in non- hazardous locations: to CSA C22.2No.4-1974.

.2 Fuseholder assemblies to CSA C22.2No.39-1972.

.3 Fusible and non-fusible disconnect switch in CSA Enclosure 1 .

.4 Fusible and non-fusible disconnect switch in CSA Enclosure 3 if located on exterior of building.

.5 Provision for padlocking.

.6 Mechanically interlocked door to prevent opening when handle in ON position.

.7 Fuses as required where indicated.

.8 Fuseholders in each switch suitable without adaptors, for type of fuse as indicated.

.9 Quick-make, quick-break action.

.10 ON-OFF switch position indication on switch enclosure cover.

2.2 EQUIPMENT IDENTIFICATION

.1 Indicate name of load controlled on nameplate to Section 26 05 01.

2.3 MANUFACTURERS

.1 Acceptable manufacturers: to match Section 26 24 17.

PART 3 EXECUTION

3.1 INSTALLATION

.1 Install disconnect switches complete with fuses as indicated.

PART 1 General

1.1 RELATED WORK SPECIFIED ELSEWHERE

.1 Breakers: Section 26 28 21.

1.2 PRODUCT DATA

.1 Submit shop drawing in accordance with Section 26 05 01.

PART 2 PRODUCTS

2.1 CONTACTORS

.1 Contactors: to CSA C22.2No.14-1973 and EEMAC No.1CS-1970.

.2 Electrically held controlled by pilot devices as indicated and rated for 1.5x load controlled. Half size contactors not accepted.

.3 Mount in CSA Enclosure 1 unless otherwise indicated.

.4 Include following options in cover:

.1 Red indicating lamp.

.2 On-Off selector key switch.

.5 Control transformer in contactor enclosure.

2.2 EQUIPMENT IDENTIFICATION

.1 Nameplate in accordance with Section 26 05 01 indicating name of load controlled as indicated.

2.3 MANUFACTURERS

.1 Acceptable manufacturers: Allen-Bradley, Group Schneider, Westinghouse.

PART 3 EXECUTION

3.1 INSTALLATION

.1 Install contactors and connect auxiliary control devices as indicated.

.2 Control voltage to be 120VAC.

PART 1 GENERAL

1.1 SHOP DRAWINGS AND PRODUCT DATA

.1 Submit shop drawings and product data in accordance with Section 26 05 01

.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.

1.2 OPERATION AND MAINTENANCE DATA

.1 Provide data for incorporation into maintenance manuals.

.2 Include operation and maintenance data for each type and style of starter.

PART 2 PRODUCTS

2.1 MATERIALS

.1 Starters: to the latest edition of CSA C22.2No.14, EEMAC E14-1.

.1 Half size starters not acceptable.

2.2 MANUAL MOTOR STARTERS

.1 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: Toggle switch: standard labeled as indicated.

.1 Indicating light: standard and color as indicated.
.2 Locking tab to permit padlocking in "ON" or "OFF" position.

2.3 FULL VOLTAGE MAGNETIC STARTERS

.1 Combination magnetic starters 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 Two spare auxiliary contacts.

.7 Hand-off-automatic control.

.8 Control transformer and fusing.

2.4 IDENTIFICATION

.1 In accordance with Section 26 05 01.

2.5 MANUFACTURERS

.1 Acceptable manufacturers are: Allen Bradley, Group Schneider, Siemens, Westinghouse.

PART 3 EXECUTION

3.1 INSTALLATION

.1 Install starters, connect power and control as indicated.

.2 Ensure correct fuses and overload devices elements installed.

3.2 TESTS

.1 Perform tests in accordance with Section 26 05 01 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.

PART 1 General

1.1 SHOP DRAWINGS AND PRODUCT DATA

.1 Submit shop drawings and product data in accordance with Section 01 33 00.

1.2 ACCESSORIES

.1 Provide supporting devices, plaster frames, rings, integral surface mounted junction boxes and outlet boxes where required.

PART 2 PRODUCTS

2.1 LUMINAIRES

.1 Provide luminaires as indicated on luminaire schedule on drawings.

2.2 LAMPS

.1 Provide lamps as indicated.

2.3 BALLASTS AND ACCESSORIES

.1 All fluorescent ballasts to be premium electronic Utility approved. All other ballasts to be high power factor. All ballasts to be suitable for mounting in location indicated.

2.4 MANITOBA POWER SMART

.1 All applicable electrical MB Power Smart credit to be passed on to MBLL.

PART 3 EXECUTION

3.1 INSTALLATION

.1 Locate luminaires as indicated.

.2 Clean all construction dirt and dust from luminaires prior to building turnover.

.3 Install lamps.

3.2 WIRING

.1 Connect luminaires to lighting circuits as indicated.

.2 Connect luminaires to dimmers as indicated.

3.3 TESTS

.1 Perform tests in accordance with Section 26 05 01.

.2 Check luminaires and replace defective lamps, ballasts and accessories.

.3 Operate fluorescent lamps for 100 hours.

PART 1 General

1.1 PRODUCT DATA

.1 Submit product data in accordance with Section 26 05 01.

.2 Data to indicate system components, mounting method, source of power and special attachments.

1.2 WARRANTY

.1 For batteries, 120 months warranty period with a no-charge replacement during the first 5 years and a pro-rate charge on the second 5 years.

PART 2 PRODUCTS

2.1 EQUIPMENT

.1 Supply voltage: to match general lighting in the area.

.2 Output voltage: 12V dc.

.3 Operating time: 30 min.

.4 720W or as required.

.5 Battery: sealed, maintenance free.

.6 Charger: solid state, multi-rate, voltage/current regulated, inverse temperature compensated, short circuit protected with regulated output of plus or minus 0.01 V for plus or minus 10% input variations.

.7 Solid state transfer circuit.

.8 Low voltage disconnect: solid state, modular, operates at 80% battery output voltage.

.9 Signal lights: solid state, for 'AC Power ON'.

.10 Lamp heads: 345° horizontal and 180° vertical adjustment. Lamp type: 4W LED. All integral and remote luminaires are to be double-head.

.11 Cabinet: suitable for direct or shelf mounting to wall and c/w knockouts for conduit. Removable or hinged front panel for easy access to batteries.

.12 Finish: white.

.13 Auxiliary equipment:

.1 Test switch.

.2 Shelf.

.3 Cord and plug connection for ac.

.4 Self-test.

.5 Zone sensing relays as required.

2.2 WIRING OF REMOTE HEADS

.1 Conduit: to Section 26 05 34 - Conduits, Conduit Fastenings and Conduit Fittings.

.2 Conductors: to Section 26 05 21 - Building Wires, sized in accordance with manufacturer's recommendations.

2.3 MANUFACTURERS

.1 Acceptable manufacturers: Lumacell, Ready-Lite, Aim-Lite.

PART 3 EXECUTION

3.1 INSTALLATION

.1 Install unit equipment and remote mounted fixtures.

.2 Direct heads.

.3 Interlock with normal lighting in the area to activate upon loss of normal lighting.

PART 1 GENERAL

1.1 RELATED WORK

.1 General Provisions: Section 26 05 01.

1.2 PRODUCT DATA

.1 Submit product data in accordance with Section 26 05 01.

PART 2 PRODUCTS

2.1 MATERIALS

.1 Housing: Extruded one-piece aluminum.

.2 Universal mounting: Wall, pendant, end, or ceiling mount.

.3 Directions supplied with all combinations for both faces.

.4 Lamps: White LED with 25 year life expectancy.

.5 Universal 120-347V AC input and 6V-24V DC input.

.6 Standards: Meets of exceeds CSA 22.2 No. 141-10.

2.2 MANUFACTURERS

.1 Acceptable manufacturer: Lumacell, Aim-Lite, Readi-lite.

PART 3 EXECUTION

3.1 INSTALLATION

.1 Install exit lights as indicated, to requirements of the latest edition of MBC.

.2 Connect fixtures to emergency power exit light circuits.

.3 Mount at suitable height. Provide rigid pendant if required. Provide single or double faceplate as required. Provide mounting as required.

.4 Fasten properly and level.

.5 Ensure that exit light circuit breaker is locked in on position.