

## **1.0 GENERAL REQUIREMENTS**

### **1.1 GENERAL**

- .1 The specification covering the General Requirements of this Section, General Specifications, and all associated sections form an integral part of this specification and shall be read in conjunction herewith.
- .2 Electrical installation shall be in accordance with the current edition of the Canadian Electrical Code CSA 22.1, local jurisdiction having authority and/or City of Winnipeg and other codes, rules and regulations. Supply material and labor required to meet the requirements of these codes, rules and regulations even though the work is not shown on the drawings or mentioned in the specifications. Where the electrical installation calls for better quality materials or construction than the minimum of these codes, rules and regulations, the electrical installation shall be as shown on the drawings and as specified.
- .3 Electrical installation shall be in accordance with the requirements of the electrical supply authority and local inspection authority.
- .4 Electrical Subcontractor to be responsible for making all arrangements with hydro utility company for incoming service. This shall include but not necessarily be limited to submitting the utility electrical service application on behalf of the City (as per the electrical loads shown on the plans and specifications), coordinating the location of the service as per the preferred service location on the plans, confirming available fault current requirements for main distribution and supplying suitable equipment, and timely submission of required information to suit the construction schedule to ensure power is available to suit the City's requirements. The electrical Contract Administrator shall provide AutoCAD drawings to the Electrical Subcontractor (upon written request) when required for submission to electrical utility company.

### **1.2 SCOPE**

- .1 Provide all materials, labor, plant and equipment required for a complete and working installation and as shown and detailed on drawings.
- .2 The electrical installation shall be in accordance with the current edition of the Canadian Electrical Code and local regulations.
- .3 Obtain all permits, approvals and pay all fees required for installation. Electrical Subcontractor shall obtain and provide a copy of the electrical inspection certificate from authority having jurisdiction and provide a copy to Contract Administrator.
- .4 All equipment supplied under this contract shall be new and be CSA approved.
- .5 Arrange for, and coordinate, rough-in and final inspections with the Inspection Authority having jurisdiction, Contract Administrators and Local Authorities.

### **1.3 WORK INCLUDED**

- .1 Refer to detailed scope of work as detailed on drawings.
- .2 Provide all power and miscellaneous wiring and make all connections as indicated.
- .3 Provide all lighting and control equipment as indicated and make all connections.

#### 1.4 EXAMINATION

- .1 Prior to submitting a Bid, the Electrical Subcontractor shall examine all drawings and specifications of other disciplines to ensure that the Work under this Contract can be satisfactorily carried out. Report any discrepancies to the Contract Administrator prior to installation of equipment.
- .2 Prior to submitting a Bid, the Electrical Subcontractor shall examine the site, local conditions and all existing apparatus if any is to be re-used and verify that the condition of this equipment is suitable for its intended use in the new construction. Report any discrepancies to the Contract Administrator prior to commencing any work. Claims for extra payments resulting from conditions which could be reasonably foreseen from examination of the documents and/or site will not be recognized.
- .3 Refer to General Conditions for instruction regarding mandatory site visit during the Bid period.

#### 1.5 SUPERVISION

- .1 Supervise the Work at all times through a responsible and competent supervisor.
- .2 Full cooperation shall be shown with other trades to facilitate installations and to avoid delays in carrying out the Work.

#### 1.6 ACCURACY OF DATA

- .1 Drawings are schematic; exact locations, distances, levels and other dimensions shall be governed by the building as constructed.
- .2 Outlets or equipment shall be moved to any point within a 10 foot radius when relocation is requested by the Contract Administrator before the Work has been substantially completed, without additional cost.
- .3 Branch circuit wiring shall be installed with circuits arranged exactly as shown on drawings. Conduit and cable runs may be modified to suit installation.

#### 1.7 APPROVAL OF MATERIAL

- .1 Request for approval of electrical equipment as equals or alternates to that specified shall be in accordance with B7.
- .2 Bidders shall submit a Bid based on the specified materials and equipment only.
- .3 Bidders may submit a Bid based on equivalent materials and equipment only if such items have been approved as equals in accordance with B7.
- .4 Bidders may submit, with their Bid, an alternate price based on alternate materials and equipment only if such items have been approved as alternate by the Contract Administrator.

#### 1.8 SHOP DRAWINGS

- .1 Submit electronic legible PDF format of shop drawings of electrical equipment to the Contract Administrator for review. Send shop drawings to: [info@sumitech.ca](mailto:info@sumitech.ca). Fabrication of equipment shall not commence until shop drawings of such equipment have been reviewed by the Contract Administrator. One set shall be submitted with Local Inspection Department approval where required.

- .2 Include details of construction, dimensions, capacities, weights and electrical performance characteristics of equipment or material. Where applicable, include wiring, single line and schematic diagrams.
- .3 Submit shop drawings of service equipment to Supply Authority.

#### 1.9 PROJECT RECORD DOCUMENTS

- .1 Keep a record set of drawings on the site at all times recording any changes that may occur.
- .2 Project record documents shall be transferred to electronic AutoCAD file format. The Electrical Subcontractor shall be responsible for the production of electrical "as-constructed" drawings which shall provide a complete and accurate record of the actual electrical installation. The Electrical Subcontractor shall stamp, sign and date these drawings as "Record Drawings". Submit one disk and hard copy for final review and submission to the Contract Administrator upon completion. Record documents that are incomplete shall be returned to the Electrical Subcontractor for correction. The Contract Administrator shall recommend a suitable deficiency holdback until such time as the Record Drawings are submitted in an acceptable form.
- .3 Indicate on the record drawings the exact location of underground services referenced to established survey benchmarks.

#### 1.10 OPERATION AND MAINTENANCE MANUALS

- .1 Provide three (3) bound copies of catalogue sheets and maintenance materials for complete installation. Submit to Contract Administrator for review upon completion of project. Include Certificate of Electrical Inspection in manuals. Manuals that are incomplete shall be returned to the Electrical Subcontractor for completion. Completed manuals shall be submitted, to the satisfaction of the Contract Administrator, before final payment may be considered to be due.
- .2 Include 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 installation.
- .3 Include technical data, product data, supplemented by bulletins, component illustrations, exploded views, technical descriptions of items and parts lists. Advertising or sales literature will not be acceptable.
- .4 Include wiring and schematic diagrams and breaker curves.
- .5 Include names and addresses of local suppliers for items included in Maintenance Manuals.
- .6 Provide an auto-cad disc copy and 3 paper hard copies of the contact drawings for record "as-builts" drawings revised as required to show any deviations of layouts from that originally shown.

#### 1.11 TESTS

- .1 The electrical installation shall be completely tested demonstrating that the equipment and systems installed perform in the manner intended.
- .2 Conduct and pay for tests including, but not limited to, the following systems:
  - a) Power Distribution system.
  - b) Circuits originating from branch distribution panels.
  - c) Grounding systems.

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- .3 Carry out tests in presence of Contract Administrator where directed.
  - .4 Provide instruments, meters, equipment and personnel required to conduct tests during and at conclusion of project.
  - .5 Check resistance to ground before energizing.
- 1.12 VOLTAGE RATINGS
- .1 Operating voltages to CAN3-C235-83.
  - .2 Motors, electrical heating, control and distribution devices and equipment to operate satisfactorily at 60 Hz within normal operating limits established by above standard. Equipment shall operate in extreme operating conditions established in above standard without damage to equipment.
- 1.13 INSPECTION
- .1 Furnish a Certificate of Acceptance from the Inspection Authorities on completion of Work. Copies of certificate shall be included in the Maintenance Manuals. This Certificate shall be submitted before final payment may be considered to be due.
  - .2 During the course of the project construction, the Contract Administrator will carry out periodic site reviews and prepare a deficiency list for remedial action by the Electrical Subcontractor.
- 1.14 CARE, OPERATION AND START-UP
- .1 Instruct the City's operating personnel in the operation, care and maintenance of equipment. Arrangement of such instructional sessions shall be done at a time convenient to the City.
  - .2 Arrange and pay for services of Manufacturer's factory service engineer to supervise start-up of installation, check, adjust, balance and calibrate components.
  - .3 Provide these services for such a period and for as many visits as necessary to put equipment into operation, and ensure that operating personnel are conversant with all aspects of its care and operation.
- 1.15 FINISHES
- .1 Paint indoor switchgear and distribution enclosures light grey to EEMAC-2Y-1. Outdoor electrical equipment enclosures shall be painted "equipment green" to EEMAC-2Y-1.
  - .2 Clean and touch up surfaces of shop-painted, scratched or marred during shipment or installation, to match original paint.
  - .3 Clean, prime and paint exposed hangers, racks, fastenings to prevent rusting.
- 1.16 EQUIPMENT IDENTIFICATION
- .1 Identify electrical equipment with lamicoïd nameplates.
  - .2 Identify circuit numbers on receptacles with "BRADY" Globemark tape.
  - .3 Provide lamicoïd nameplates, 1/8" thick plastic engraving sheet, black with white core, mechanically attached (screwed or riveted) unless otherwise specified. Sizes 4" wide x 3" high.
  - .4 Wording on nameplates shall be approved prior to manufacture. Submit schedule of nameplates and wording.

- .5 Allow for average of thirty-five (35) letters per nameplate.
- .6 Identification shall be English.
- .7 Nameplates for terminal cabinets and junction boxes shall indicate system and/or voltage characteristics.
- .8 Use red nameplates with white lettering for emergency power.

#### 1.17 LOCATIONS OF OUTLETS

- .1 Outlet locations shall be reviewed on site with the City and Contract Administrator prior to installation.
- .2 Do not install outlets back-to-back in wall; allow minimum 16" horizontal clearance between boxes.
- .3 Drawings are schematic only and do not indicate all architectural or structural elements.
- .4 Change location of outlets at no extra cost or credit, providing distance does not exceed 10'-0" and information is provided prior to rough-in.
- .5 Locate light switches on latch side of doors.

#### 1.18 MOUNTING

- .1 Mounting height of equipment is from the finished floor to the centerline of equipment unless specified or indicated otherwise.
- .2 If mounting height of equipment is not indicated, verify with Contract Administrator before proceeding with installation.
- .3 Install electrical equipment at the following heights unless indicated or directed otherwise (to center of outlet).
  - a) General receptacles shall be mounted at 16" in vertical orientation.
  - b) Panelboards: 78" to top.

#### 1.19 PROTECTION

- .1 Protect exposed live equipment during construction for personnel safety.
- .2 Shield and mark live parts "LIVE ( ) VOLTS", 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.
- .4 Provide wire guards for all electrical equipment (occupancy sensor, motion sensors) in areas subject to damage.

#### 1.20 FIREPROOFING

- .1 Where cables or conduits pass through floors, block or concrete walls and fire-rated walls, seal openings with fire-stopping material with intumescent properties.
- .2 Fire proofing of electrical cables, conduits, trays, etc. passing through fire barriers shall conform to local codes and inspection authorities.
- .3 Fire Stop materials shall be asbestos free and have been tested in accordance with ASTM E-84 and E-814 and ULC-1479,
- .4 Approved Manufacturer: Nelson Firestop Products or Spec Seal.

1.21 CLEANING

- .1 Do final cleaning in accordance with General Conditions.
- .2 At time of final cleaning, clean lighting reflectors, lenses, and other lighting surfaces that have been exposed to construction dirt and dust.
- .3 Clean interiors of all panels.

1.22 DELIVERY, STORAGE AND HANDLING

- .1 Co-ordinate all deliveries with on site supervisor prior to delivery.
- .2 Deliver all materials to site in an orderly fashion.
- .3 Store all materials in a clean and dry place, secure from vandalism or theft. All materials shall be left in shipping containers until required for use.
- .4 Provide additional protection such as tarps, padding, wood skids, etc. where such is required to ensure protection of equipment.

1.23 SPARE PARTS

- .1 The City/Contract Administrator to review and confirm spare breakers are provided as indicated on drawings upon completion of Work.

1.24 REQUEST FOR CHANGE

- .1 All quotations in response to request for change shall be submitted complete with an itemized cost breakdown of all materials and labor required for the change. Contract Administrator reserves the right to review costing using accepted Contractor's Pricing Standards.

1.25 GROUNDING

- .1 The entire installation shall be grounded in accordance with the Canadian Electrical Code.

1.26 WORKMANSHIP

- .1 Install equipment, conduit and cables in a workmanlike manner to present a neat appearance to the satisfaction of the Contract Administrator. Install conduit and cable runs parallel and perpendicular to building lines.
- .2 Install neatly and group to present a tidy appearance. Install equipment and apparatus requiring maintenance, adjustment or eventual replacement with adequate clearances and accessibility.
- .3 Include, in the Work, all requirements shown on the shop drawings or manufacturer's installation instructions. Replace Work unsatisfactory to the Contract Administrator without extra cost.
- .4 All conduit and cables must be clipped to structure by means of anchors or supported by Unistrut hangers as close to U/S as possible. Tye wraps for wire hanging or fastening is not acceptable, unless pre-authorized by the City and acceptable to Canadian Electrical Code. Perforated strapping is also unacceptable.

1.27 CASH ALLOWANCES

- .1 Refer to Section 01210.

1.28 GUARANTEE

- .1 The satisfactory operation of all Work shall be guaranteed for a period of 12 calendar months after final acceptance of Work.

**2.0 MATERIALS AND INSTALLATION**

2.1 WIRING METHODS

- .1 Conduits -
  - a) Rigid galvanized steel threaded conduit size as indicated.
  - b) Electrical metallic tubing (EMT) size as indicated.
  - c) Rigid PVC conduit size as indicated.
  - d) Flexible metal conduit (Flex) size as indicated.
  - e) Liquid-tite flexible metal conduit (Seal-tite) size as indicated.
- .2 Conduit fastenings -
  - a) Two hole steel straps to secure surface conduits.
  - b) Beam clamps to secure conduits to exposed steel work.
  - c) Uni-strut channel type support for two or more conduits, surface or suspended.
  - d) 4 3/8" diameter threaded rods to support suspended channels.
- .3 Conduit fittings -
  - a) Fittings manufactured for use with conduit specified.
  - b) Manufactured elbows are required for conduits 2 1/2" or larger.
  - c) Die cast set screw connectors and couplings. Insulated throat liners on connectors.
  - d) Raintight connectors with O-rings for weatherproof or sprinklerproof applications.
  - e) Expansion fittings with internal bonding jumper where required.
- .4 Install conduits to conserve head room in exposed locations and cause minimum interference in spaces through which they pass. Conceal conduits, wherever possible, except in mechanical and service rooms. Surface conduit installations in finished areas shall be reviewed by Contract Administrator and the City prior to installation.
- .5 Wiring home runs to panels and main branch wiring in ceiling spaces shall be run in conduit. Wiring drops from conduit systems into boxes for wiring devices in steel stud partitions may be wired in AC-90. Drops may not exceed 6 feet from box to partition.
- .6 Use flexible metal conduit for transformers, motors or other equipment subject to vibration. Provide separate insulated grounding conductor within flexible conduit.
- .7 Use rigid PVC conduit for underground services and installations. Provide separate insulated grounding conductor within PVC conduit.
- .8 Bend conduit cold and replace conduit if kinked or flattened more than one-tenth of its original diameter. Dry conduits out before installing wire. Install polypropylene fish cord in empty conduits.
- .9 Install two 1" spare conduits up to ceiling space above surface or recessed panels and terminated in 6"x6"x4" junction boxes. Where ceiling is exposed mount junction boxes on wall at 24" above panel top.
- .10 Conduit Identification - Color code coverplates of junction boxes in conduit systems as per the color code listed below. Color code by spray painting the coverplate on each junction

box in conduit run. In addition to color coding coverplates on junction boxes with power wiring, the circuits being run in the box shall be identified on the inside of the coverplate with permanent felt marker.

- a) 120/208V Normal Power: yellow
  - b) 120/208V Emergency Power: fluorescent red
  - c) 347/600V Normal Power: orange
  - d) 347/600V Emergency Power: fluorescent orange
  - e) Fire Alarm: red
  - f) Ground: green
- .11 Conductors in conduit - type RW90, solid copper #10 AWG or smaller, stranded copper #8 AWG or larger, minimum #12 AWG, cross link polyethylene (XLPE) 90 deg C, 1000V.
- .12 2 hour rated conductors in conduit - stranded copper Draka Lifeline RHW two hour rated conductors sized as indicated. Provide cable support every 50 feet of vertical run in conduit with Kellam grips in junction box. E.C shall verify with authority having jurisdiction to confirm and verify type of feeders required prior to ordering and installation. Failure to do so does not constitute any extra costs to the City.
- .13 Armoured cable - type AC-90 (B/X) - solid copper #10 AWG or smaller, stranded copper #8 AWG or larger, minimum #14 in suites and #12 AWG in balance of facility, cross link polyethylene (XLPE), 90 deg C, 1000V, multi-conductor as required c/w bare CU ground wire, bare interlocked aluminum armour.
- .14 Armoured Cable (Teck) - type Teck 90, solid copper #10 AWG or smaller, stranded copper #8 or larger, minimum #12 AWG, cross link polyethylene (XLPE) 90 deg C, 1000V, multi-conductor as required c/w bare CU ground wire, inner jacket black PVC, armour interlocked aluminum, outer jacket black PVC with FT-4 flame spread rating. Wires to be color coded black, red, blue and white in 4/C cable and numbered in cables of more than 4/C. Aluminum ACWU or aluminum Teck may be permitted for feeders larger than 150A.
- .15 Wiring Methods -
- a) Service entrance feeders - parallel or single runs of ACWU c/w ground wire.
  - b) Branch wiring home runs - RW90 wire in EMT conduit.
  - c) Branch circuit wiring concealed - AC90.
  - d) Branch circuit wiring surface - RW90 wire in EMT conduit.
  - e) Motor wiring - RW90 wiring in Liquid tight flex conduit or Teck 90.
  - f) Fire Alarm wiring - Multi-conductor Securex in EMT conduit or Multi-conductor armoured Securex where permitted.

## 2.2 FASTENINGS AND SUPPORTS

- .1 U-shape, galvanized steel uni-strut, sized 1.6" x 1.6" x 0.1" thick, surface mounted, suspended or set in poured concrete walls and ceiling as required. Acceptable manufacturers: Burndy, Electrovert, Unistrut, Pilgrim or Pursley.
- .2 Secure surface mounted equipment, conduit or cables on uni-strut channels using clips, spring bolts and nuts and cable clamps designed as accessories to basic channel members.
- .3 Support suspended uni-strut channels with minimum 3/8" threaded rod hangers directly to building structure where possible.
- .4 Secure equipment to solid masonry, tile and plaster surfaces with lead anchors or nylon shields.



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- .5 Secure equipment to hollow masonry walls or suspended ceilings with toggle bolts.
  - .6 Fasten exposed conduit or cables to building construction or support system using straps:
    - a) Two hole steel straps to secure surface conduits.
    - b) Beam clamps to secure conduit exposed steel work.
  - .7 Support conduit and cables at spacing of no more than 48" except for surface conduit rooms and corridors.
  - .8 Provide metal brackets, frames, hangers, clamps and related types of support structures where indicated or as required to support conduit and cable runs.
  - .9 Ensure adequate support for raceways and cables dropped vertically to equipment where there is no wall support.
  - .10 Do not use wire lashings, perforated pipe straps or tye-wraps to support or secure raceways or cables.
  - .11 Do not use supports or equipment installed for other trades for conduit or cable support.
  - .12 Run conduit and cable support systems path perpendicular and parallel to building lines.
- 2.3 CUTTING AND PATCHING
- .1 Pay the costs of all cutting and patching required for the installation of electrical work.
  - .2 Obtain the approval of the Contract Administrator and/or City before arranging for any cutting. Patching shall restore the affected area to the original condition.
- 2.4 EXCAVATION AND BACKFILLING
- .1 Excavate and backfill as required (and if applicable) for underground electrical services as indicated. Provide protective materials around and over services and be present at all times during the excavation and backfilling to supervise work. Backfilling shall restore the excavated area to the original condition and shall include sodding, compacting, paving and asphalt finish where required. As underground services shall be dimensioned on electrical "Record Drawings" and shall be referenced to established survey bench marks.
  - .2 Work shall be in accordance with the current CSA bulletin.
  - .3 Include all costs for excavation, backfilling and surface restoration, for any secondary underground electrical installation.
  - .4 Obtain all clearances for Hydro, water, sewer, MTS, cable prior to digging.
  - .5 Electrical Subcontractor shall conduct a private utilities line locate for existing utilities prior to any excavation work commencing.
- 2.5 ACCESS DOORS
- .1 Access doors shall be minimum #12 gauge prime coat painted bonderized steel. Each shall be complete with a heavy flush frame and anchor, concealed hinges, positive locking screwdriver lock, and mounting and finishing provisions to suit the finish material for which they are supplied. Access doors in fire rated ceilings, walls, partitions, structures, etc. shall be ULC listed and labelled and of a rating to maintain the integrity of the fire separation.

## 2.6 JUNCTION AND PULL BOXES

- .1 Sheet steel construction with screw-on flat covers for surface or recessed mounting. Covers with 1" minimum extension all around, for flush-mounted pull and junction boxes.
- .2 Cast-type with gasketed covers where exposed to weather.
- .3 Install pull boxes in inconspicuous but accessible locations.
- .4 Provide pullboxes in conduit runs at maximum 100' spacing.
- .5 Boxes shall be installed plumb and square to building lines.
- .6 Install junction and pullboxes clear of all mechanical duct work and piping.
- .7 Junction and pullboxes to be sized as per C.E.C.
- .8 Identify junction and pullboxes as per voltage, system and circuit.

## 2.7 OUTLET BOXES AND FITTINGS

- .1 4" square outlet boxes with extension and plaster rings, flush mounting devices in finished plaster and tile walls.
- .2 Cast FS or FD ferrous boxes with factory threaded hubs and mounting feet for surface wiring of outlets where exposed to moisture.
- .3 Bushings and connectors with nylon insulated throats. Double locknuts and insulated bushings on sheet metal boxes.
- .4 Sectional boxes will be accepted.
- .5 Support boxes independently of connecting conduits
- .6 For flush installations, mount outlets flush with finished wall using plaster rings to permit wall finish to come within 1/4" of opening.
- .7 Provide correct size of openings in boxes for conduit and cable connections. Use of reducing washers will not be allowed.
- .8 Boxes shall be mounted plumb and square to building lines.

## 2.8 WIRING DEVICES

- .1 Duplex receptacles - premium specification grade NEMA 5-15R, 125VAC, 15A U-ground, nylon face white, suitable for #10 AWG back and side wiring, break off links for split wiring, double wipe contacts and rivetted grounding contacts. Acceptable Manufacturers shall be Hubbell, Bryant, Leviton, Pass & Seymour, Arrow Hart and Woodhead. Duplex receptacles of one manufacturer throughout project. Mount receptacles vertically at 16" AFF unless otherwise noted. Provide premium specification Hospital grade receptacles in all basic care areas or as indicated on drawings. Provide separate insulated ground wire for all circuits to Hospital grade receptacles.
- .2 Corridor receptacles - premium specification grade NEMA 5-15RA, 125VAC, 20A U-ground T-slot nylon face white. Acceptable Manufacturers as per duplex receptacles.

## 2.9 PANELBOARDS

- .1 Submit shop drawings in accordance with section 1.08. Drawings shall include electrical detail of panel, branch breaker type, quantity, ampacity and enclosure dimension. Factory install circuit breakers in panelboards before shipment. In addition to CSA requirements,

- manufacturer's nameplate shall show fault current that panel, including breakers, has been built to withstand.
- .2 Panelboards built to CSA C22.2 No. 29-M1989 and shall be of one manufacturer throughout project.. Minimum 42 circuit, 200A unless otherwise noted.
  - .3 CDP panels built to CSA C22.2 No. 29-M1989 and shall be manufactured to allow installation of two 200A frame breakers adjacent to each other - horizontally. CDP panels to be of one manufacturer throughout project.
  - .4 Panelboards and CDP panels bus and breakers to be rated for short circuit withstand ampacity as indicated on drawings but in no case shall be less than 10kA for 250V branch panelboards, 25kA for 250V CDP panels, 18kA for 600V panels and 22kA for 600V CDP panels.
  - .5 Panelboards and CDP panels shall have copper bus with full size neutral (where required), copper ground bus, keyed alike locks with two keys for each, flush or surface mounted tubs as shown, finish trim and door baked grey enamel. Provide fully hinged, lockable front panel covers for all Panelboards and CDP panels. Provide spare breakers and spaces as indicated on drawings
  - .6 Breakers to section 2.10.
  - .7 Main breaker: mounted on top or bottom of panel to suit cable entry. Reverse fed branch bus mounted main breakers will not be accepted.
  - .8 Provide lock-on devices for 5% of 15A branch breakers installed and for fire alarm, emergency, exit and night light circuits. Turn unused locks over to the City.
  - .9 Provide equipment identification as per drawings. Provide typewritten panel legend showing location and load of each circuit. Provide lamicoids nameplate beside each breaker in CDP panels.
  - .10 Acceptable manufacturers: Cutler-Hammer, Square D, Siemens and GE.
  - .11 Load centres with feed through lugs shall be permitted for suite panels.
  - .12 Locate panelboards and CDP panels as indicated and mount securely, plumb, true and square, to adjoining surfaces.
  - .13 Install surface mounted panelboards and CDP panels on uni-strut except for surface panels in corridors or finished areas which shall be mounted directly to wall.
  - .14 Connect loads to circuits as indicated and provide a separate neutral for each branch circuit.
  - .15 Mount panelboards at 78" AFF to top of panelboard.

## 2.10 CIRCUIT BREAKERS

- .1 Submit shop drawings in accordance with section 1.08.
- .2 Bolt-on moulded case breaker, quick-make, quick-break type, for manual and automatic operation with temperature compensation for 40 deg C (140 deg F). Common-trip breakers with single handle for multi-poke applications Magnetic instantaneous trip elements in circuits, to operate only when the value of current reaches setting. Trip settings on breakers with adjustable instantaneous trips to range from 3-10 times current rating. Provide LSI trip units for all breakers 300-amps and higher.

.3 Moulded case circuit breaker shall 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.

.4 Acceptable manufacturers: Cutler-Hammer, Square D, Siemens and GE.

#### 2.11 UTILITIES UNDERGROUND SERVICE

.1 Make all arrangements and co-ordinate with Hydro supply authority to ensure availability of service when required.

.2 Submit all required drawings to supply authority for their approval.

.3 Refer to Section 01001, 1.2 for cash allowance requirements associated with electrical service by the supply authority.

.4 Pad mounted transformers and primary underground cabling to CSTE shall be supplied and installed by supply authority, unless otherwise indicated.

.5 Provide secondary cables from CSTE to main distribution as indicated. Allow adequate conductor length for termination.

#### 2.12 GROUNDING

.1 Grounding conductors system, circuit and equipment grounding to be bare stranded copper, sized in accordance with the Canadian Electrical Code.

.2 Non-corroding accessories necessary for grounding system, type, size, material as indicated including but not necessarily limited to: .1 grounding and bonding bushings, .2 protective type clamps, .3 bolted type conductor connectors, .4 compression type conductor connectors, .5 bonding conductors, straps, .6 pressure wire connectors.

.3 Install complete permanent, continuous, system and circuit, grounding systems including electrodes, conductors, connectors and accessories to conform to requirements of local authority having jurisdiction over installation.

.4 Install connectors to manufacturer's instructions.

.5 Protect exposed grounding conductors from mechanical injury.

.6 Make buried connections using Burndy "HYPRESS" connectors.

.7 Use mechanical connectors for grounding connections to equipment provided with lugs. Soldered joints not permitted.

.8 The main public metallic water service to the facility shall be utilized as the main ground electrode. Where such a service does not exist, an artificial grounding electrode shall be provided to suit the requirements of the local inspection authorities.

.9 Install bonding wire for flexible conduit, connected to both ends to grounding bushing, solderless lug, clamp or cup washer and screw. Neatly cleat bonding wire to exterior of flexible conduit.

.10 Make grounding connections in radial configuration only, with connections terminating at single grounding point. Avoid loop connections.

.11 Provide separate ground conductors in PVC conduit, plastic or fibreglass raceways.

.12 Install system and circuit grounding connections to neutral points of 600V and 208V systems.

- .13 Install grounding connections to typical equipment including, but not necessarily limited to: service equipment, transformers, frames of motors, building steel work.
- .14 Perform ground continuity and resistance tests using method appropriate to site conditions and to approval of the local inspection authority. Perform tests before energizing electrical system. Disconnect ground fault indicator, if provided, during tests. A report shall be submitted to the Contract Administrator from the testing agency.

#### 2.13 LIGHTING

- .1 Submit shop drawings in accordance with section 1.08.
- .2 Provide luminaires as specified on drawings or approved equal in accordance with B7 c/w lamps. Provide two spare lamps and one spare ballast for each type of luminaire onsite. All ballasts shall be electronic premium gold label approved by Manitoba Hydro for Power Smart Rebate. Electrical Subcontractor shall be responsible for providing complete ballast information and completion of application for Power Smart rebate on behalf of client.
- .3 Suspend luminaires from building structure on and ensure that they are parallel and perpendicular to building lines.
- .4 Replace all defective ballasts and lamps for a period of 12 months after substantial completion of project.

- END OF SECTION -