Part 1 General

1.1 RELATED WORK

a) Division 0 – Bidding & Bid Opportunity Requirements

b) General Requirements

c) All Electrical Drawings.

1.2 QUALITY ASSURANCE

a) Do complete installations in accordance with CSA C22.1-2006.

b) While not identified and specified by number in this Division, comply with CSA Electrical Bulletins in force at time of tender submission. Comply with the requirements of all Provincial and local laws, rules, ordinances and codes.

c) Electrical installation shall be in accordance with the current edition of the Canadian Electrical Code, Provincial and other codes, rules and regulations. Supply material and labour 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 requirements of these codes, rules and regulations, the electrical installation shall be as shown on the drawings and as specified.

d) Electrical installation shall be in accordance with the requirements of the electrical supply authority and local inspection authority.

1.3 PERMITS, FEES

a) Submit to Electrical Inspection Department and Supply Authority necessary number of drawings and specifications for examination and approval prior to commencement of work.

b) Obtain all necessary permits required for the electrical installation.

c) Pay all fees for permits and inspections as required for the electrical installation.

1.4 MATERIALS AND EQUIPMENT

a) Provide labour, materials, transportation, equipment and facilities, etc., required for the complete electrical installation as indicated or implied on the drawings and specifications.

b) Electrical equipment shall be new and of type and quality specified.

c) Equipment and material shall be CSA certified, and manufactured to standards described. Where there is no alternative to supplying equipment which is not CSA certified, obtain special approval from the appropriate Inspection Departments.

1.5 SUBMITTALS

a) Submit shop drawings and product data for review by the Contract Administrator. All drawings shall be in English and Imperial dimensions or in metric where indicated. Manufacture of equipment shall not commence until shop drawings have been reviewed. Shop

drawings may be submitted electronically or 10 hard copies. The MCW/AGE shop drawing email address for electrical submission is wpg.shopdrawings@mcw.com. Shop drawings shall be reviewed prior to submittal to Contract Administrator, confirming that they meet all the design requirements. Mark up and sign Contractor approval on the drawings.

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

c) Where applicable, include wiring, single line and schematic diagrams.

d) Include wiring drawings or diagrams showing inter-connection with work of other sections.

e) Submit samples in accordance with General Conditions. Samples shall be forwarded to the Contract Administrator's office and return. Approved samples will be retained until after tender closing, then all samples will be returned except for the sample submitted by the Manufacturer who has been listed by the successful Contractor in the tender documents. This sample will be used for comparison with the actual production run of successful manufacturer.

f) Submit shop drawings of service entrance equipment to utilities.

g) Material submitted for Contract Administrator's review shall bear Contractor's, and where applicable, Utility reviewed stamp.

1.6 OPERATIONS AND MAINTENANCE DATA

a) Provide operation and maintenance data for incorporation into Maintenance Manuals.

b) 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 installation.

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

d) Include wiring and schematic diagrams and performance curves.

e) Include names and addresses of local suppliers for items included in Maintenance Manuals.

f) Submit Maintenance Manuals to the Contract Administrator for review. Manuals that are incomplete shall be returned to the Electrical Sub-Contractor for completion. Completed manuals shall be submitted, to the satisfaction of the Contract Administrator, before final payment may be considered to be due.

1.7 MAINTENANCE MANUALS

a) Provide maintenance materials as specified.

b) Turn materials over to City of Winnipeg in an orderly fashion upon completion of installation.

1.8 VOLTAGE RATINGS

a) Operating voltages: to CAN3-C235-83.

b) 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.

1.9 INSPECTION

a) Furnish a Certificate of Acceptance from the Inspection Authorities on completion of work. Copies of certificate shall be included in Maintenance Manuals.

b) Certificate of Inspection of Approval shall be submitted before final payment may be considered to be due.

c) 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. When requested, the Electrical Subcontractor shall respond in writing to the Contract Administrator, stating corrective action and completion date for each item listed as deficient. This response shall be in the hands of the Contract Administrator within three working days of receipt of the Inspection Report.

1.10 CARE, OPERATION AND START-UP

a) Instruct the City of Winnipeg'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 of Winnipeg.

b) 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.

1.11 FINISHES

a) Finish outdoor electrical equipment such as parking lot panels, to match light standards.

b) Clean, prime and paint exposed hangers, racks, fastenings to prevent rusting.

1.12 EQUIPMENT IDENTIFICATION

a) Identify electrical equipment with lamacoid nameplates.

b) Provide lamacoid nameplates, 1/8″ (3mm) thick plastic engraving sheet, black or red face, white core, mechanically attached (screwed or riveted) unless specified otherwise. Sizes as follows:

Size 0	3.8″ x 1 1/2″(10 x 38 mm)	1 line	1/8″ (3mm) high letters
Size 1	3/8″ x 4″ (10 x 100mm)	1 line	1/8″ (3 mm) high letters
Size 2	1/2" x 3″ (13 x 75mm)	1 line	3/16″ (5 mm) high letters
Size 3	1/2" x 3″ (13 x 75mm)	2 lines	1/8″ (3 mm) high letters
Size 4	3/4" x 3″ (19 x 75mm)	1 line	3/8″ (10mm) high letters
Size 5	3/4" x 4″ (19 x 100mm)	2 lines	3/16″ (5 mm) high letters
Size 6	1″ x 4″ (25 x 100mm)	1 line	1/2″ (13mm) high letters
Size 7	1″ x 4″ (25 x 100mm)	2 lines	1/4" (6 mm) high letters

c) Wording on nameplates shall be approved prior to manufacture. Submit schedule of nameplates and wording.

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

e) Identification shall be English.

f) Nameplates for terminal cabinets and junction boxes shall indicate system and/or voltage characteristics.

g) Use black nameplates with white lettering for normal power and communications equipment. Use red nameplates with white lettering for emergency power and fire alarm equipment.

1.13 PROJECT RECORD DOCUMENTS

a) Project record documents shall be transferred to electronic disc AutoCAD file and labelled “Record Drawings”. The Electrical Sub-Contractor 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 affix his company name and the words “Record Drawings” on the drawings, and sign and date them. Submit disc 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 Sub-Contractor for remedial measures. The Contract Administrator shall recommend a suitable deficiency holdback until such time as “record drawings” are submitted in the acceptable form.

b) Indicate on record drawings, location of all buried services. This information is to be certified correct by Contract Administrator before backfilling commences.

c) Contractor to take all schedules/details from specification and put onto additional drawing sheets for Record Drawings.

1.14 DEFINITIONS

a) The following are definitions of terms and expressions used in the specification:

.1 CONTRACT ADMINISTRATOR means Electrical Engineering Contract Administrator:

.2 INSPECTION AUTHORITY means agent of any authority having jurisdiction over construction standards associated with any part of electrical work on site.

.3 SUPPLY AUTHORITY means electrical power utility company responsible for delivery of electrical power to project.

.4 ELECTRICAL CODE means as shown on Bid Opportunity drawings or noted in Bid Opportunity Documents.

.5 TYPE TESTED means that each piece of equipment produced by Manufacturer is not fully tested. An original piece with similar arrangement has been fully tested and results of that test are available.

.6 PROVIDE means to supply, install and leave in working order all materials and necessary wiring, supports, access panels, etc., as necessary for equipment indicated.

1.15 LABELS AND WARNING SIGNS

a) Manufacturer’s nameplates and CSA labels shall be visible and legible after equipment is installed.

b) Provide warning signs on equipment, as required, to meet the requirements of the Inspection Authorities, including indication of multiple power sources.

1.16 MOUNTING

a) Mounting height of equipment is from finished grade to centreline of equipment unless specified or indicate otherwise.

b) If mounting height of equipment is not indicated, verify with Contract Administrator before proceeding with installation.

c) All distribution panels shall be mounted on 4” (100 mm) concrete housekeeping pads. The Electrical Subcontractor shall be responsible for provision of these pads.

1.17 PROTECTION

a) Protect exposed live equipment during construction for personnel safety.

b) Shield and mark live parts “LIVE ( ) VOLTS”, with appropriate voltage in English.

c) Arrange for installation of temporary doors for rooms containing electrical distribution equipment. Keep these doors locked except when under direct supervision.

1.18 LOAD BALANCE

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

b) Measure phase voltages at loads and adjust transformer taps to within 2% of rated voltage of equipment.

c) Submit, at completion of work, a report listing phase and neutral currents on panelboards, transformers and motor control centres, operating under normal load. State hour and date on which each load was measured, and voltage at time of test.

1.19 CONDUIT SLEEVES AND HOLES

a) Install conduit, and sleeves, prior to pouring of concrete. Sleeves through concrete shall be sized for free passage of conduit.

1.20 TESTS

a) Conduct and pay for tests including, but not limited to, the following systems:

.1 Circuits originating from branch distribution panels.

.2 Lighting and its control.

.3 Grounding systems.

b) Furnish Manufacturer’s Certificate or letter confirming that entire installation, as it pertains to each system, has been installed to Manufacturer’s instructions.

c) Carry out tests in presence of Contract Administrator where directed.

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

e) Submit test results in Maintenance Manuals.

1.21 INSULATION RESISTANCE TESTING

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

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

c) Check resistance to ground before energizing.

1.22 CLEANING

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

1.23 DELIVERY STORAGE AND HANDLING

a) Deliver all materials to site in an orderly fashion.

b) 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.

c) Provide additional protection such as tarps, padding, wood skids, etc., where such is required to ensure protection of equipment and as directed by the Contract Administrator.

1.24 COORDINATION WITH OTHER TRADES

a) Refer to Structural, Civil and Landscape Architectural drawings and specifications for additional electrical work in connection with other Divisions. Where such work is included in other sections of the specifications, provide equipment, conduit, wiring, etc. (in accordance with the Manufacturer’s approved shop drawings), as required, for operation of the specified equipment.

b) Schedule execution of electrical work with associated work specified in other Divisions.

c) Coordinate electrical work with work of other trades to avoid conflicts with pipes, air ducts or other equipment.

1.25 EXAMINATION OF SITE AND CONSTRUCTION DOCUMENTS

a) Prior to submitting a tender, examine the site and local conditions which will affect the work. Refer to the Architectural, Mechanical and Structural drawings, schedules and specifications for construction details to be certain that the electrical work can be satisfactorily carried out as specified. Claims for extra payments, resulting from conditions, which could reasonably be foreseen during an examination of the documents and/or site, will not be recognized.

b) Ensure that all equipment designated as “Existing to Remain” or “Existing to be Relocated” is suitable for its intended re-use, including panelboards and circuits. Report any discrepancies to the Contract Administrator BEFORE close.

c) Refer to General Conditions for instructions regarding a pre-arranged site visit during the tender period.

1.26 EXCAVATION AND BACKFILLING

a) Excavate and backfill as required for underground electrical services as indicated. Provide protective materials around and over services and be present at all times during excavation and backfilling to supervise work. Backfilling shall restore the excavated area to the original condition and shall include sodding where required.

b) Work shall be in accordance with the current CSA Bulletin.

c) Include all costs for excavation and backfilling, for any underground electrical installation, unless otherwise indicated.

1.27 CUTTING AND PATCHING

a) Pay the costs of all cutting and patching required for the installation of electrical work. Payment for cutting and patching shall be made through the General Contractor.

b) Cutting and patching required for the installation of electrical work shall be done by the particular trade whose work is involved. No cutting or patching shall be carried out by the tradesman employed on the electrical work.

c) Obtain the approval of the Contract Administrator and/or City of Winnipeg before arranging for any cutting. Patching shall restore the affected area to the original condition; materials and methods used for patching shall be in accordance with the requirements of the corresponding Divisions of the specification.

1.28 WORKMANSHIP

a) 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 in chases, behind furring or above ceilings, where such concealment is possible. In areas where systems are shall be exposed, install neatly and group in a tidy appearance.

b) Install equipment and apparatus requiring maintenance, adjustment or eventual replacement, with adequate clearances and accessibility for same.

c) Include, in the work, all requirements shown on the shop drawings or Manufacturer’s installation instructions.

d) Replace work unsatisfactory to the Contract Administrator without extra cost.

1.29 SPARE PARTS

a) Assemble spare parts as specified:

b) Include the following:

.1 Part number.

.2 Identification of equipment or system for which parts applicable.

.3 Installation instructions as applicable.

c) Provide a written list complete with City of Winnipeg’s signature assuring that spare parts have been received by the City of Winnipeg.

END OF SECTION

Part 1 General

1.1 RELATED WORK

.1 Section 26 00 10 - Basic Electrical Material and Methods

.2 Section 26 05 34 – Conduit

Part 2 Products

2.1 MATERIALS

.1 Conductors in Conduit (R-90):

Type:	RW-90
Conductors:	Solid copper #10 AWG and smaller. Stranded copper #8 AWG and larger. Sized as indicated (minimum #12 AWG)
Insulation:	Cross link polyethylene (XLPE), 90ºC. (194ºF)
Configuration:	Single conductor
Voltage Rating:	1000V
Certification:	CSA C22.22 No.38 or latest revision

.2 Armored Cable (Teck):

Type:	Teck 90.
Conductors:	Solid copper #10 AWG and smaller. Stranded copper #8 AWG and larger. Sized as indicated (minimum #12 AWG).
Insulation:	Cross link polyethylene (XLPE), 90ºC. (194ºF).
Configuration	Multi-conductor, as required, complete with a separate bare CU ground wire.
Color Code:	Black, red, blue and white in 4/c cable. Cables of more than 4/c to be number coded.
Voltage Rating:	1 kV or 5 kV as indicated.*
Inner Jacket:	Black polyvinyl chloride (PVC) Low flame spread (LFS). Low gas emission (LGE).
Armor:	Interlocked aluminium.
Outer Jacket:	Black polyvinyl chloride (PVC), -40ºC. (-40ºF) Low flame spread (LFS). Low gas emission (LGE).
Fire Rated:	FT4.
Certification:	CSA C22.22 No. 131 or latest revision.

.3 Non-Metallic Cable:

1. Direct Buried Use

Type :	NMWU
Conductors:	Solid copper #10 AWG and smaller. Stranded copper #8 AWG and larger. Sized as indicated (minimum #12 AWG).
Insulation:	Polyvinyl chloride (PVC), 60ºC (140ºF).
Configuration:	Multi-conductor, as required, complete with a separate bare CU ground wire.
Voltage Rating:	300V
Outer Jacket:	Polyvinyl chloride (PVC).

Certification:	CSA C22.22 No. 48 or latest revision.

.4 Power Cables:

Type	High voltage power cable 5 kV-46 kV.
Conductors	Stranded copper size as indicated.
Conductor Shielding	Semi-conducting cross link polyethylene.
Insulation	Unfilled cross-linked polyethylene.
Insulation Shielding	Cross linked polyethylene.
Configuration	Single or multi-conductor.
Metallic	100% cover copper tapes or concentric wires with Inter-locked aluminium armour.
Outer Jacket	Polyvinyl chloride (PVC) –40°C. (-40°F). Low flame spread (LFS). Low gas emission (LGE).
Certification	A.E.I.C. CS-5 I.C.E.A. S-66-524. C.S.A. C68.2. R.E.A. U-1

.5 Low Voltage Control Cables:

Type:	LVT.
Conductors:	Solid copper #18 AWG.
Insulation:	Thermoplastic, color coded.
Configuration:	Single. Two conductor – parallel, Three or more conductors twisted.
Voltage Rating:	30V.
Outer Jacket:	Thermoplastic.
Certification:	CSA C22.22 No. 35.

.6 Pressure type connectors, fixture type splicing connectors, cable clamps and lugs, as required.

Part 3 Execution

3.1 INSTALLATION IN RACEWAYS

.1 Install wiring as follows:

1. In conduit systems in accordance with Section 26 05 34.
2. Ensure conduits are dry and free of debris before pulling cables.
3. Color coding and identification as per this Section.
4. Wires in outlet, junction and switch boxes, not having a connection within the box shall not be spliced, but shall continue unbroken through the box.
5. Conduits installed prior to completion of electrical work shall be capped and sealed to protect against ingress of water.

3.2 INSTALLATION OF NON-METALLIC CABLE

.1 Directed buried non-metallic cable shall be installed below grade as per Section 26 05 45.

.2 Cabling installed in non-approved raceways shall be suitable for direct burial.

3.3 INSTALLATION IN EQUIPMENT

.1 Group and lace-in neatly, wire and cable installed in switchboards, panelboards, cabinets, wireways and other such enclosures.

3.4 TERMINATIONS

.1 Terminate wires and cables with appropriate connectors in an approved manner.

3.5 IDENTIFICATION

.1 Wire in conduit #2 AWG and smaller shall have solid coloured insulation, color coded as listed below.

.2 Wire in conduit #1 AWG and larger and single conductor cables for normal power feeders shall be identified at each outlet box and termination with a 6” (150 mm) band of coloured vinyl tape of the appropriate color. Emergency power feeders shall be provided with an additional 3” (75 mm) band of red vinyl tape installed adjacent to the 6” (150 mm) band of the coloured phase identification tape, as listed below. Neutral and ground conductors shall be identified. Paint or other means of coloring 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

Unless shown otherwise on the drawings.

.4 Maintain phase sequence and color coding throughout project.

.5 Use color coded wires in communication cables, matched throughout system.

.6 Identify control conductors in motor equipment, contactors, fire alarm panels, etc. with Mylar / cloth wire markers.

END OF SECTION

Part 1 General

1.1 RELATED WORK

.1 Section 26 00 10 – Basic Electrical Materials and Methods.

.2 Section 26 05 29 – Fastenings and Supports

1.2 LOCATION OF CONDUIT

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

.2 Electrical Subcontractor shall 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: size as indicated.

.2 Electrical metallic tubing (EMT), with couplings: size as indicated.

.3 Rigid PVC conduit: size as indicated.

.4 Flexible metal conduit and liquid-tight flexible metal conduit: size as indicated.

.5 Electrical non-metallic tubing (ENT) only as indicated.

2.2 CONDUIT FASTENINGS

.1 One hole steel straps to secure surface conduits 1 ¼" (35mm) and smaller. Two hole steel straps for conduits larger than 1 ¼" (35mm).

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

.3 U-channel type supports as specified in Section 26 05 29.2.1.1 for two or more conduits at 60" (1.52m) intervals (surface-mounted or suspended).

2.3 CONDUIT FITTINGS

.1 Fittings manufactured for use with conduit specified.

.2 Manufacturer elbows where 90º bends are required for 2 ½" (63mm) and larger conduits.

.3 Die cast set screw connectors and couplings. Insulated throat liners on connectors.

.4 Raintight connector fittings complete with O-rings, for use on weatherproof enclosures. Raintight couplings shall be used for surface conduit installations exposed to moisture or sprinkler heads. Raintight connectors shall be used for all top entries to panels.

2.4 EXPANSION FITTINGS FOR RIGID AND PVC CONDUIT

.1 Weatherproof expansion fittings with internal bonding assembly, suitable for 4" (100mm) or 8" (200mm) linear expansion, as required.

.2 Watertight expansion fittings with integral bonding jumper suitable for linear expansion, and ¾" (19mm) deflection in all directions, as required.

.3 Weatherproof expansion fittings for linear expansion at entry to panel as required.

.4 O-ring type expansion fittings for PVC conduit.

.5 Flexible watertight conduit between junction boxes with integral bonding jumper suitable for linear and lateral movement greater than ¾" (19mm).

.6 Weatherproof expansion fittings suitable for transverse expansion shall be provided at all structural expansion joints throughout the project. Coordinate with structural prior to installation.

Part 3 Execution

3.1 INSTALLATION

.1 Install conduits to cause minimum interference in spaces through which they pass.

.2 Use electrical metallic tubing (EMT) except where noted otherwise.

.3 Use rigid PVC conduit for underground installations.

.4 The use of electrical non-metallic tubing (ENT) shall be limited to in-slab installations only.

.5 Use flexible metal conduit for connection to motors, fluorescent fixtures recessed in T-bar ceilings, suspended fixtures, transformers and equipment subject to movement or vibration. Provide a separate insulated grounding conductor within flexible conduit.

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

.7 Install polypropylene fish cord in empty conduits.

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

.9 Dry conduits out before installing wire.

.10 The length of any conduit run shall not exceed 100' (33m) and no conduit run shall have more than two 90º bends (or equivalent) before a pullbox is installed. Pullboxes shall be installed in accessible ceiling spaces. Conduits shall be supported within 12" (300mm) of entering any junction box, pullbox, cabinet, or panelboard.

.11 Conduit shall 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 shall 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 at no extra cost.

3.2 CONDUITS IN POURED CONCRETE

.1 Locate to suit reinforcing steel. Install in centre one third of slab, unless noted otherwise. Parallel runs of conduit shall have a minimum separation of 6" (150mm) face-to-face. Conduits may cross provided the maximum aggregate height based on outside diameters does not exceed 2 ½" (64mm). Do not install conduits in drop panels, beams or columns. Submit a marked up drawing of proposed conduit runs complete with conduit sizes to Structural Engineer and Electrical Contract Administrator for approval prior to installation.

.2 Provide 5" x 7" (125 x 175mm) color photographs of conduits installed in slab, where conduits are grouped, or cannot follow perpendicular or parallel to building lines. As-constructed drawings shall show all conduit runs embedded in concrete slabs, or run below slab, with measurements from fixed building lines (an/or columns).

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

.4 Install sleeves where conduits pass through slab.

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

3.3 CONDUITS UNDERGROUND

.1 Use PVC conduits underground. Provide a separate ground wire in non-metallic conduits.

.2 All fittings shall be waterproof.

.3 Slope conduits to provide drainage.

END OF SECTION

Part 1 General

1.1 RELATED WORK

.1 Section 26 00 10 – Basic Electrical Materials and Methods

.2 Section 26 05 34 – Conduits

1.2 SYSTEM DESCRIPTION

.1 Provide boxes to suit each specified application. Locate as indicated.

Part 2 Products

2.1 OUTLET AND CONDUIT BOXES – GENERAL

.1 Size boxes in accordance with CSA C22.1, Section 12.

.2 Gang boxes where wiring devices are grouped.

.3 Blank coverplates for boxes without wiring devices.

.4 Combination boxes with barriers where outlets for more than one system are grouped.

2.2 SHEET STEEL OUTLET BOXES

.1 Electro-galvanized steel device boxes for flush installation, minimum size 4” (100mm) square with extension and plaster rings, as required.

.2 Electro-galvanized steel utility boxes for outlets connected to surface-mounted EMT conduit.

.3 Boxes mounted outdoors shall be weatherproof complete with all required fittings and connectors to create a complete weatherproof system.

.4 Provide wire guard for outlet boxes mounted outdoors in accessible locations.

2.3 CONCRETE BOXES

.1 Electro-galvanized sheet steel concrete-type boxes for flush-mount in concrete with matching extension and plaster rings as required.

2.4 FITTINGS – GENERAL

.1 Bushings and connectors with nylon insulated throats.

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

.3 Conduit outlet bodies for conduit up to 1 ¼” (35mm) and pullboxes for larger conduits.

.4 Double locknuts and insulated bushings on sheet metal boxes.

2.5 SECTIONAL BOXES

.1 Do not utilize sectional boxes.

2.6 INSTALLATION OF BOXES

.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 Provide correct size of openings in boxes for conduit and cable connections. Reducing washers not allowed.

END OF SECTION

Part 1 General

1.1 RELATED WORK

.1 Section 26 00 10 – Basic Electrical Materials and Methods

.2 Section 26 05 34 – Conduits

.3 Section 26 05 19 – Wire and Cable

1.2 SUBMITTALS

.1 Submit shop drawings in accordance with Section 26 00 10.

Part 2 Products

2.1 CONDUIT

.1 Heavy wall rigid PVC conduits, size as indicated.

2.2 FITTINGS

.1 Rigid PVC opaque solvent welded type watertight couplings, bell end fittings, plugs, caps, adaptors, as required to make complete installation.

.2 Expansion joints as required.

2.3 GROUNDING

.1 Provide a separate insulated ground wire in each PVC conduit run.

2.4 DIRECT BURIED SINGLE AND MULTI-CONDUCTOR CABLES

.1 Single conductor and multi-conductor direct buried cables to Section 26 05 19.

2.5 WIRE

.1 Wire in conduit to Section 26 05 19.

Part 3 Execution

3.1 INSTALLATION OF DIRECT BURIED CABLES AND CONDUITS

.1 Conduits and multi-conductor cables shall be laid out and spaced appropriately.

.2 Install sand 6” (150mm) below and 6” (150mm) above cables and conduits.

.3 Install conduit with watertight couplings. Make transitions, offsets and changes in direction using 5°bend sections. Do not exceed a total of 20° with conduit offset. Clean conduits before laying. Cap ends of conduits ducting construction and after installation to prevent entrance of foreign materials. Install pull cords in empty conduits

.4 Install continuous overlapping cuprinol-treated planking 6” (150mm) above cables and conduits before backfilling. Install continuous yellow marker tapes 6” (150mm) above treated planking.

3.2 INSPECTIONS

.1 Advise Contract Administrator that he may inspect cable installation prior to backfilling.

3.3 RECORD DRAWINGS

.1 Include on Record Drawings, exact dimensioned position and routing of all underground cable feeders, etc.

3.4 COORDINATION

.1 Coordinate underground installation with utilities and underground work of other trades.

END OF SECTION

Part 1 General

1.1 RELATED WORK

.1 Section 26 00 10 – Basic Electrical Materials and Methods

.2 Section 26 05 34 – Conduit

.3 Section 26 28 17 – Circuit Breakers

1.2 SUBMITTALS

.1 Submit shop drawings in accordance with Section 26 00 10.

.2 Drawings shall 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 shall show fault current that panel, including breakers, has been built to withstand.

Part 2 Products

2.1 PANELBOARDS

.1 Panelboards: to CSA C22.2 No. 29-M1989.

.2 CDP panels: to CSA C22.2 No. 29-M1989 and shall be manufactured to allow installation of two 200A frame breakers adjacent to each other – horizontally.

.3 Panelboards shall be product of one manufacturer throughout project.

.4 250V branch circuit panelboards: bus and breakers rated for 10 kA symmetrical interrupting capacity minimum or as indicated.

.5 Sequence phase bussing such that circuit breakers shall be numbered vertically in consecutive order. Each breaker shall be identified by permanent number identification as to circuit number.

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

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

.1 Copper bus with full size neutral.

.2 Flush or surface-mounted tubs as shown.

.3 Finish trim and door baked grey enamel.

.4 All panelboards and CDP's shall have "sprinklerproof" enclosures.

2.2 CUSTOM BUILT PANELBOARD ASSEMBLY

.1 Double section panels as indicated.

.2 Feed through lugs as indicated.

.3 Isolated ground bus as indicated.

.4 Weatherproof enclosure as indicated.

.5 Built-in contactors as indicated.

2.3 BREAKERS

.1 Breakers to Section 26 28 17.

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

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

.4 Lock-on devices for 5% of 15A branch breakers installed as indicated. Turn over unused lock-on devices to City of Winnipeg.

.5 \Branch circuit breakers shall be 15A single-pole, unless otherwise indicated on drawings.

2.4 EQUIPMENT IDENTIFICATION

.1 Provide equipment identification in accordance with Section 26 00 10.

.2 Size 4 nameplate for each panelboard to indicate panel designation and voltage.

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

2.5 MANUFACTURERS

.1 Acceptable manufacturers: Cutler Hammer, Federal Pioneer, 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 Connect loads to circuits as indicated.

.3 Provide a separate neutral for each branch circuit.

.4 Finish parking lot panel enclosures shall match site lighting poles.

END OF SECTION

Part 1 General

1.1 RELATED WORK

.1 Section 26 00 10 – Basic Electrical Materials and Methods

.2 Section 26 24 16 – Panelboards

1.2 SUBMITTALS

.1 Submit product data in accordance with Section 26 00 10.

1.3 BREAKERS – GENERAL

.1 Bolt-on molded case circuit breaker, quick-make, quick-break type, for manual and automatic operation with temperature compensation for 40°C (104°F) ambient.

.2 Common-trip breakers with single handle for multi-pole applications.

.3 Magnetic instantaneous trip elements in circuit breakers, to operate only when the value of current reaches setting. Trip settings on breakers with adjustable trips to range from 3-10 times current rating.

.4 Circuit breakers with interchangeable trips as indicated.

1.4 THERMAL MAGNETIC BREAKERS

.1 Molded 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.

1.5 GROUND FAULT CIRCUIT INTERRUPTERS

.1 Molded case circuit breakers as above with integral Class A Group 1 ground fault interrupter.

Part 2 Products

2.1 MANUFACTURERS

.1 Acceptable manufacturers: Cutler Hammer, Federal Pioneer, Square D, Siemens.

Part 3 Execution

3.1 INSTALLATION

.1 Install circuit breakers as indicated.

END OF SECTION

Part 1 General

1.1 RELATED WORK

.1 Basic Electrical Materials and Methods Section 26 00 10

.2 Outlet Boxes & Fittings Section 26 05 35

1.2 SUBMITTALS

.1 Submit shop drawings and product data in accordance with Section 26 00 10. Shop drawings shall include luminaire lamp type, ballast and/or driver data including manufacturer name and model number, for each luminaire type. Include total luminaire power consumption including ballast and/or driver losses, voltage, base type, and order codes. Lamp data shall include color temperature, and CRI.

.2 Maintenance manuals shall include a list of replacement lamps, ballasts and/or drivers for each luminaire. Include manufacturer data including name and model number, lamp type. Voltage, wattage, base type and order code. Lamp data shall include color temperature and CRI.

1.3 COORDINATION

.1 Coordinate luminaire locations with work of other trades.

.2 Coordinate luminaire types with ceiling finishes to ensure compatibility.

Part 2 Products

2.1 GENERAL

.1 Luminaires shall carry the CSA label.

.2 Provide supporting devices, junction boxes and outlet boxes where required.

.3 Include finishes to Section 26 00 10 and as indicated.

2.2 DRIVERS AND ACCESSORIES

.1 Provide drivers and accessories as indicated.

.2 Drivers shall be suitable for operation to -40 degrees C.

.3 Provide Hatch dimming LED Driver, model LC22-0500P-120-D or approved equal.

.4 Provide UY2 gel-filled connectors as required for a complete and functional system.

.5 All additional parts and accessories required for complete and functional system shall be provided.

2.3 SITE LIGHTING

.1 Provide post top, landscape and roadway luminaires as indicated.

.2 Coordinate with the General Contractor to provide concrete bases for pole-mounted luminaires and bollards as detailed. Anchor bolts to be designed to suit local wind conditions.

.3 Provide a hand hole, complete with gasketted cover and ground lug on each pole.

2.4 LED LIGHTING

.1 All LED lighting shall have the following I.E.S. testing to be considered for installation.

.1 LM 80 08 Approved methods measuring lumen maintenance for SSL light sources.

.2 LM 79 08 Approved methods for electrical photo and metric measurements of solid state lighting products.

.2 All LED lamps and drivers shall have minimum 5 year warranty with minimal hours of operation of 50,000 hours or equal to luminaires hours.

.3 Heat dissipation and maximum heat build up shall be submitted for review.

.4 Handrail lighting shall be Planet Lighting HLS Vertical beam minipuck, 316 stainless steel with polycarbonate lens, heavy duty flat face, 3000K/119 lumen output. Catalogue number HLS-VA-HW-FF-WW complete with in situ installation tools.

Part 3 Execution

3.1 INSTALLATION (LUMINAIRES)

.1 Install luminaires at locations indicated, complete with all wiring, connections, fittings, aligners, box covers and accessories, as required.

.2 Install luminaires and lens materials in architectural details, as indicated.

.3 Coordinate 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 shall be relocated to a more suitable location, as directed by the Contract Administrator.

.4 Install post top, landscape and roadway luminaires plumb.

.5 LED minipuck handrail luminaires shall be installed on-site according to manufacturer's written instructions and utilizing in situ installation tools as supplied by LUMID/FIRELAB, 7940 Jean-Brillon, Montreal, Quebec, H8N 2L5, Telephone (514) 524-1831 ext. 28.

.6 Mark out location of all luminaires for acceptance from Contract Administrator prior to installation.

3.2 WIRING

.1 Connect luminaires to lighting circuits as indicated.

3.3 LAMPS

.1 Adjust lamp position in adjustable lamp holder-type luminaires to produce the proper beam distribution for the specified lamp.

3.4 TESTS

.1 Perform tests in accordance with Section 26 00 10.

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

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 OF SECTION