Division 26 00 10

Electrical Specification

26 00 10 BASIC MATERIAL AND METHODS

1.1 GENERAL REQUIREMENTS
1. The specification covering the General Conditions of the Contract, General Specifications, Instructions to Bidders and all associated sections form an integral part of this specification and shall be read in conjunction herewith.

1.2 SCOPE
1. Provide all materials, labour, plant and equipment required for a complete and working installation as herein specified and as shown on the drawings.
2. The electrical installation shall be in accordance with the current edition of the Canadian Electrical Code, Provincial and Municipal codes and regulations.
3. Obtain all permits, approvals and pay all related fees required for this installation.
4. All equipment supplied under this Contract shall be new and be C.S.A. approved.
5. Arrange for, and co-ordinate, rough-in and final inspections with City of Winnipeg, Consultant and Building Engineer.

1.3 DEFINITIONS
The following are definitions of terms and expressions used in the specification:
- CONSULTANT means Electrical Engineering Consultant: MCW/AGE Consulting Professional Engineers
- INSPECTION AUTHORITY means agent of any authority having jurisdiction over construction standards associated with any part of electrical work on site.
- SUPPLY AUTHORITY means electrical power utility company responsible for delivery of electrical power to project.
- ELECTRICAL CODE means as shown on contract drawings or noted in Contract Documents.
- 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.
- PROVIDE means to supply, install and leave in working order all materials and necessary wiring, supports, access panels, etc., as necessary for equipment indicated.

1.4 EXAMINATION
1. Examine the architectural drawings to ensure that the work under this Contract can be satisfactorily carried out. Report any discrepancies to the Consultant prior to submission of tender.
2. Examine the site, local conditions and all existing apparatus if any to be re-used and verify that the condition of this equipment is suitable for its intended use in the new construction.

1.5 SUPERVISION
1. Supervise the work at all times through a responsible and competent supervisor.
2. Full co-operation 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 site as constructed.
2. Outlets or equipment shall be moved to any point within a 10' radius when the Consultant requests relocation before the work has been substantially completed, without additional cost.
3. Branch circuit wiring shall be installed with circuits arranged exactly as shown on the drawings. Conduit and cable runs may be modified to suit the installation.
4. Contractor shall provide a typical mock-up of one area if requested prior to complete rough-in.

1.7 APPROVAL OF MATERIAL
1. Request for approval of material as equals or alternates to that specified shall be submitted to the Consultant with a stamped self-addressed envelope and performance specifications three (3) working days prior to the tender submitted. Samples shall be provided on request.
2. Approvals may be transmitted electronically providing all pertinent information is included for a complete review by the Consultant.

1.8 SHOP DRAWINGS
1. Submit shop drawings of electrical equipment to the Architect for review. Fabrication of equipment shall not commence until the Consultant has reviewed shop drawings of such equipment. Two (2) sets shall be submitted with local Inspection Department approval where required.
2. Shop drawings may be transmitted electronically providing Contractors include their review confirmation.

1.9 "AS-BUILT" DRAWINGS
1. Keep a record set of drawings on the site at all times recording any changes that may occur. Submit these drawings to the Consultant upon completion of the work. As-builts shall include circuiting of new and existing equipment to remain. Transfer changes to electronic disc AutoCAD file. Submit disc and hard copy for final review and submission to Owners.
2. Submit a Certificate of Inspection from the local Inspection Authority upon completion of work and include with As-builts.
3. The Consultant reserves the right to recommend that a portion of the Contract funds be withheld pending submission of acceptable as-built drawings.

1.10 TEST
1. The electrical installation shall be completely tested demonstrating that the equipment and systems installed perform in the manner intended.

1.11 GUARANTEE
1. The satisfactory operation of all work shall be guaranteed for a period of 12 calendar months after final acceptance of the building.

1.12 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 labour required in the change.

1.13 GROUNDING
1. The entire installation shall be grounded in accordance with the Canadian Electrical Code.
2. Isolated ground conductors for panels shall be minimum #6 (green insulation) and be in one continuous, separate run, to the building water main (unless noted otherwise).

1.14 WORKMANSHIP
1. Install equipment, conduit and cables in a workmanlike manner to present a neat appearance to the satisfaction of the Consultant. Install conduit and cable runs parallel and perpendicular in chases, behind furring or above ceilings. In areas where systems are to be exposed, install neatly and group to present a tidy appearance.
2. Install equipment and apparatus requiring maintenance, adjustment or eventual replacement with adequate clearances and accessibility for same.
3. Include, in the work, all requirements shown on the shop drawings or manufacturers' installation instructions.
4. Replace work unsatisfactory to the Consultant without extra cost.
5. All conduit must be clipped to structural concrete by means of anchors or supported by Unistrut hangers as close to U/S as possible. Tie wraps for wire hanging and fastening is not acceptable, unless pre-authorized by the Building Owner. Perforated strapping is also unacceptable.
6. All support material for all luminaires, outlet boxes, junction boxes, etc. in a non-combustible building shall be of non-combustible material. Wood is not acceptable.

1.15 IDENTIFICATION OF EQUIPMENT
1. All equipment, including receptacles, shall be identified with engraved lamacoid nameplates either screwed or riveted in place. Where Phenolic plastic coverplates are utilized, the circuit identification to be attached to the outlet box, visible when the coverplate is removed.
2. The utilization of Dynamo 6000 or equal is acceptable.
3. Wording for coverplates shall be confirmed by Consultant.

1.16 CUTTING AND PATCHING
1. Arrange and pay for all cutting and patching as required for the electrical installation.

1.17 WIRING METHODS
1. Unless otherwise shown on the drawings, all wires shall be copper, minimum #12 AWG with 90°C x-link insulation. Wiring to be installed in conduit.
2. Wiring in concrete or masonry construction shall be in steel electrical metallic tubing (EMT). Provide a separate grounding conductor in EMT conduit runs embedded in concrete slabs. Conduits installed in areas exposed to moisture shall have watertight fittings.
3. All wiring in finished areas shall be concealed. Conduits shall be run at right angles to the building lines.
4. Conduit and wiring shall be grouped where possible and clipped in a neat and workmanlike manner.
5. Existing AC-90 runs to base building panels shall be removed and replaced with conduit and wire within this Contract.
6. Conduit runs shall be installed and inspected before AC-90 runs are installed to ensure conformance with Item 5 herein.
7. Soft wiring NMD-7 may be utilized in all wood construction where same meets Code. Conduit shall be installed to central junction box for NMD-7 cable termination.

1.18 MOUNTING
1. Mounting height of equipment is from finished floor to centreline of equipment unless specified or indicate otherwise.
2. If mounting height of equipment is not indicated, verify with Architect before proceeding with installation.
3. Install electrical equipment at the following heights unless indicated or directed otherwise.
   .1 Branch circuit panels, control panels, annunciators, etc.: 72" (1825mm).
.2 As per Architectural elevations.
4. All transformers shall be mounted on 4" (100mm) concrete housekeeping pads. The Electrical Contractor shall be responsible for provision of these pads.

26 06 22 MISCELLANEOUS APPARATUS AND APPLIANCES

1.1 GENERAL
1. Provide all required electrical devices, components, conduits, fittings, wiring, disconnects, and miscellaneous equipment to make all connections to equipment.
2. Be familiar with the apparatus being supplied and carefully coordinate and cooperate with the supplier/installer to ensure a proper and complete installation.

1.2 ILLUMINATED SIGNS
1. Wire and connect all illuminated signs. Provide a disconnect at each sign.
2. Utilize water-tight wiring methods.

26 24 16 PANELBOARDS

1. Panels shall be complete with panel trim having concealed hinges and trim mounting screws, locking door with flush catch. Provide two (2) keys for each panel.
2. Circuit breakers shall be bolt on moulded case with thermal breakers rated at 10,000A symmetrical.
3. Affix typewritten directory to the inside of the panelboard indicating loads controlled by each circuit.
4. Panelboards to be surface or recessed mounted as indicated.

Part 1 General

1.1 RELATED WORK
.1 Section 26 00 10 – Basic Electrical Material and Methods
.2 Section 26 05 34 – Conduit
.3 Section 27 05 28 – Communication Cabling Raceways
.4 Section 26 05 29 – Fastenings and Support

Part 2 Products

2.1 MATERIALS
.1 Conductors in Conduit (R-90):
Type: RW-90Conductors: Solid copper #10 AWG and smaller.Stranded copper #8 AWG and larger.Sized as indicated (minimum #12 AWG)Insulation: Cross link polyethylene (XLPE), 90°C (194°F).Configuration: Single conductorVoltage Rating: 1000VCertification: CSA C22.22 No.38 or latest revision..2Armored Cable:
Type: AC-90Conductors: Solid copper #10 AWG and smaller.Stranded copper #8 AWG and larger.Sized as indicated (minimum #12 AWG).Insulation: Cross link polyethylene (XLPE), 90°C (194°F).Configuration: Multi-conductor, as required, complete with a separate bare CU ground wire.Voltage Rating: 1000VArmor: Bare interlocked aluminum.Certification: CSA C22.22 No.38 or latest revision..3 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), 90°C (194°F).Configuration: Multi-conductor, as required, complete with a separate bare CU ground wire.Colour 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), –40°C (–40°F).Low flame spread (LFS).Low gas emission (LGE).Fire Rated: FT4.Certification: CSA C22.22 No. 131 or latest revision..4 Aluminium Sheathed Cables:
Type: RA-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), 90°C (194°F).Configuration: Single conductor.Voltage Rating: 1000V.Aluminium Sheath: Liquid and vapour tight solid corrugation.Outer Jacket: Polyvinyl chloride (PVC), –40°C (–40°F).Low flame spread (LFS).Low gas emission (LGE).Fire Rating: FT4.Certification: CSA C22.22 No. 123 or latest revision.Ground: Provide bare ground sized to Table 17 C.E.C..5 Electronic Cables
Conductors: 18 AWG– STC solid copper.Insulation: Polyvinyl chloride (PVC).Configuration: Twisted pairs (No. as indicated)Shielding: Copper braid.Voltage Rating: 300V.Certification: CSA..6 Non-Metallic Cable:
1. Direct Buried Wire
Type: NMWUConductors: Solid copper #10 AWG and smaller.Stranded copper #8 AWG and larger.Sized as indicated (minimum #12 AWG).Insulation: Polyvinyl chloride (PVC), 60°C (140°F).Configuration: Multi-conductor, as required, complete with a separate CU ground wire.Voltage Rating: 300VOuter Jacket: Polyvinyl chloride (PVC).Certification: CSA C22.22 No. 48 or latest revision..7 Instrumentation Cable:
Type: Instrumentation cable.Conductors: 7 wire, concentric lay, Class B, tinned copper, #18 Or #14 AWG, required.Voltage Rating: 300V or 600V, as required.Insulation: Fire retardant – cross link polyethylene (XLPE), 90°C (194°F).Configuration: Single or multi-pairs or triads, as indicated.Shielding: Aluminium/mylar shield with drain wire for each pair or Triad.Overall aluminium/mylar shield with drain wire.Drain Wires: 7 wire, concentric lay, Class B, tinned copper.Individual shields to be one size smaller than conductor size.Overall shields to be the same as conductor size.
Colour Codes: 300V pairs – black, white and number code.300V triads – black, white and number code.600V pairs – black, red and number code.600V triads – black, red, yellow and number code.Armor: Interlocked aluminium.Outer Jacket: Grey polyvinyl chloride (PVC).Low flame spread (LFS).Low gas emission (LGE).Fire Rating: FT4.Certification: CSA C21.1 or latest revision.CSA C22.2 No.174 or latest revision..8 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.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–5a.C.E.A. S–66–524.C.S.A. C68.2.R.E.A. U–1.9 Low Voltage Control Cables:
Type: LVT.Conductors: Solid copper #18 AWG.Insulation: Thermoplastic, colour coded.Configuration: Single. Two conductor – parallel, Three or more conductors twisted.Voltage Rating: 30V.Outer Jacket: Thermoplastic.Certification: CSA C22.22 No. 35..10 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. Colour 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.

3.2 INSTALLATION SINGLE CONDUCTOR CABLES
.1 Single conductor cables shall be installed one cable diameter apart on suspended cable tray or channel supports and shall be clamped with aluminium cable clamps. Cables shall be terminated using non-magnetic connectors. Cable armour shall be grounded via an aluminium plate at the supply end and isolated via an insulating plate, at the load end of the cable. A #3/0 AWG bare (unless otherwise noted) copper ground wire shall be installed with each set of feeder cables. Cable bending radius shall be at least twelve times the overall cable diameter and bend shall not damage or distort the outer sheath.
.2 Install cables in trenches as per Section 26 05 45.
.3 Provide pressure tight connectors when aluminum cable is utilized.

3.3 INSTALLATION OF FLEXIBLE ARMOURED CABLE
.1 Type AC-90 armoured cable (BX) shall be used for connections from conduit systems to recessed luminaires in accessible ceilings. Cable shall be of sufficient length to allow the lighting fixture to be relocated to any location within a 6' (1.83 mm) radius. Cable shall be clamped before entering the lighting fixture and shall be clipped before entering the conduit system junction box. (Minimum requirements)
.2 Type AC-90 armoured cable may be used for connections from conduit systems to wiring devices in steel stud partitions and for interconnection of wiring devices within steel stud partitions, cable shall be clipped before entering junction or outlet boxes. Cable shall be clamped within partitioning with plastic tie-wraps.
.3 Type AC-90 ISO-BX as supplied by Alcatel shall be used for isolated ground receptacles.

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

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

3.6 IDENTIFICATION
.1 Wire in conduit #2 AWG and smaller shall have solid coloured insulation, colour 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 colour. Neutral and ground conductors shall be identified. Paint or other means of colouring the insulation shall not be used.
.3 Colour code wire in conduit and single conductor cables as follows:
Phase A redPhase B blackPhase C blueNeutral whiteGround green Unless shown otherwise on the drawings.
.4 Maintain phase sequence and colour coding throughout project.
.5 Use colour coded wires in communication cables, matched throughout system.

END OF SECTION

Part 1 General

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

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 FRE duct: size 2" (53mm) and above as indicated.
.6 Electrical non-metallic tubing (ENT) only as indicated.

2.2 CONDUIT FASTENINGS
.1 One hole steel straps to secure surface conduits 1¼" (35mm) and smaller. Two hole steel straps for conduits larger than 1¼" (35mm).
.2 Beam clamps to secure conduits to exposed steel work.
.3 U-channel type supports as specified for two or more conduits at 60° (1.52m) intervals (surface-mounted or suspended).
.4 ¾" (10mm) diameter threaded rods to support suspended channels. One rod shall be non-ferrous.

2.3 CONDUIT FITTINGS
.1 Fittings manufactured for use with conduit specified.
.2 Manufacturer elbows where 90° 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 or sprinklerproof 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, contactors and motor control centres.

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).

Part 3 Execution

3.1 INSTALLATION
.1 Install conduits to conserve headroom in exposed locations and cause minimum interference in spaces through which they pass.
.2 Conceal conduits except in mechanical and electrical service rooms.
.3 Use electrical metallic tubing (EMT) except where noted otherwise.
.4 Wiring home runs to panels and main branch wiring runs 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 with AC-90. AC-90 drops to light fixtures shall not run horizontally more than 6' (1.83m) from conduit system junction boxes in ceiling space. AC-90 drops from conduit system in the ceiling space to feed outlets in steel stud partitions shall not run more than 6' (1.83m) horizontally from the ceiling outlet box to the point where the AC-90 drops vertically into the partition.
.5 Use rigid PVC conduit for underground installations.
.6 The use of electrical non-metallic tubing (ENT) shall be limited to in-slab installations only.
.7 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.
.8 Use threaded rigid conduit and fittings in hazardous areas, concrete encased duct banks or where conduit is exposed to mechanical injury. Install conduit sealing fittings in hazardous areas and fill with compound. Field threads on rigid conduit shall be sufficient length to draw conduits up tight. Mechanically bend rigid steel conduit over 1" (21mm) diameter.
.9 Bend conduit cold. Replace conduit if kinked or flattened more than 1/10th of its original diameter.
.10 Install polypropylene fish cord in empty conduits.
.11 Where conduits become blocked, remove and replace blocked section.
.12 Dry conduits out before installing wire.
.13 The length of any conduit run shall not exceed 100' (33m) and no conduit run shall have more than two 90° 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.
.14 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 SURFACE CONDUITS
.1 Run parallel or perpendicular to building lines.
.2 Do not locate conduits within 78" (2m) of infrared or gas-fired heaters.
.3 Group conduits wherever possible on suspended or surface channels.
.4 Do not pass conduits through structural members, except as indicated.
.5 Do not locate conduits less than 6" (150mm) to steam or hot water lines.

3.3 CONCEALED CONDUITS
.1 Do not install conduit home runs horizontally in masonry walls.
.2 Do not install conduits in terrazzo or concrete toppings, unless otherwise indicated.

3.4 CONDUITS IN POURED CONCRETE
.1 Locate to suit reinforcing steel. Install in centre one third of slab. Maximum permissible conduit size in slabs is 1" (25mm). 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 2½" (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 Consultant for approval prior to installation.
.2 Provide 5" x 7" (125x175mm) colour 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 (and/or columns).
.3 Protect conduits from damage where they stub out of concrete.
.4 Install sleeves where conduits pass through slab or wall.
.5 Where conduits pass through waterproof membrane, provide oversized sleeve before membrane is installed. Use cold mastic between sleeve and conduit.
.6 Do not install conduits larger than 1" (27mm) in concrete slabs without prior approval or Architect.

3.5 CONDUITS IN POURED SLABS ON GRADE
.1 Run conduits larger than 1" (25mm) below slab and encased in 3" (75mm) concrete envelope. Provide ground wire in all conduits below grade.

3.6 CONDUITS UNDERGROUND
.1 Use PVC conduits or FRE duct underground. Provide a separate ground wire in non-metallic conduits.
.2 All fittings shall be waterproof.
.3 Slope conduits to provide drainage.

3.7 CONDUIT IDENTIFICATION
.1 Colour code coverplates of junction boxes in conduit systems as per the colour code list below.
.2 Colour code by spray painting the coverplate on each junction box in the conduit run.

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 FRE duct, 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.
.3 FRE duct couplings, bends, adapters, caps, etc., as required.

2.3 GROUNDING
.1 Provide a separate insulated ground wire in each PVC or FRE 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 Single conductor cables shall be spaced 7½" (190mm) apart.
.3 Install sand 6" (150mm) below and 6" (150mm) above cables and conduits.
.4 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
.5 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 Consultant 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 Basic Electrical Materials and Methods Section 26 00 10

1.2 SUBMITTALS
.1 Submit complete photometric data prepared by an independent testing laboratory for luminaires where specified for approval by Consultant.
.2 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 colour temperature, and CRI.
.3 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 colour temperature and CRI.

1.3 GUARANTEE
.1 Replace:
.1 Incandescent and tungsten halogen lamps burnt out within 3 months of takeover.
.2 Fluorescent and HID lamps burning out within 12 months of takeover.
.3 Ballasts that fail or exceed their labelled noise level rating within 12 months of takeover.

1.4 COORDINATION
.1 Coordinate luminaire locations with work of other trades.

Part 2 Products

2.1 GENERAL
.1 Luminaires shall carry the CSA label.
.2 Provide supporting devices, plaster frames, junction boxes and outlet boxes where required.
.3 Provide lenses or diffusers of glass or acrylic material as indicated. Acrylic lenses used with fluorescent luminaires shall be a minimum of .125" (3 mm) thick.
.4 Include finishes to Section 26 00 10 and as indicated.
.5 Conduct lamp burn in procedures as per manufacture recommendations.
.6 Power Smart requirements:
.1 Lighting shall adhere to the Manitoba Hydro Power Smart Program. Linear fluorescent ballasts shall be applicable for the "Premium" rebate category (dimmable and 8' systems are under one rebate level).
.2 To ensure these products are supplied, and to facilitate the application process, shop drawings shall include the quantity, manufacturer, catalogue number and a specification sheet of each ballast to be used in each linear and compact fluorescent fixture.
.3 A copy of the Power Smart Listing should be provided with each applicable product submitted.
.4 A summary of total quantity, manufacturer and catalogue number shall be provided for furtherance to the Owner's representative for application preparation. This is to be submitted with approval shop drawings.
.7 All 347 volt luminaires shall be complete with integral disconnect switch to meet CEC Part 1 Rule 30-308(4).

2.2 LAMPS
.1 Provide lamps as indicated.

2.3 BALLASTS AND ACCESSORIES
.1 Provide ballasts and accessories as indicated.
.2 Provide ballasts with non-PCB type capacitors with pressure sensitive devices to prevent rupturing.
.3 Ballasts used in exterior luminaires shall be rated at –20°C (–4°F) starting.
.4 Ballasts shall be program start. HF except for occupancy sensor control which shall be rapid start.

2.4 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.

2.5 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.

Part 3 Execution

3.1 INSTALLATION (LUMINAIRES)
.1 Install luminaires at locations indicated, complete with all wiring, connections, fittings, hangers, aligners, box covers and accessories, as required.
.2 Install luminaires and lens materials in architectural details, as indicated.
.3 Install luminaires parallel with building lines. Wall-mounted luminaires shall be installed plumb.
.4 Review all ceiling type, construction details and mounting arrangements before placing luminaire orders and ensure that all mounting assemblies, frames, rings and similar features are included for and match the required installation.
.5 All luminaires and assemblies shall be properly secured and supported. Support luminaires independent of the ceiling construction, complete with all fasteners, framing and hangers, as may be required. Do not secure luminaires to mechanical ductwork or other vibration producing apparatus, unless specifically detailed on the drawings.
.6 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, pipes or ductwork shall be relocated to a more suitable location, as directed by the Consultant and/or Architect.
.7 Install post top, landscape and roadway luminaires plumb.

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

APEGM
Certificate of Authorization
MCW/AGE Consulting Professional Engineers
No. 589 Expiry: April 30, 2015

NOTE:
These design documents are prepared solely for the use by the party with whom the design professional has entered into a contract and there are no representations of any kind made by the design professional to any party with whom the design professional has not entered into a contract.

NO.	REVISIONS	DATE	BY
0	ISSUED FOR CONSTRUCTION	05-08-2014	EG

G.B.M.
ELEV.

MCW / AGE
Consulting Professional Engineers
210-1821 Wellington Avenue
Winnipeg, Manitoba, R3H 0G4
Phone - (204) 779-7600 Fax - (204) 779-1119
E-Mail: mcw_wpg@mcw.com
10331

DESIGNED BY	MJB	CHECKED BY	EG
DRAWN BY	MJB	APPROVED BY	EG
SCALE	N.T.S	ELECTRICAL SPECIFICATION	
DATE	AUGUST 5, 2014		

ENGINEER'S SEAL
PROFESSIONAL ENGINEER PROVINCE OF MANITOBA H. GARFINKEL Member 7089 REGISTERED PROFESSIONAL ENGINEER
2014 08 04

CONSULTANT ACAD DWG. NO. E1.2

Winnipeg
THE CITY OF WINNIPEG
PUBLIC WORKS DEPARTMENT
ENGINEERING SERVICES DIVISION
CITY OF WINNIPEG

CITY DRAWING NUMBER

BID NO. 742-2014

Aug 05, 2014 – 4:03pm
H:\10300\10331\00 Drawings\ELEC\10331 – E1.2.dwg – tab: E1.2