



THE CITY OF WINNIPEG

NMS SPECIFICATIONS

BID OPPORTUNITY NO. 772-2017

**FERMOR AVENUE BRIDGE OVER SEINE RIVER – BRIDGE REHABILITATION,
PEDESTRIAN-CYCLIST UNDERPASS STRUCTURE AND ROADWORKS FROM
ST. ANNE'S ROAD TO ARCHIBALD STREET**

SPECIFICATION NO.	SPECIFICATION TITLE	PAGES
	Table of Contents	1
26 05 01	Common Work Results – Electrical	4
26 05 20	Wire and Box Connectors 0-1000 V	1
26 05 21	Wires and Cables	2
26 05 28	Grounding Secondary	2
26 05 31	Splitters, Junction, Pull Boxes and Cabinets	1
26 05 32	Outlet Boxes , Conduit Boxes and Fittings	2
26 05 34	Conduits, Conduit Fastenings and Conduit Fittings	3
26 05 44	Installation of Cables in Trenches and in Ducts	3
26 09 24	Lighting Control Devices – Low Voltage	1
26 21 17	Panelboards Breaker Type	2
26 27 16	Electrical Cabinets and Enclosures	1
26 27 26	Wiring Devices	3
26 28 21	Moulded Case Circuit Breakers	2

Part 1 General

- .1 This section covers items common to sections of Division 26. This section supplements requirements of Division 1.

1.1 CODES AND STANDARDS

- .1 Do complete installation in accordance with CSA C22.1-2015 except where specified otherwise.
- .2 Do overhead and underground systems in accordance with CSA C22.3 No.1-2015 except where specified otherwise.
- .3 Abbreviations for electrical terms: to CSA Z85-1983.

1.2 CARE, OPERATION AND START-UP

- .1 Instruct Owner and operating personnel in the operation, care and maintenance of equipment.
- .2 Provide these services for such period, and for as many visits as necessary to put equipment in operation, and ensure that operating personnel are conversant with all aspects of its care and operation.

1.3 VOLTAGE RATINGS

- .1 Operating voltages: to CAN3-C235-83.
- .2 Motors, electric heating, control and distribution devices and equipment to operate satisfactorily at 60 Hz within normal operating limits established by above standard. Equipment to operate in extreme operating conditions established in above standard without damage to equipment.

1.4 PERMITS, FEES AND INSPECTION

- .1 Submit to Electrical Inspection Department and Supply Authority necessary number of Drawings and specifications for examination and approval prior to commencement of Work.
- .2 Pay associated fees.
- .3 Contract Administrator will provide Drawings and specifications required by Electrical Inspection Department and Supply Authority at no cost.
- .4 Notify Contract Administrator of changes required by Electrical Inspection Department prior to making changes.
- .5 Furnish Certificates of Acceptance from authorities having jurisdiction on completion of Work to Contract Administrator.

1.5 MATERIALS AND EQUIPMENT

- .1 Equipment and material to be CSA certified. Where there is no alternative to supplying equipment which is not CSA certified, obtain special approval from Electrical Inspection Department.
- .2 Factory assembled control panels and component assemblies.

1.6 FINISHES

- .1 Shop finish metal enclosure surfaces by application of rust resistant primer inside and outside, and at least two coats of finish enamel.
- .2 Paint indoor switchgear and distribution enclosures light grey to EEMAC 2Y-1-1958.
- .3 Paint outdoor electrical equipment "Equipment Green" finish to EEMAC Y1-1-1955.
- .4 Clean and touch up surfaces of shop-painted equipment scratched or marred during shipment or installation, to match original paint.
- .5 Clean and prime exposed non-galvanized hangers, racks and fastenings to prevent rusting.

1.7 EQUIPMENT IDENTIFICATION

- .1 Panels, switchboards, telephone cabinets, motor starters and controls, disconnect switches, control devices, and similar equipment connected to the electrical systems shall be properly identified by means of engraved laminated plastic nameplates.
- .2 Nameplates shall be at least 50 x 75 mm (2" x 3") with the minimum size of lettering 10 mm (3/8") high, thickness of 5 mm (3/16").
- .3 Nameplates shall be as follows:

	<u>Background</u>	<u>Letters</u>
240 Volt Normal	Black	White
240 Volt Essential	Red	White

Panel sample:

PANEL A

Fed from MANITOBA HYDRO PADMOUNT TRANSFORMER

120/240V, 1, 3W

19 mm panel name, 12 mm for remainder

- .4 Submit a complete list of all nameplates, including proposed inscriptions to the Departmental Representative for approval prior to placing the order for the manufacture of the nameplate.
- .5 Nameplates shall be fastened to the equipment with adhesive backing and two blind rivets.
- .6 Pressure indented adhesive strip nameplates are not acceptable and shall not be used.

1.8 WIRING IDENTIFICATION

- .1 Identify wiring with permanent indelible identifying markings, either numbered or coloured plastic tapes, on both ends of phase conductors of feeders and branch circuit wiring.
- .2 Maintain phase sequence and colour coding throughout.
- .3 Colour code: to CSA C22.1-2015.
- .4 Use colour coded wires in communication cables, matched throughout system.

1.9 CONDUIT AND CABLE IDENTIFICATION

- .1 Colour code conduits, boxes and metallic sheathed cables.
- .2 Code with plastic tape or paint at points where conduit or cable enters wall, ceiling, or floor, and at 15 m intervals.
- .3 Colours: 25 mm wide prime colour and 19 mm inch wide auxiliary colour to match existing.

1.10 WIRING TERMINATIONS

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

1.11 MANUFACTURERS AND CSA LABELS

- .1 Visible and legible after equipment is installed.

1.12 WARNING SIGNS

- .1 As specified and to meet requirements of Electrical Inspection Department and Contract Administrator.
- .2 Decal signs, minimum size 150 x 250 mm.

1.13 MOUNTING HEIGHTS

- .1 Mounting height of equipment is from finished floor to centreline of equipment unless specified or indicated otherwise.
- .2 If mounting height of equipment is not specified or indicated, verify before proceeding with installation.

1.14 CONDUIT AND CABLE INSTALLATION

- .1 Install conduit and sleeves prior to pouring of concrete. Sleeves through concrete; plastic, sized for free passage of cables and protruding 50 mm.

1.15 FIELD QUALITY CONTROL

- .1 Conduct and pay for following tests:

- .1 Distribution system including phasing, voltage, grounding and load balancing;
- .2 Furnish manufacturer's certificate or letter confirming that entire installation as it pertains to each system has been installed to manufacturer's instructions.
- .3 Insulation resistance testing:
 - .1 Megger circuits, feeders and equipment up to 350 V with a 500 V instrument;
 - .2 Megger 350-600 V circuits, feeders and equipment with a 1000 V instrument;
 - .3 Check resistance to ground before energizing.
- .4 Carry out tests in presence of Contract Administrator.
- .5 Provide instruments, meters, equipment and personnel required to conduct tests during and at conclusion of project.
- .6 Submit test results for Contract Administrator's review.
- .7 All shutdowns to be coordinated with Contract Administrator. Advise Contract Administrator forty-eight (48) hours prior to shutdown.

END OF SECTION

Part 1 General

1.1 REFERENCES

- .1 Canadian Standards Association (CSA International)
 - .1 CSA C22.1-2015 Canadian Electrical Code, Part 1
 - .2 CAN/CSA-C22.2 No.18-98, Outlet Boxes, Conduit Boxes, Fittings and Associated Hardware
 - .3 CSA C22.2 No.65-13 (R2013), Wire Connectors
- .2 Electrical and Electronic Manufacturers' Association of Canada (EEMAC)
 - .1 EEMAC 1Y-2, Bushing Stud Connectors and Aluminum Adapters (1200 Ampere Maximum Rating)
- .3 National Electrical Manufacturers Association (NEMA)

Part 2 Products

2.1 MATERIALS

- .1 Pressure type wire connectors to: CSA C22.2 No.65, with current carrying parts of copper and copper alloy sized to fit copper conductors as required.
- .2 Fixture type splicing connectors to: CSA C22.2 No.65, with current carrying parts of copper and copper alloy sized to fit copper conductors 10 AWG or less.
- .3 Bushing stud connectors: to NEMA to consist of:
 - .1 Connector body and stud clamp for stranded conductors;
 - .2 Clamp for stranded copper conductors;
 - .3 Stud clamp bolts;
 - .4 Bolts for copper conductors;
 - .5 Sized for conductors as indicated.
- .4 Clamps or connectors for flexible conduit, as required to: CAN/CSA-C22.2 No.18.

Part 3 Execution

3.1 INSTALLATION

- .1 Remove insulation carefully from ends of conductors and:
 - .1 Install mechanical pressure type connectors and tighten screws with appropriate compression tool recommended by manufacturer. Installation shall meet secureness tests in accordance with CSA C22.2 No.65;
 - .2 Install fixture type connectors and tighten. Replace insulating cap;
 - .3 Install bushing stud connectors in accordance with NEMA.

END OF SECTION

Part 1 General

1.1 RELATED WORK

- .1 Section 26 05 01 – Common Work Results – Electrical

Part 2 Products

2.1 BUILDING WIRES

- .1 Conductors: stranded for 10 AWG and larger. Minimum size: 12 AWG unless noted otherwise.
- .2 Copper conductors: size as indicated, with 300V insulation of chemically cross-linked thermosetting polyethylene material rated RW90 and RWU90 when installed below grade.

2.2 CONTROL CABLES

- .1 Single conductor wire shall be 98% conductivity copper type RW90 90°C insulation rated at 300 V, stranded conductor RWU90 when wiring is installed below grade, sizes to suit but generally no smaller than #16 AWG. Insulation shall be manufactured to CSA specification C22.2 No. 38.
- .2 Control panel and cabinet wiring shall be based on stranded copper conductor Type TEW or TBS with insulation rated at 300 V. Wiring shall be sized to code for the intended application but should not be smaller than #16 AWG.
- .3 Analog instrumentation cable shall use single or multiple pair, seven strand copper conductor, individually twisted and shielded, individual tinned copper drain wire, complete electrical isolation between shields, overall multi-conductor cable shield with drain wire, interlocking aluminum armour and flame retardant rated outer PVC jacket. Cable and conductor insulation shall be rated for 90°C and 300 V. Conductor size shall be minimum #16 AWG or as noted on drawings.
- .4 Connectors shall utilize CSA approved types to suit conductor size, watertight in all cases.
- .5 Cable for control purposes integral to the equipment furnished, with the exception of internal wiring of control panels or cabinets which do not require armour protection, shall be based on multi-conductor, shielded copper conductor with cross linked flame resistant polyethylene insulation with overall flame resistant neoprene jacket insulation to be rated for 300 V, 90°C sized to suit application.

Part 3 Execution

3.1 INSTALLATION OF BUILDING WIRES

- .1 Install wiring as follows:
 - .1 In conduit systems as shown on drawings;

- .2 Seal all openings watertight through structure exterior walls.

3.2 INSTALLATION OF CONTROL CABLES

- .1 Install control cables as indicated.
- .2 Ground control cable shield at the source end only.

END OF SECTION

Part 1 General

1.1 RELATED SECTIONS

- .1 Section 26 05 01 - Common Work Results - Electrical

1.2 REFERENCES

- .1 American National Standards Institute (ANSI)/Institute of Electrical and Electronics Engineers (IEEE)
- .2 ANSI/IEEE 837-2014, Qualifying Permanent Connections Used in Substation Grounding
- .3 Canadian Standards Association, (CSA International)

Part 2 Products

2.1 EQUIPMENT

- .1 Clamps for grounding of conductor: size as indicated or as required to electrically conductive underground water pipe.
- .2 Copper conductor: minimum 6 m long for each electrode, bare, stranded, soft annealed, size as indicated.
- .3 Rod electrodes: copper clad steel 21 mm dia. by 3 m long.
- .4 Ground bus: copper, minimum 200mmX50mmX6mm, complete with insulated supports, fastenings, connectors.
- .5 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 Thermite welded type conductor connectors;
 - .5 Bonding jumpers, straps;
 - .6 Pressure wire connectors.

Part 3 Execution

3.1 GROUNDING INSTALLATION

- .1 Install complete permanent, continuous grounding system including, electrodes, conductors, accessories. Where EMT or PVC is used, run ground wire in conduit.
- .2 Install connectors in accordance with manufacturer's instructions.
- .3 Protect exposed grounding conductors from mechanical injury.

- .4 Make buried connections and connections to conductive water main, electrodes, using permanent mechanical connectors or inspectable wrought copper compression connectors to ANSI/IEEE 837.
- .5 Use mechanical connectors for grounding connections to equipment provided with lugs.
- .6 Soldered joints not permitted.
- .7 Install bonding wire for flexible conduit, connected at both ends to grounding bushing, solderless lug, clamp or cup washer and screw. Neatly cleat bonding wire to exterior of flexible conduit.
- .8 Install flexible ground straps for bus duct enclosure joints, where such bonding is not inherently provided with equipment.

3.2 ELECTRODES

- .1 Install rod electrodes and make grounding connections.
- .2 Bond separate, multiple electrodes together.
- .3 Use size #1 AWG copper conductors for connections to electrodes.

3.3 SYSTEM AND CIRCUIT GROUNDING

- .1 Install system and circuit grounding connections to neutral of primary 120/240V system.

3.4 EQUIPMENT GROUNDING

- .1 Install grounding connections to typical equipment included in, but not necessarily limited to the following list: service equipment, control panels, bridge structure steel work, distribution panels, lighting.

3.5 GROUNDING BUS

- .1 Install copper grounding bus mounted on insulated supports inside pad mounted distribution enclosure.

3.6 FIELD QUALITY CONTROL

- .1 Perform tests in accordance with Section 26 05 01 – Common Work Results – Electrical.
- .2 Perform ground continuity and resistance tests using method appropriate to site conditions and to approval of Departmental Representative and local authority having jurisdiction over installations.
- .3 Perform test before energizing electrical system.
- .4 Disconnect ground fault indicator during tests.

END OF SECTION

Part 1 Products

1.1 JUNCTION AND PULL BOXES

- .1 Welded steel construction with screw-on flat covers for surface mounting.
- .2 Covers, gasketed with 25 mm minimum extension all around, for flush-mounted pull and junction boxes.

Part 2 Execution

2.1 JUNCTION AND PULL BOXES INSTALLATION

- .1 Install pull boxes in inconspicuous but accessible locations.
- .2 Install terminal blocks as indicated in Type T cabinets.
- .3 Only main junction and pull boxes are indicated. Install pull boxes so as not to exceed 30 m of conduit run between pull boxes.

2.2 IDENTIFICATION

- .1 Provide equipment identification in accordance with Section 26 05 01 – Common Work Results - Electrical.
- .2 Install size 2 identification labels indicating system name voltage and phase.

END OF SECTION

Part 1 General

1.1 REFERENCES

- .1 CSA C22.1-2015, Canadian Electrical Code, Part 1.

Part 2 Products

2.1 OUTLET AND CONDUIT BOXES GENERAL

- .1 Size boxes in accordance with CSA C22.1.
- .2 102 mm square or larger outlet boxes as required for distribution cabinet devices..
- .3 Gang boxes where wiring devices are grouped.
- .4 Blank cover plates for boxes without wiring devices.
- .5 PVC pull/connection boxes with sheet steel barriers where wiring for more than one system voltage are grouped.

2.2 SHEET STEEL OUTLET BOXES

- .1 Electro-galvanized steel single and multi-gang flush device boxes for flush installation, minimum size 76 x 50 x 38 mm or as indicated.

2.3 CONCRETE BOXES

- .1 Moulded 150x150x100 PVC pull/connection electrical box suitable for concrete encasement and allows multiple conduits to be connected and wire splices made within. PVC pull/connection box for light fixture power connections. Pull/connection box suitable flush mounting.

2.4 CONDUIT BOXES

- .1 Cast FD ferrous alloy boxes with factory-threaded hubs and mounting feet for surface wiring of switches and receptacle within padmount distribution center.

2.5 FITTINGS - GENERAL

- .1 Bushing and connectors with nylon insulated throats.
- .2 Knock-out fillers to prevent entry of debris.
- .3 Conduit outlet bodies for conduit up to 32 mm and pull boxes for larger conduits.
- .4 Double locknuts and insulated bushings on sheet metal boxes.

Part 3 Execution

3.1 INSTALLATION

- .1 Support boxes independently of connecting conduits.
- .2 Fill boxes with paper, sponges or foam or similar approved material to prevent entry of debris during construction. Remove upon completion of work.
- .3 For flush installations mount outlets flush with finished wall using plaster rings to permit wall finish to come within 6 mm of opening.
- .4 Provide correct size of openings in boxes for conduit, mineral insulated and armoured cable connections. Reducing washers are not allowed.

END OF SECTION

Part 1 General**1.1 REFERENCES**

- .1 Canadian Standards Association (CSA)
 - .1 CAN/CSA C22.2 No. 18.2-06 (R2016), Outlet Boxes, Conduit Boxes, and Fittings and Associated Hardware
 - .2 CSA C22.2 No. 45.2-08 (R2013), Rigid Metal Conduit
 - .3 CSA C22.2 No. 56-13, Flexible Metal Conduit and Liquid-Tight Flexible Metal Conduit
 - .4 CSA C22.2 No. 83.1-07 (R2017), Electrical Metallic Tubing
 - .5 CSA C22.2 No. 211.2-06 (R2016), Rigid PVC (Unplasticized) Conduit
 - .6 CAN/CSA C22.2 No. 227.1-06 (R2016), Flexible Nonmetallic Tubing

Part 2 Products**2.1 CONDUITS**

- .1 Rigid metal conduit: to CSA C22.2 No. 45, hot dipped galvanized steel threaded.
- .2 Electrical metallic tubing (EMT): to CSA C22.2 No. 83, with couplings.
- .3 Rigid PVC conduit: to CSA C22.2 No. 211.2.
- .4 Flexible PVC conduit: to CAN/CSA-C22.2 No. 227.

2.2 CONDUIT FASTENINGS

- .1 One-hole steel straps to secure surface conduits 53 mm and smaller. Two-hole steel straps for conduits larger than 53 mm.
- .2 Beam clamps to secure conduits to exposed steel work.
- .3 Channel type supports for two or more conduits at 900 mm on center.
- .4 Threaded rods, 6 mm dia., to support suspended channels.

2.3 CONDUIT FITTINGS

- .1 Fittings: manufactured for use with conduit specified. Coating: same as conduit.
- .2 Factory "ells" where 90 degree bends are required for 27 mm and larger conduits.
- .3 Watertight connectors and couplings for EMT. Set-screws are not acceptable.

2.4 EXPANSION FITTINGS FOR RIGID CONDUIT

- .1 Weatherproof expansion fittings with internal bonding assembly suitable for 100 mm linear expansion.
- .2 Watertight expansion fittings with integral bonding jumper suitable for linear expansion and 21 mm deflection in all directions.
- .3 Weatherproof expansion fittings for linear expansion at entry to panel.

2.5 FISH CORD

- .1 Polypropylene

Part 3 Execution**3.1 INSTALLATION**

- .1 Install conduits to conserve headroom in exposed locations and cause minimum interference in spaces through which they pass.
- .2 Conceal conduits except in mechanical and electrical service rooms.
- .3 Use rigid PVC conduit underground and embedded in concrete.
- .4 Brace concrete embedded conduit from shifting position during concrete pouring.
- .5 Minimum conduit size for lighting and power circuits: 21 mm.
- .6 Bend conduit cold. Replace conduit if kinked or flattened more than 1/10th of its original diameter.
- .7 Mechanically bend steel conduit over 21 mm dia.
- .8 Field threads on rigid conduit must be of sufficient length to draw conduits up tight.
- .9 Install fish cord in empty conduits.
- .10 Remove and replace blocked conduit sections. Do not use liquids to clean out conduits.
- .11 Dry conduits out before installing wire.

3.2 CONCEALED CONDUITS

- .1 Run parallel or perpendicular to structure lines.
- .2 Do not install horizontal runs in masonry walls.
- .3 Do not install conduits in terrazzo or concrete toppings.

- .4 Install conduits encase in minimum 50 mm concrete in concrete structures.

3.3 CONDUITS UNDERGROUND

- .1 Slope conduits to provide drainage.
- .2 Waterproof joints (PVC excepted) with heavy coat of bituminous paint.

END OF SECTION

Part 1 General

1.1 RELATED SECTIONS

- .1 Section 26 05 01 – Common Work Results - Electrical

1.2 REFERENCES

- .1 Canadian Standards Association, (CSA International)
- .2 Insulated Cable Engineers Association, Inc. (ICEA)

Part 2 Products

2.1 CABLE PROTECTION

- .1 38 x 140 mm planks pressure treated with copper naphthenate or 5% pentachlorophenol solution, water repellent preservative.

Part 3 Execution

3.1 DIRECT BURIAL OF CABLES

- .1 After 150mm sand bed is in place, lay cables maintaining 75 mm clearance from each side of trench to nearest cable. Do not pull cable into trench.
- .2 Provide offsets for thermal action and minor earth movements. Offset cables 150 mm for each 30 m run, maintaining minimum cable separation and bending radius requirements.
- .3 Make termination and splice only as indicated leaving 0.6 m of surplus cable in each direction.
 - .1 Make splices and terminations in accordance with manufacturer's instructions using approved splicing kits.
- .4 Underground cable splices not acceptable.
- .5 Minimum permitted radius at cable bends for rubber, plastic or lead covered cables, eight times diameter of cable; for metallic armoured cables, 12 times diameter of cables or in accordance with manufacturer's instructions.
- .6 Cable separation:
 - .1 Maintain 75 mm minimum separation between cables of different circuits;
 - .2 Maintain 300 mm horizontal separation between low and high voltage cables;
 - .3 When low voltage cables cross high voltage cables maintain 300 mm vertical separation with low voltage cables in upper position;

- .4 At crossover, maintain 150 mm minimum vertical separation between low voltage cables and 150 mm between high voltage cables;
- .5 Maintain 300 mm minimum lateral and vertical separation for fire alarm and control cables when crossing other cables, with fire alarm and control cables in upper position;
- .6 Install treated planks on lower cables 0.6 m in each direction at crossings.
- .7 After sand protective cover is in place, install continuous row of overlapping 38 x 140 mm pressure treated planks as indicated to cover length of run.

3.2 CABLE INSTALLATION IN DUCTS

- .1 Install cables as indicated in ducts.
 - .1 Do not pull spliced cables inside ducts.
- .2 Install multiple cables in duct simultaneously.
- .3 Use CSA approved lubricants of type compatible with cable jacket to reduce pulling tension.
- .4 To facilitate matching of colour coded multi-conductor control cables reel off in same direction during installation.
- .5 Before pulling cable into ducts and until cables are properly terminated, seal ends of lead covered cables with wiping solder; seal ends of non-leaded cables with moisture seal tape.
- .6 After installation of cables, seal duct ends with duct sealing compound.

3.3 FIELD QUALITY CONTROL

- .1 Perform tests in accordance with Section 26 05 01 – Common Work Results - Electrical.
- .2 Perform tests using qualified personnel. Provide necessary instruments and equipment.
- .3 Check phase rotation and identify each phase conductor of each feeder.
- .4 Check each feeder for continuity, short circuits and grounds. Ensure resistance to ground of circuits is not less than 50 megohms.
- .5 Acceptance tests:
 - .1 After installing cable but before splicing and terminating, perform insulation resistance test with 500 V megger on each phase conductor;
 - .2 Check insulation resistance after each splice and/or termination to ensure that cable system is ready for acceptance testing.
- .6 Provide Contract Administrator with list of test results showing location at which each test was made, circuit tested and result of each test.

- .7 Remove and replace entire length of cable if cable fails to meet any of test criteria.

END OF SECTION

Part 1 General

1.1 RELATED SECTIONS

- .1 Section 26 05 01 - Common Work Results - Electrical.

1.2 SYSTEM DESCRIPTION

- .1 Low voltage control system designed to provide dimming of lighting loads by use of:
 - .1 Low voltage 0 – 10 VDC manual adjustable switch

Part 2 Products

2.1 MATERIALS

- .1 Control system: by one manufacturer and assembled from compatible components.

2.2 MANUAL CONTROL

- .1 4 individual remote control switches as indicated.

Part 3 Execution

3.1 INSTALLATION

- .1 Locate and install equipment in accordance with manufacturer's recommendations and as indicated.

3.2 TESTS

- .1 Perform tests in accordance with Section 26 05 01 - Common Work Results - Electrical.
- .2 Actuate control units in presence of Owner to demonstrate lighting circuits are controlled as designated.

END OF SECTION

Part 1 General

1.1 SECTION INCLUDES

- .1 Materials and installation for standard and custom breaker type panelboards.

1.2 RELATED SECTIONS

- .1 Section 26 05 01 – Common Work Results – Electrical

1.3 REFERENCES

- .1 Canadian Standards Association (CSA International)
 - .1 CSA C22.2 No. 29-15, Panelboards and enclosed Panelboards.

1.4 SHOP DRAWINGS

- .1 Submit product data in accordance with Section E3 – Shop Drawings
- .2 Drawings to include electrical detail of panel, branch breaker type, quantity, ampacity, and enclosure dimension.

Part 2 Products

2.1 PANELBOARDS

- .1 Panelboards: to CSA C22.2 No. 29 and product of one manufacturer.
- .2 Install circuit breakers in panelboards before shipment.
- .3 In addition to CSA requirements manufacturer's nameplate must show fault current that panel including breakers has been built to withstand.
- .4 250V panelboards: bus and breakers rated for 18000A (symmetrical) interrupting capacity or as indicate.
- .5 Sequence phase bussing with odd numbered breakers on left and even on right, with each breaker identified by permanent number identification as to circuit number and phase.
- .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.
- .8 Copper bus with neutral of same ampere rating as mains.
- .9 Mains: suitable for bolt-on breakers.
- .10 Trim with concealed front bolts and hinges.
- .11 Trim and door finish: baked grey enamel.

2.2 BREAKERS

- .1 Breakers: to match panelboard.
- .2 Breakers with thermal and magnetic tripping in panelboards except as indicated otherwise.
- .3 Main breaker: separately mounted on top or bottom of panel to suit cable entry. When mounted vertically, down position should be open breaker.
- .4 Lock-on devices for 10% breakers installed as indicated. Turn over unused lock-on devices to Departmental Representative.
- .5 Lock-on devices for fire alarm, emergency circuits.

2.3 EQUIPMENT IDENTIFICATION

- .1 Provide equipment identification in accordance with Section 26 05 01 – Common Work Results – Electrical.
- .2 Nameplate for each panelboard size 4 engraved.
- .3 Nameplate for each circuit in distribution panelboards size 2 engraved.
- .4 Complete circuit directory with typewritten legend showing location and load of each circuit.

2.4 APPROVED MANUFACTURER

- .1 Square D, EATON, Schneider Electric, Cutler-Hammer.

Part 3 Execution

3.1 INSTALLATION

- .1 Locate panelboards as indicated and mount securely, plumb, true and square, to adjoining surfaces.
- .2 Install surface mounted panelboards on plywood backboards. Where practical, group panelboards on common backboard.
- .3 Mount panelboards to height specified in Section 26 05 01 – Common Work Results – Electrical or as indicated.
- .4 Connect loads to circuits.
- .5 Connect neutral conductors to common neutral bus with respective neutral identified.

END OF SECTION

Part 1 General

1.1 SHOP DRAWINGS AND PRODUCT DATA

.1 SUBMITTALS

- .2 Submit product data in accordance with Section E3 – Shop Drawings.

Part 2 Products

2.1 MATERIALS

- .1 Enclosure constructed with 2.7 mm thick minimum steel, with weather and corrosion resistant finish, Munsell Notation 7.5GY3.5/1.5, size as indicated.
- .2 Entire enclosure capable of withstanding maximum impact force of 86 MN/m² area without rupture of material.
- .3 Removable enclosure panels with formed edges, galvanized steel external fasteners removable only from inside enclosure.
- .4 Enclosure equipped with hot dipped galvanized mounting rails 1 m adjustable horizontally and vertically to enable mounting of equipment at any location within housing.
- .1 Rails: 14 mm holes and 50 x 14 mm slots on 100 mm centers for horizontal adjustment.
- .2 Holes in side panel flanges in 60 mm increments for vertical adjustment.
- .5 Cover: tamperproof, bolt-on, domed to shed water.
- .6 Door: minimum 1 m wide, hinged, 3-point latching, with padlocking means.
- .7 Ventilation panel constructed to allow air circulation yet preventing entry of foreign objects, wild life, and vermin.
- .8 Enclosure construction such as to allow any configuration of single or ganged enclosures.
- .9 Enclosure capable of being shipped in knocked-down condition.

Part 3 Execution

3.1 INSTALLATION

- .1 Assemble enclosure in accordance with manufacturer's instructions and mount on manufactured fiberglass pad.
- .2 Mount equipment in enclosure.

END OF SECTION

Part 1 General

1.1 SECTION INCLUDES

- .1 Switches, receptacles, wiring devices, cover plates and their installation.

1.2 RELATED SECTIONS

- .1 Section 26 05 01 – Common Work Results - Electrical

1.3 REFERENCES

- .1 Canadian Standards Association (CSA International)
 - .1 CSA-C22.2 No.42-10 (R2015), General Use Receptacles, Attachment Plugs and Similar Devices
 - .2 CSA-C22.2 No.42.1-00, Cover Plates for Flush-Mounted Wiring Devices (Bi-national standard, with UL 514D)
 - .3 CSA-C22.2 No.55-2015 Special Use Switches
 - .4 CSA-C22.2 No.111-2010 (R2015), General-Use Snap Switches (Bi-national standard, with UL 20, twelfth edition)

1.4 SHOP DRAWINGS AND PRODUCT DATA

1.5 SUBMITTALS

- .1 Submit product data in accordance with Section E3 – Shop Drawings.

Part 2 Products

2.1 LIGHTING CONTROLS

- .1 Minimum 15 A, 120V, single pole toggle on / off, with 0 to 100 percent dimming capability. Acuity Controls nLight nPODM suitable for -40 deg. C to 70 deg. C.
- .2 16A, 120 V, power/relay pack light fixture controller suitable for zone lighting control. Acuity Controls nLight nPP16 power/relay pack suitable for -40 deg. C to 70 deg. C.

2.2 SWITCHES

- .1 20 A, 120 V, single pole, three-way, switches to: CSA-C22.2 No.5 and CSA-C22.2 No.111.
- .2 Manually-operated general purpose ac switches with following features:
 - .1 Terminal holes approved for No. 10 AWG wire;
 - .2 Silver alloy contacts;
 - .3 Urea or melamine moulding for parts subject to carbon tracking;
 - .4 Suitable for back and side wiring;

- .5 Brown toggle.
- .3 Toggle operated fully rated for tungsten filament, LED and fluorescent lamps, and up to 80% of rated capacity of motor loads.
- .4 Switches of one manufacturer throughout project.
- .5 Acceptable materials: Leviton, Lutron, Cooper, Hubbell.

2.3 SPECIAL WIRING DEVICES

- .1 Special wiring devices:
 - .1 Groundfault Circuit Interrupter, self-contained with 15 A, 125 V circuit interrupter and duplex receptacle complete with:
 - .1 Solid state ground sensing device;
 - .2 Trip level 4-6mA;
 - .3 Interrupting capacity 2000A;
 - .4 Facility for testing and reset.
 - .2 Pilot lights as indicated, with neon type 0.04 W, 125 V lamp and red plastic jewel lenses flush type.
 - .5 Acceptable materials: Leviton, Hubbell, Pass and Seymour.

2.4 COVER PLATES

- .1 Cover plates for wiring devices to: CSA-C22.2 No.42.1.
- .2 Cover plates from one manufacturer throughout project.
- .3 Sheet steel utility box cover for wiring devices installed in surface-mounted utility boxes.
- .4 Stainless steel, vertically brushed, 1 mm thick cover plates for wiring devices mounted in flush-mounted outlet box.
- .5 Sheet metal cover plates for wiring devices mounted in surface-mounted FS or FD type conduit boxes.
- .6 Weatherproof double lift spring-loaded cast aluminum cover plates, complete with gaskets for duplex receptacles as indicated.
- .7 Weatherproof spring-loaded cast aluminum cover plates complete with gaskets for single receptacles or switches.

Part 3 Execution

3.1 INSTALLATION

- .1 Switches
 - .1 Install single throw switches with handle in "UP" position when switch closed.
 - .2 Install switches in gang type outlet box when more than one switch is required in one location.
 - .3 Mount toggle switches at height in accordance with Section 26 05 01 – Common Work Results – Electrical as indicated.
- .2 Receptacles
 - .1 Install receptacles in gang type outlet box when more than one receptacle is required in one location.
 - .2 Mount receptacles at height in accordance with Section 26 05 01 – Common Work Results - Electrical as indicated.
 - .3 Where split receptacle has one portion switched, mount vertically and switch upper portion.
- .3 Cover plates
 - .1 Protect stainless steel cover plate finish with paper or plastic film until painting and other work is finished.
 - .2 Install suitable common cover plates where wiring devices are grouped.
 - .3 Do not use cover plates meant for flush outlet boxes on surface-mounted boxes.

END OF SECTION

Part 1 General

1.1 SECTION INCLUDES

- .1 Materials for moulded-case circuit breakers, circuit breakers, and ground-fault circuit-interrupters.

1.2 REFERENCES

- .1 Canadian Standards Association (CSA International)
 - .1 CSA-C22.2 No. 5-02, Moulded-Case Circuit Breakers, Molded-Case Switches and Circuit-Breaker Enclosures (Tri-national standard with UL 489, tenth edition, and the second edition of NMX-J-266-ANCE).

1.3 SUBMITTALS

- .1 Submit product data in accordance with Section E4 – Shop Drawings.
- .2 Include time-current characteristic curves for breakers with ampacity of 200A and over or with interrupting capacity of 18,000 A symmetrical (rms) and over at system voltage.

Part 2 Products

2.1 BREAKERS GENERAL

- .1 Moulded-case circuit breakers, Circuit breakers, and Ground-fault circuit-interrupter: to CSA C22.2 No. 5.
- .2 Bolt-on moulded case circuit breaker: quick- make, quick-break type, for manual and automatic operation with temperature compensation for 40°C ambient.
- .3 Plug-in moulded case circuit breakers: quick- make, quick-break type, for manual and automatic operation with temperature compensation for 40°C ambient.
- .4 Common-trip breakers: with single handle for multi-pole applications.
- .5 Circuit breakers to have minimum 18 kA symmetrical rms interrupting capacity rating, or to match circuit breaker in existing panel boards.

2.2 THERMAL MAGNETIC BREAKERS

- .1 Moulded case circuit breaker to operate automatically by means of thermal and magnetic tripping devices to provide inverse time current tripping and instantaneous tripping for short circuit protection.

Part 3 Execution

3.1 INSTALLATION

- .1 Install circuit breakers as indicated.

END OF SECTION