

**Part 1            General**

**1.1                GENERAL**

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

**1.2                CODES AND STANDARDS**

- .1            Do complete installation in accordance with CSA C22.1-2006 except where specified otherwise.
- .2            Comply with all laws, ordinances, rules, regulations, codes, and orders of all authorities having jurisdiction relating to this Work.

**1.3                DRAWINGS AND SPECIFICATIONS**

- .1            The intent of the Drawings and Specifications is to include all labour, products, and services necessary for complete Work, tested and ready for operation.
- .2            Symbols used to represent various electrical devices often occupy more space on the Drawing than the actual device does when installed. In such instances, do not scale locations of devices from electrical symbols. Install these devices with primary regard for usage of wall space, convenience of operation, and grouping of devices.
- .3            These Specifications and the Drawings and Specifications of all other divisions shall be considered as an integral part of the accompanying Drawings. Any item or subject omitted from either the Specifications or the Drawings but which is mentioned or reasonably specified in and by the others, shall be considered as properly and sufficiently specified and shall be provided.
- .4            Provide all minor items and Work not shown or specified but which are reasonably necessary to complete the Work.
- .5            If discrepancies or omissions in the Drawings or Specifications are found, or if the intent or meaning is not clear, advise the Contract Administrator for clarification before submitting Bid.

**1.4                CARE, OPERATION AND START-UP**

- .1            Instruct City maintenance and operating personnel in the operation, care and maintenance of systems, system equipment and components.
- .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.

### **1.5 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 Notify Contract Administrator of changes required by Electrical Inspection Department prior to making changes.
- .4 Furnish a Certificate of Final Inspection and approvals from inspection authority to the Contract Administrator.

### **1.6 MATERIALS AND EQUIPMENT**

- .1 Provide materials and equipment in accordance with Section 01 61 00 - Common Product Requirements.
- .2 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.

### **1.7 FINISHES**

- .1 Shop finish metal enclosure surfaces by application of rust resistant primer inside and outside, and at least two coats of finish enamel.
  - .1 Paint indoor switchgear and distribution enclosures light grey to ANSI 61 grey enamel, unless otherwise specified.
- .2 Clean and touch up surfaces of shop-painted equipment scratched or marred during shipment or installation, to match original paint.
- .3 Clean and prime exposed non-galvanized hangers, racks and fastenings to prevent rusting.

### **1.8 EQUIPMENT IDENTIFICATION**

- .1 Lamicaid 3 mm thick plastic lamicaid nameplates, black face, white core, mechanically attached with self tapping screws.

#### **NAMEPLATE SIZES**

Size 1	10 x 50 mm	1 line	3 mm high letters
Size 2	12 x 70 mm	1 line	5 mm high letters
Size 3	12 x 70 mm	2 lines	3 mm high letters
Size 4	20 x 90 mm	1 line	8 mm high letters
Size 5	20 x 90 mm	2 lines	5 mm high letters
Size 6	25 x 100 mm	1 line	12 mm high letters
Size 7	25 x 100 mm	2 lines	6 mm high letters

### **1.9 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.

#### **1.10 MANUFACTURERS AND CSA LABELS**

- .1 Visible and legible, after equipment is installed.

#### **1.11 WARNING SIGNS**

- .1 As specified and to meet requirements of Electrical Inspection Department.
- .2 Lamicaid 3 mm thick plastic engraving sheet, red face, white core, mechanically attached with self tapping screws, 20mm text.

#### **1.12 CONDUIT AND CABLE INSTALLATION**

- .1 Sleeves through concrete: schedule 40 galvanized steel pipe, sized for free passage of conduit.
- .2 For wall, partitions, and ceilings the sleeve ends shall be flush with the finish on both sides but for floors they shall extend 100 mm above finished floor level.
- .3 The space between the sleeve and the conduit shall be filled with Dow Corning silicone room temperature vulcanizing (RTV) foam for fire stop and caulked around the top and bottom with approved permanently resilient, non-flammable and weatherproof silicone base compound. Ensure that the seal is compatible with the floor and ceiling finishes.

#### **1.13 FIELD QUALITY CONTROL**

- .1 All electrical work to be carried out by qualified, licensed electricians or apprentices as per the conditions of the Provincial Act respecting manpower vocational training and qualification. Employees registered in a provincial apprentices program shall be permitted, under the direct supervision of a qualified licensed electrician, to perform specific tasks - the activities permitted shall be determined based on the level of training attained and the demonstration of ability to perform specific duties.
- .2 The work of this division to be carried out by a contractor who holds a valid Master Electrical contractor license as issued by the Province of Manitoba.

#### **1.14 SUBMITTALS**

- .1 Within 15 days of award of Contract, the Contractor shall submit a completed equipment procurement schedule, which lists the Manufacturer and model of equipment, indicating the projected ordering, Shop Drawing submittal date and delivery dates of all Products to meet the required construction schedule.
- .2 Prior to delivery of any Products to job Site and sufficiently in advance of requirements to allow ample time for checking, submit Shop Drawings for review as specified in Division
- .3 Submit Shop Drawings for all equipment as required in each Section of this Specification.

- .4 Prior to submitting the Shop Drawings to the Contract Administrator, the Contractor shall review the Shop Drawings to determine that the equipment complies with the requirements of the Specifications and Drawings.
- .5 The term “Shop Drawing” means drawings, diagrams, illustrations, schedules, performance characteristics, brochures and other data, which are to be provided by the Contractor to illustrate details of a portion of the Work. Indicate materials, methods of construction and attachment of support wiring, diagrams, connections, recommended installation details, explanatory notes and other information necessary for completion of Work. Where equipment is connected to other equipment, indicate that such items have been coordinated, regardless of the section under which the adjacent items will be supplied and installed. Indicate cross-references to Design Drawings and Specifications. Adjustments made on Shop Drawings by the Contract Administrator are not intended to change the contract price. If adjustments affect the value of the Work state such in writing to the Contract Administrator prior to proceeding with the Work.
- .6 Manufacture of Products shall conform to revised Shop Drawings.
- .7 Keep one (1) complete set of Shop Drawings at job Site during construction.

**1.15 RECORD DRAWINGS**

- .1 The Contractor shall keep one (1) complete set of white prints at the Site office, including all addenda, change orders, Site instructions, clarifications, and revisions for the purpose of Record Drawings. As the Work on-site proceeds, the Contractor shall clearly record in Red Pencil all as-built conditions, which deviate from the original Contract Documents. Record Drawings to include circuiting of all devices, conduit and feeder runs (complete with conductor size and number) and locations of all electrical equipment.
- .2 On completion of the Work, two (2) weeks prior to final inspection, submit Record Drawings to Contract Administrator for review. The Contractor shall certify, in writing, that the As-built Record Drawings are complete and that they accurately indicate all electrical services, including exposed as well as concealed items.

**Part 2 Products**

**2.1 NOT USED**

- .1 Not Used.

**Part 3 Execution**

**3.1 NOT USED**

- .1 Not Used.

**END OF SECTION**

**Part 1            General**

**1.1                REFERENCES**

- .1 Canadian Standards Association (CSA)
  - .1 CAN/CSA-C22.2 No. 131-M89 (R2004), Type TECK90 Cable.
  - .2 CAN/CSA-C22.2 No. 38-05, Thermoset-Insulated Wires and Cables.
  - .3 CAN/CSA-C68.3-97(R2006), Shielded and Concentric Neutral Power Cables Rated 5-46 kV.
- .2 National Electrical Manufacturers Association (NEMA) / Insulated Cable Engineers Association (ICEA)
  - .1 NEMA WC74 / ICEA S-93-639, Shielded Power Cable 5-46 kV
- .3 Institute of Electrical and Electronics Engineers, Inc. (IEEE)
  - .1 IEEE 400.2, IEEE Guide for Field Testing of Shielded Power Cable Systems Using Very Low Frequency (VLF)

**1.2                SHOP DRAWINGS AND PRODUCT DATA**

- .1 Submit product data in accordance with section 01 33 00 - Submittal Procedures.
- .2 Identify manufacturer's free air ampacity of the cables.

**Part 2            Products**

**2.1                5 kV TECK POWER CABLE**

- .1 Bare copper grounding conductor, size as indicated.
- .2 3 Copper circuit conductors, 350 MCM.
- .3 Insulation: tree-retardant cross-linked polyethylene (TRXLPE)
- .4 Cable rated 90°C continuous duty.
- .5 Insulation shielding: semi-conducting thermosetting insulation shield and copper tape shield.
- .6 Inner jacket of PVC.
- .7 Interlocked aluminum armour.
- .8 Overall PVC jacket rated minus 40°C.
- .9 Submit certified manufacturer's data sheets, including ampacity in free air.

## **2.2 Fastenings & Support**

- .1 Support cables in existing or new cable tray where possible. Cables are to be strapped to the supporting tray a minimum of every 1.5 metres, or as required. 1.05 cable diameter spacing is to be maintained between the cables, and from all other conductors, at all times.
- .2 Two hole aluminum straps for supporting from perpendicular Unistrut channel. A minimum support spacing of 0.5 metres is required.
- .3 Support cables along parallel cable channels in area of limited space, and where support to wall or ceiling surfaces every 0.5 metres is not practical. Parallel cable channels are to be supported a minimum of every 2.5 metres, or as required to maintain a load safety margin of 2.

## **2.3 Terminations**

- .1 Supply suitable compression type connectors for use on copper conductors.
- .2 Install stress cones on all 5 kV, or higher voltage, shielded cable terminations.
- .3 Stress Cones: heat shrinkable Raychem HVT series, or equivalent.

## **Part 3 Execution**

### **3.1 INSTALLATION**

- .1 Install cables in ducts in accordance with Section 26 05 44 - Installation of Cables in Trenches and in Ducts.
- .2 Do not splice cables. A continuous length is required for all feeds.
- .3 Install in accordance with manufacturer's recommendations, observing requirements for minimum bending radius and pulling tensions.
- .4 Form stress cones in accordance with manufacturer's recommendations.
- .5 Install compression connectors using tools provided or recommended by the connector manufacturer.

### **3.2 TESTING**

- .1 Perform the following tests on all 5kV cables prior to energization. Submit complete test results to the Contract Administrator. Upon failure of any of the tests, the contractor shall repair the deficiency, or replace the cables, to the satisfaction of the Contract Administrator.
  - .1 Perform a shield-continuity test on each power cable by ohmmeter method. The shielding must exhibit continuity. Cables with resistance values in excess of 10 ohms per 300 metres of cable will be rejected.
  - .2 Perform an insulation-resistance test on each conductor, with the shield and other conductors grounded, utilizing a megohmmeter with a voltage output of 2500 volts. Individually test each conductor with all other conductors and shields

- grounded. The test duration shall be one minute, with readings taken every minute for ten (10) minutes. Investigate resistances less than 200 megaohms. Conductors with insulation resistance values, at one minute, less than 50 megaohms, or that deviate from other similar conductors by more than 50% will be rejected.
- .3 Calculate the Polarization Index (PI) as the ten (10) minute insulation resistance reading divided by the one (1) minute insulation resistance reading. Cables with a Polarization Index less than 2.0 will be rejected, unless all insulation resistance values are above 5000 megaohms.
  - .4 Perform a Very Low Frequency (VLF) AC high-potential test on all cables. Adhere to all precautions and limits as specified in the applicable NEMA / ICEA Standard for the specific cable. Perform tests in accordance with IEEE Standard 400.2. Test procedure shall be as follows, and the results for each cable test shall be recorded as specified herein. The test voltage shall be sinusoidal with a frequency of 0.1 Hz, and shall not exceed cable manufacturer's maintenance test value or 10 kV RMS (14 kV peak) phase-to-ground. If no evidence of distress or insulation failure is observed by the end of the total time of voltage application during the overpotential test, the test specimen is considered to have passed the test.
    - .1 Ensure that the input voltage to the test set is regulated.
    - .2 Current-sensing circuits in test equipment shall measure only the leakage current associated with the cable under test and shall not include internal leakage of the test equipment.
    - .3 Record wet and dry-bulb temperatures or relative humidity and temperature.
    - .4 Test each section of cable individually.
    - .5 Individually test each conductor with all other conductors grounded. Ground all shields.
    - .6 Terminations shall be adequately corona-suppressed by guard ring, field reduction sphere, or other suitable methods as necessary.
    - .7 Ensure that the maximum test voltage does not exceed the limits for terminators specified in IEEE Standard 48 or manufacturer's specifications.
    - .8 Raise the conductor test voltage to 7 kV RMS (10kV peak) and hold for five (5) minutes. Record leakage current.
    - .9 Raise the conductor test voltage to 10 kV RMS (14 kV peak) and hold for fifteen (15) minutes. Record leakage current.
    - .10 Apply grounds for a time period adequate to drain all insulation-stored charge.
  - .5 Perform a Time-Domain Reflectometer test on the cable. Record measured installed cable lengths, as well as any faults or significant reflections along the length of the cable. Cables with significant reflections along the length of the cable, will be rejected.
  - .6 After connection of cables to the switchgear, inspect bolted electrical connections for high resistance using a low-resistance ohmmeter. Connections that deviate more than 50% from similar connections will not be accepted.
  - .7 Verify correct conductor phase rotation prior to energization.
  - .2 Carry out tests in presence of the Contract Administrator or designated representative.

- .3 All cable test results shall be neatly recorded, signed, dated, and submitted to the Contract Administrator.
- .4 Upon successful completion of all cable tests, affix an inspection sticker or inspection tag in an appropriate place so that it will be conspicuous to all authorized personnel. This inspection notice must include, but is not limited to, the cable tested, testing company name, date of inspection and the inspector's name. The sticker shall not obscure any equipment nameplates, readouts, or indicators.

**END OF SECTION**

**Part 1            General**

**1.1                REFERENCES**

- .1        CSA C22.2 No .0.3, Test Methods for Electrical Wires and Cables.
- .2        CAN/CSA-C22.2 No. 131, Type TECK 90 Cable.

**1.2                PRODUCT DATA**

- .1        Submit product data in accordance with Section 01 33 00 - Submittal Procedures.

**Part 2            Products**

**2.1                TECK CABLE**

- .1        Cable: to CAN/CSA-C22.2 No. 131.
- .2        Conductors:
  - .1        Grounding conductor: copper.
  - .2        Circuit conductors: copper, size as indicated.
- .3        Insulation:
  - .1        Chemically cross-linked thermosetting polyethylene rated type RW90, 1000 V.
- .4        Inner jacket: polyvinyl chloride material.
- .5        Armour: interlocking aluminum.
- .6        Overall covering: polyvinyl chloride material.
- .7        Fastenings:
  - .1        One hole aluminum straps to secure surface cables 50 mm and smaller. Two hole aluminum straps for cables larger than 50 mm.
  - .2        Channel type supports for two (2) or more cables at 1500 mm centers.
  - .3        Threaded rods: 6 mm dia. to support suspended channels.
- .8        Connectors:
  - .1        Watertight, approved for TECK cable.

**Part 3            Execution**

- .1        Do not splice cables. A continuous length is required for all feeds.
- .2        Install in accordance with manufacturer's recommendations, observing requirements for minimum bending radius and pulling tensions.
- .3        Colour code all feeders at all terminations.

### **3.2 TESTING**

- .1 Perform the following tests on all 0 – 1000V feeder cables prior to energization. Submit complete test results to the Contract Administrator. Upon failure of any of the tests, the contractor shall repair the deficiency, or replace the cables, to the satisfaction of the Contract Administrator.
  - .1 Perform an insulation-resistance test on each conductor utilizing a megohmmeter with a voltage output of 1000 volts. Individually test each conductor with all other conductors and shields grounded. The test duration shall be one minute. Investigate resistances less than 50 megaohms, or deviations between parallel conductors. Conductors with insulation resistance values, at one minute, less than 25 megaohms, or that deviate from other similar conductors by more than 50% will be rejected.
  - .2 After connection of cables to the switchgear, inspect bolted electrical connections for high resistance using a low-resistance ohmmeter. Connections that deviate more than 50% from similar connections will not be accepted.
  - .3 Verify correct conductor phase rotation prior to energization.
- .2 All wire and cable test results shall be neatly recorded, signed, dated, and submitted to the Contract Administrator.
- .3 Upon successful completion of all cable tests, affix an inspection sticker or inspection tag in an appropriate place so that it will be conspicuous to all authorized personnel. This inspection notice must include, but is not limited to, the cable tested, testing company name, date of inspection and the inspector's name. The sticker shall not obscure any equipment nameplates, readouts, or indicators.

**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)
  - .1            ANSI/IEEE 837, Qualifying Permanent Connections Used in Substation Grounding.
- .2            Canadian Standards Association, (CSA International)

**Part 2            Products**

**2.1                EQUIPMENT**

- .1            Grounding conductors: bare stranded copper, soft annealed, size as indicated.
- .2            Non-corroding accessories necessary for grounding system, type, size, material as indicated, including but not necessarily limited to:
  - .1            Grounding and bonding bushings.
  - .2            Protective type clamps.
  - .3            Bolted type conductor connectors.
  - .4            Thermit welded type conductor connectors.
  - .5            Bonding jumpers, straps.
  - .6            Pressure wire connectors.

**Part 3            Execution**

**3.1                INSTALLATION GENERAL**

- .1            Install connectors in accordance with manufacturer's instructions.
- .2            Use mechanical connectors for grounding connections to equipment provided with lugs.
- .3            Use Burndy compression connectors or approved equal for all grounding splices and terminations, unless otherwise indicated.
- .4            Soldered joints not permitted.

**3.2                FIELD QUALITY CONTROL**

- .1            Perform tests in accordance with Section 26 05 01 - Common Work Results - Electrical.

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

**END OF SECTION**

**Part 1           General**

**1.1               RELATED SECTIONS**

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

**Part 2           Products**

**2.1               FRAMING AND SUPPORT SYSTEM**

- .1           Materials:
  - .1           Conduit support structures shall employ aluminum Unistrut Framing System or equal together with the manufacturer's connecting components and fasteners for a complete system.
- .2           Finishes:
  - .1           Wet locations: Aluminum.
  - .2           Indoors, dry locations: Aluminum.
  - .3           Nuts, bolts, machine screws: Cadmium plated.

**2.2               CONCRETE AND MASONRY ANCHORS**

- .1           Materials: hardened steel inserts, zinc plated for corrosion resistance.
- .2           Components: non-drilling anchors for use in predrilled holes, sized to safely support the applied load with a minimum safety factor of four.
- .3           Manufacturer: Hilti (Canada) Limited or approved equal.

**Part 3           Execution**

**3.1               INSTALLATION**

- .1           Secure equipment to solid masonry, tile and plaster surfaces with galvanized anchors.
- .2           Secure equipment to poured concrete with expandable inserts.
- .3           Secure equipment to hollow masonry walls or suspended ceilings with toggle bolts.
- .4           Support equipment, conduit or cables using clips, spring loaded bolts, cable clamps designed as accessories to basic channel members.
- .5           Fasten conduit to building construction or support system at intervals of 2.5m or less, unless otherwise noted.
- .6           Provide metal brackets, frames, hangers, clamps and related types of support structures where indicated or as required to support conduit and cable runs.

- .7 Ensure adequate support for raceways and cables dropped vertically where there is no wall support.
- .8 Do not use wire lashing or perforated strap to support or secure cables.
- .9 Install fastenings and supports as required for each type of equipment cables and conduits, and in accordance with manufacturer's installation recommendations.

**END OF SECTION**

**Part 1            General**

**1.1                RELATED SECTIONS**

- .1            Section 01 33 00 - Submittal Procedures.

**1.2                REFERENCES**

- .1            Canadian Standards Association (CSA International)
  - .1            CAN/CSA C22.2 No.126, Cable Tray Systems.

**1.3                SHOP DRAWINGS AND PRODUCT DATA**

- .1            Submit shop drawings and product data in accordance with section 01 33 00 - Submittal Procedures.
- .2            Identify types of cabletroughs used.
- .3            Show actual cabletrough installation details and suspension system, if different than that shown on the drawings.

**Part 2            Products**

**2.1                CABLETROUGH**

- .1            Cabletroughs and fittings: to NEMA VE 1.
- .2            Ladder type, Class A to CAN/CSA C22.2 No.126.
- .3            Trays: extruded aluminum, 300 mm wide with depth of 75 mm.
- .4            Fittings: horizontal elbows, end plates, drop outs, vertical risers and drops, tees, wyes, expansion joints and reducers where required, manufactured accessories for cabletrough supplied.
  - .1            Radii on fittings: 600 mm minimum.
- .5            Barriers where different voltage systems are in same cabletrough.

**2.2                CABLE CHANNEL**

- .1            Cable channel and fittings: to NEMA VE 1.
- .2            Ventilated type to CAN/CSA C22.2 No.126.
- .3            Trays: aluminum, 100 mm wide with depth between 30 and 50 mm.
- .4            Fittings: horizontal elbows, end plates, drop outs, vertical risers and drops, tees, wyes, expansion joints and reducers where required, manufactured accessories for cable channel supplied.

- .1 Radii on fittings: 600 mm minimum.

### **2.3 SUPPORTS**

- .1 Provide supports as required.
- .2 Approved materials: same as cabletrough or cable channel.

## **Part 3 Execution**

### **3.1 INSTALLATION**

- .1 Install complete cable tray system.
- .2 Support cable tray on both sides at 1500 mm on-centre spacing.
- .3 Provide additional support system for cable trays as may be deemed necessary to provide a secure system.
- .4 Remove sharp burrs or projections to prevent damage to cables or injury to personnel.
- .5 Fire stop all penetrations of fire separations.
- .6 Install all cabletroughs for medium voltage cables with 300mm vertical clearance from the top of the cable tray, except under short-length obstructions, which require 150mm vertical clearance.
- .7 Install #2/0 bare grounding conductor in all new cabletrough, and bond to trough as required by the CEC. For parallel cable channels, only one channel is required to contain the grounding conductor, but both channels must be bonded as required.
- .8 Install permanent, legible warning notice carrying the words "DANGER - 4160V" on all cable trays containing 5kV conductors, with a maximum spacing between warning notices of 10 metres.

### **3.2 CABLES IN CABLE TRAY**

- .1 Install cables individually.
- .2 Lay cables into cabletrough. Use rollers when necessary to pull cables.
- .3 Secure cables in cabletrough at 1.5 m centres, with nylon ties.
- .4 Identify cables every 30 m with size 2 nameplates in accordance with Section 260501.

**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                Not Used**

**Part 3            Execution**

**3.1                CABLE INSTALLATION IN DUCTS**

- .1            Inspect & clean ducts prior to installing cables.
- .2            Install cables as indicated in ducts.
  - .1            Do not pull spliced cables inside ducts.
- .3            Use CSA approved lubricants of type compatible with cable jacket to reduce pulling tension.
- .4            Before pulling cable into ducts and until cables are properly terminated, seal ends of non-leaded cables with moisture seal tape.
- .5            After installation of cables, seal duct ends with duct sealing compound.

**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 01 33 00 - Submittal Procedures.
- .2            Section 26 05 01 - Common Work Results - Electrical.
- .3            Section 26 28 21 - Moulded Case Circuit Breakers.

**1.3                REFERENCES**

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

**1.4                PRODUCT DATA**

- .1            Submit product data in accordance with Section 01 33 00 - Submittal Procedures.

**Part 2            Products**

**2.1                PANELBOARDS**

- .1            Panelboards: to CSA C22.2 No.29 and product of one manufacturer.
  - .1            In addition to CSA requirements manufacturer's nameplate must show fault current that panel including breakers has been built to withstand.
- .2            600V panelboards: bus and breakers rated for 14,000 A (symmetrical) or greater interrupting capacity at 600V, or as indicated.
- .3            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.
- .4            Panelboards: mains, number of circuits, and number and size of branch circuit breakers as indicated.
- .5            Two (2) keys for each panelboard and key panelboards alike.
- .6            Trim with concealed front bolts and hinges.

**2.2                BREAKERS**

- .1            Breakers: to Section 26 28 21 - Moulded Case Circuit Breakers.
- .2            Breakers with thermal and magnetic tripping in panelboards except as indicated otherwise.

**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 as indicated.
- .3 Nameplate for each circuit in distribution panelboards size 2 engraved as indicated.
- .4 Complete circuit directory with typewritten legend.

**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 Unistrut supports.
- .3 Mount panelboards to a height two (2) metres to top of cover, as required by Code, or as indicated.
- .4 Connect loads to circuits.

**END OF SECTION**

**Part 1            General**

**1.1                SECTION INCLUDES**

- .1            Materials for moulded-case circuit breakers.

**1.2                RELATED SECTIONS**

- .1            Section 01 33 00 - Submittal Procedures.

**1.3                REFERENCES**

- .1            Canadian Standards Association (CSA International).
  - .1            CSA-C22.2 No. 5, 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).

**1.4                SUBMITTALS**

- .1            Submit product data in accordance with Section 01 33 00 - Submittal Procedures.
- .2            Include time-current characteristic curves for breakers with ampacity of 100 A and over.

**Part 2            Products**

**2.1                BREAKERS GENERAL**

- .1            Moulded-case circuit breakers: 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 degrees C ambient.
- .3            Common-trip breakers: with single handle for multi-pole applications.
- .4            Magnetic instantaneous trip elements in circuit breakers to operate only when value of current reaches setting.
  - .1            Trip settings on breakers with adjustable trips to range from 3-8 times current rating.
- .5            Circuit breakers with interchangeable trips as indicated.
- .6            Circuit breakers to have minimum 14kA symmetrical rms interrupting capacity rating.

**Part 3            Execution**

**3.1                INSTALLATION**

- .1            Install circuit breakers as indicated.

- .2 Identification: Provide lamacoid plate on each breaker showing load being fed.

**END OF SECTION**