Part 1 General

1.1 SUMMARY

.1 Section Includes:

.1 General requirements that are common to Sections of Division 26 – Electrical.

1.2 RELATED SECTIONS

.1 Division 01 – General Requirements.

1.3 REFERENCES

.1 Canadian Standards Association (CSA International) Latest Edition of the following:

.1 CSA C22.1–18, Canadian Electrical Code, Part 1 (24th Edition), Safety Standard for Electrical Installations.

.2 CAN3-C235-83 (R2003) Preferred Voltage Levels for AC Systems, 0 to 50,000 V.

.2 Electrical and Electronic Manufacturer's Association of Canada (EEMAC) Latest Edition of the following:

.1 EEMAC 2Y-1, Light Gray Colour for Indoor Switch Gear.

.3 Health Canada / Workplace Hazardous Materials Information System (WHMIS) Latest Edition of the following:

.1 Material Safety Data Sheets (MSDS).

.4 CAN/CSA-Z460-12 Control of Hazardous Energy – Lockout and Other Methods.

1.4 SCOPE OF WORK

.1 The work shall include all labour, materials and equipment necessary for the complete installation of the electrical systems shown on the drawings and described in these specifications.

1.5 DESIGN REQUIREMENTS

.1 Operating voltages: to CAN3-C235.

.2 Motors, electric heating, control and distribution devices and equipment to operate satisfactorily at 60 Hz within normal operating limits established by above standard.

.1 Equipment to operate in extreme operating conditions established in above standard without damage to equipment.

.3 Language operating requirements: provide identification nameplates and labels for control items in English and French in accordance with Departmental Representative Standards.

1.6 SUBMITTALS

.1 Submittals: in accordance with Division 01 – General Requirements.

.2 Shop drawings:

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

.2 Submit wiring diagrams and installation details of equipment indicating proposed location, layout and arrangement, control panels, accessories, piping, ductwork, and other items that must be shown to ensure co-ordinated installation.

.3 Identify on wiring diagrams circuit terminals and indicate internal wiring for each item of equipment and interconnection between each item of equipment.

.4 Indicate on drawings clearances for operation, maintenance, and replacement of operating equipment devices.

.5 Submit required number of copies of drawings and specifications to authority having jurisdiction and to inspection authorities.

.1 If changes are required, notify Departmental Representative of these changes.

.6 In addition to transmittal letter referred to in Division 01 – General Requirements: **Identify section and paragraph number on all shop drawings.**

1.7 OPERATION AND MAINTENANCE DATA

.1 Provide operation and maintenance data for incorporation into operation and maintenance manual specified in Division 01 – General Requirements. See Appendix A for Operation and Maintenance Manual Guidelines.

.2 Include in Operation and Maintenance Data:

.1 Details of design elements and construction requirements, to permit effective start-up, operation, maintenance, repair, modification, extension and expansion of any portion or feature of installation.

.2 Technical data, product data, supplemented by bulletins, component illustrations, exploded view, technical descriptions of items and parts lists. Advertising or seals literature not acceptable.

.3 Wiring and schematic diagrams and performance curves.

.4 Names, addresses and telephone numbers of local suppliers for items included in maintenance manuals.

.5 Copy of reviewed shop drawings.

.6 Warranty Letter.

1.8 MAINTENANCE MATERIALS

.1 Provide maintenance materials in accordance with Division 01 – General Requirements and as indicated in respective specification sections.

1.9 QUALITY ASSURANCE

.1 Quality Assurance: in accordance with Division 01 – General Requirements.

.2 Health and Safety Requirements: do construction occupational health and safety in accordance with Division 01 – General Requirements.

1.10 FIRESTOPPING

.1 All fire stopping work is to be performed by General Contractor.

.2 Electrical contractor shall coordinate all fire rated assembly penetrations with General Contractor.

.3 Electrical Contractor shall provide required clearances between outside surface of conduit and inside surface of sleeve, core drilled hole or listed fire rated system.

1.11 TESTS

.1 Give 48 hours written notice of date for all tests.

.2 Conceal work only after testing and approval by Departmental Representative and after authority having jurisdiction has inspected work.

.3 Conduct tests in presence of Departmental Representative and local authority having jurisdiction where applicable.

.4 Bear costs including retesting and making good.

.5 Equipment: test as specified in relevant sections.

.6 Prior to tests, isolate all equipment or other parts which are not designed to withstand test pressures or test medium.

1.12 INTERPRETATION OF PLANS AND SPECIFICATIONS

.1 These specifications are to be considered as an integral part of the plans which accompany them and neither the plans nor the specifications shall be used alone.

.2 Misinterpretations of the plans or specifications shall not relieve this Contractor of responsibility.

.3 Where uncertainty exists in the passing of conduits and location of equipment, the General Contractor and or project manager shall be consulted before work is started.

.4 Drawings are diagrammatic. Building dimensions shall not be scaled from the Electrical plans but shall be obtained from on-site dimensions of the building.

.5 Any discrepancy between the drawings and the building shall be questioned before proceeding with any installation.

1.13 CO-OPERATION OF CONTRACTORS

.1 This Contractor shall become familiar with the work of other contractors and in laying out and installing the work shall co-operate with the other Contractors, so as to facilitate the progress of the work as a whole and avoid interference or delays. Where interference exists, this Contractor shall notify the General Contractor and/or project manager and the Departmental Representative before installing the work.

Any changes in the work or alterations of the Electrical Contractor's schedule required for such co-operation will not be considered as a claim for extra compensation.

.2 Due to the complexities of many sub-trades, and the restrictive space available in this project, it is required that all trades co-operate closely so as to install all systems in their allotted locations as indicated on the drawings, or coordination on site.

1.14 ERRORS AND OMISSIONS

.1 Should this Contractor discover errors or discrepancies in the plans or specification, he shall refer the matter to the Departmental Representative for change or clarification and shall not proceed with that portion of the work until advised by the Departmental Representative to do so.

1.15 DELIVERY, STORAGE, AND HANDLING

.1 Waste Management and Disposal:

.1 Construction/Demolition Waste Management and Disposal: separate waste materials for reuse and recycling in accordance with Division 01 – General Requirements.

.2 Store and handle materials in accordance with Construction Plan and Manufacturer’s written instructions.

1.16 SYSTEM START-UP

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

1.17 PERMITS, FEES AND INSPECTION

.1 Submit to Electrical Inspection Department necessary number of drawings and specifications for examination and approval prior to commencement of work.

.2 Obtain an electrical work permit and pay associated fees.

.3 Notify Departmental Representative of changes required by the Provincial Inspection Department prior to making changes.

1.18 EXISTING CONDITIONS

.1 Tie into existing systems at times coordinated with Departmental Representative.

.2 Submit written request for approval 10 days minimum, prior to commencement of work.

.3 Provide minimum 5 days’ notice to tenant prior to any power disruption.

.4 Prior to submitting any power disruption notice, the contractor will be required to provide specific details on the anticipated length (duration) of the power disruption.

.5 Any electrical system shutdown to be scheduled after normal business hours and coordinated with site staff.

.6 Be responsible for damage to existing construction by this work.

.7 Ensure daily clean-up of existing areas.

Part 2 Products

2.1 MATERIALS AND EQUIPMENT

.1 Provide material and equipment in accordance with Division 01- General Requirements.

.2 Material and equipment to be CSA certified. Where CSA certified material and equipment are not available, obtain special approval from authority having jurisdiction, before delivery to site.

.3 Factory assemble electrical panels and component assemblies.

.4 Do verification requirements in accordance with Division 01 – General Requirements.

2.2 ELECTRIC MOTORS, EQUIPMENT AND CONTROLS

.1 Verify installation and co-ordination responsibilities related to motors, equipment and controls, as indicated.

.2 Division 26 responsibility is as follows:

.1 Supply and installation of breakers and/or switches.

.2 Supply and installation of power feeder (conduit and wire) from panel to equipment as indicated on plans.

.3 Supply and installation of disconnect switches at motors unless noted otherwise.

.3 Control wiring and conduit is by Division 25 unless noted otherwise on electrical drawings.

2.3 WARNING SIGNS

.1 Warning Signs: in accordance with requirements of authority having jurisdiction, inspection authorities and Departmental Representative.

.2 Signs, minimum size 178 x 254 mm.

2.4 WIRING TERMINATIONS

.1 Ensure lugs, terminals and screws used for termination of wiring are suitable for copper conductors.

2.5 EQUIPMENT IDENTIFICATION

.1 Identify electrical equipment with nameplates and labels as follows:

.1 Nameplates: 3 mm thick plastic engraving sheet, matte white finish face, black core, lettering accurately aligned and engraved into core, mechanically attached with self- tapping screws.

.2 Sizes as follows:

NAMEPLATE SIZES

Size 1	11 x 51 mm	1 line	3 mm high letters
Size 2	13 x 73 mm	1 line	5 mm high letters
Size 3	13 x 22 mm	2 lines	3 mm high letters
Size 4	13 x 160 mm	1 line	10 mm high letters
Size 5	13 x 89 mm	2 lines	5 mm high letters
Size 6	25 x 102 mm	1 line	13 mm high letters
Size 7	25 x 102 mm	2 lines	13 mm high letters

.3 Wording on nameplates to be approved by Departmental Representative prior to manufacture.

.4 Allow for minimum of twenty-five (25) letters per nameplate.

.5 Identification to be English and French.

.6 Nameplates for splitters to indicate equipment being fed, circuit numbers, voltage, phase and amperage.

.7 Provide new nameplate for new breaker indicating equipment being fed.

.8 Provide new updated, typewritten panel directories for all panels modified under this contract.

2.6 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 coding: to CSA C22.1.

.4 Use colour coded wires in communication cables, matched throughout system.

2.7 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 13 mm wide auxiliary colour.

	Primary	**Auxiliary**
up to 250 V	Yellow	
up to 600 V	Yellow	Green

.4 Confirm color coding requirements with user prior to start of work.

Part 3 Execution

3.1 INSTALLATION

.1 Do complete installation in accordance with CSA C22.1 except where specified otherwise.

3.2 NAMEPLATES AND LABELS

.1 Ensure manufacturer's nameplates, CSA labels and identification nameplates are visible and legible after equipment is installed.

3.3 FIELD QUALITY CONTROL

.1 Conduct and pay for following tests in accordance with Division 01 – General Requirements:

- .1 Circuits originating from branch distribution panels.
- .2 Motors, heaters and associated control equipment including sequenced operation of systems where applicable.
- .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 Replace conductors as required.

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

.3 Manufacturer's Field Services:

- .1 Obtain written certificates from manufacturers verifying compliance of Work, in handling, installing, applying, protecting and cleaning of products and with operation and maintenance manuals.

3.4 AS-BUILT DRAWINGS BY CONTRACTOR

.1 General: To be read in conjunction with Division 01 – General Requirements.

.2 Site Records:

- .1 Obtain sets of white prints and mark thereon all changes as work progresses and as changes occur. Incorporate all information issued in Addenda, Site Instructions, Change Orders and all changes in actual installation as a result of site conditions and coordination.

.3 As-Built Drawings:

- .1 Prior to start of testing, balancing and adjusting, finalize production of as-built drawings.
- .2 Identify each drawing in lower right hand corner in letters at least 13 mm high as follows: AS-BUILT DRAWINGS (This drawing has been revised to show electrical systems as installed) (Signature of Contractor) (Date)
- .3 Submit to the General Contractor for approval and make all corrections as directed.
- .4 Testing, balancing and adjusting to be performed using as-built drawings.

3.5 PAINTING REPAIRS AND RESTORATION

.1 Do painting in accordance with Section 09 91 00 - Interior Painting.

.2 Prime and touch up marred finished paintwork to match original.

.3 Restore to new condition, finishes which have been damaged.

3.6 DEMONSTRATION

.1 Departmental Representative will use equipment and systems for test purposes prior to acceptance. Supply labour, material and instruments required for testing.

.2 Supply tools, equipment and personnel to demonstrate and instruct operating and maintenance personnel in operating, controlling, adjusting, trouble-shooting and servicing of all systems and equipment during regular work hours, prior to acceptance.

.3 Use operation and maintenance manual, as-built drawings, and audio visual aids as part of instruction materials.

.4 Departmental Representative may record these demonstrations on video tape for future reference.

3.7 PROTECTION

.1 Protect equipment and systems openings from dirt, dust, and other foreign materials with materials appropriate to system.

3.8 CONTROL OF HAZARDOUS ENERGY

.1 Lock out and tag out all electrical and other equipment before performing work as per CAN/CSA Z460-12.

END OF SECTION

Part 1 General

1.1 SECTION INCLUDES

.1 Materials and installation for wire and box connectors.

1.2 RELATED SECTIONS

.1 Division 01 – General Requirements.

.2 Section 26 05 01 – Common Work Results – Electrical.

.3 Section 26 05 21 – Wires and Cables 0-1000V.

1.3 REFERENCES

.1 Canadian Standards Association (CSA International) Latest Edition of the following:

.1 CAN/CSA-C22.2, No.18, Outlet Boxes, Conduit Boxes, Fittings and Associated Hardware.

.2 CSA C22.2 No.65 Wire Connectors.

.2 Electrical and Electronic Manufacturers' Association of Canada (EEMAC) Latest Edition of the following:

.1 EEMAC 1Y-2, 1961 Bushing Stud Connectors and Aluminum Adapters (1200 Ampere Maximum Rating).

1.4 MATERIALS

.1 Pressure type wire connectors with current carrying parts of copper sized to fit copper conductors as required.

.2 Fixture type splicing connectors with current carrying parts of copper sized to fit copper conductors 10 AWG or less.

.3 Bushing stud connectors to consist of:

.1 Connector body and stud clamp for stranded, copper conductors.

.2 Clamp for stranded copper conductors.

.3 Stud clamp bolts.

.4 Bolts for copper conductors.

.5 Bolts for aluminum conductors.

.6 Sized for conductors as indicated.

.4 Clamps or connectors for armoured cable, flexible conduit, as required.

.5 Joints required in connecting all wiring up to and including # 8, are to be made using twist-on connectors.

.6 Joints for all other wiring shall be made using colour-keyed compression type connectors followed by a layer of CSA approved vinyl plastic tape.

Part 2 Products

2.1 NOT USED

.1 Not Used.

Part 3 Execution

3.1 MANUFACTURER'S INSTRUCTIONS

.1 Compliance: comply with manufacturer's written recommendations or specifications, including product technical bulletins, handling, storage and installation instructions, and datasheet.

3.2 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 EEMAC 1Y-2.

END OF SECTION

Part 1 General

1.1 RELATED SECTIONS

.1 Division 01 – General Requirements.

.2 Section 26 05 01 – Common Work Results – Electrical.

.3 Section 26 05 20 - Wire and Box Connectors - 0 - 1000 V.

.4 Section 26 05 34 Conduits, Conduit Fastenings and Conduit Fittings.

1.2 REFERENCES

.1 CSA C22.2 No .0.3-01 (R2005), Test Methods for Electrical Wires and Cables Latest Edition.

Part 2 Products

2.1 BUILDING WIRES

.1 Conductors: stranded for #8 AWG copper and larger. Minimum size: #12 AWG.

.2 Conductors: size as indicated, with 600V insulation of chemically cross-linked thermosetting polyethylene material rated RW90.

.3 Neutral conductor insulated for 600V shall be continuous with no fuses, switches, or breaks of any kind.

.4 Wiring for specialized systems such as fire alarm shall be as indicated in other sections or on drawings.

.5 The voltage drop in no case shall exceed 3% of the line volts for branch circuits.

Part 3 Execution

3.1 MANUFACTURER'S INSTRUCTIONS

.1 Compliance: comply with manufacturer's written recommendations or specifications, including product technical bulletins, handling, storage and installation instructions, and datasheet.

3.2 INSTALLATION OF BUILDING WIRES

.1 Install wiring as follows:

.1 In conduit systems in accordance with Section 26 05 34

.2 Use vibration proof expanding spring wire connectors for No. 10 and smaller.

END OF SECTION

Part 1 General

1.1 RELATED SECTIONS

.1 Division 01 – General Requirements.

.2 Section 26 05 01 – Common Work Results – Electrical.

1.2 REFERENCES

.1 Canadian Standards Association, CSA C22.1–18, Canadian Electrical Code, Part 1.

Part 2 Products

2.1 EQUIPMENT

.1 Grounding conductors: bare stranded copper, soft annealed, size as indicated.

.2 Insulated grounding conductors: green, type RW90.

.3 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 MANUFACTURER'S INSTRUCTIONS

.1 Compliance: comply with manufacturer's written recommendations or specifications, including product technical bulletins, handling, storage and installation instructions, and datasheet.

3.2 INSTALLATION GENERAL

.1 Install complete permanent, continuous grounding system including conductors, connectors and accessories. Where EMT 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 Use mechanical connectors for grounding connections to equipment provided with lugs.

.5 Soldered joints not permitted.

.6 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.

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

.8 Bond single conductor, metallic armoured cables to cabinet at supply end, and provide non-metallic entry plate at load end.

3.3 FIELD QUALITY CONTROL

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

.2 Perform tests before energizing electrical system.

.3 Disconnect ground fault indicator during tests.

END OF SECTION

Part 1 General

1.1 RELATED SECTIONS

.1 Division 01 – General Requirements.

.2 Section 26 05 01 – Common Work Results – Electrical.

Part 2 Products

2.1 SUPPORT CHANNELS

.1 U shape, size 41 x 41 x 2.5 mm thick, surface mounted or suspended.

Part 3 Execution

3.1 MANUFACTURER'S INSTRUCTIONS

.1 Compliance: comply with manufacturer's written recommendations or specifications, including product technical bulletins, handling, storage and installation instructions, and datasheet.

3.2 INSTALLATION

.1 Secure equipment to hollow or solid masonry, tile and plaster surfaces with nylon shields.

.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 exposed conduit or cables to building construction or support system using straps:

.1 One-hole steel straps to secure surface conduits and cables 51mm and smaller.

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

.6 For surface mounting of two or more conduits use channels at 1.5 m on centre spacing.

.7 Provide metal brackets, frames, hangers, clamps and related types of support structures where indicated or as required to support conduit and cable runs.

.10 Ensure adequate support for raceways and cables dropped vertically to equipment where there is no wall support.

.11 Do not use wire lashing or perforated strap to support or secure raceways or cables.

.12 Do not use supports or equipment installed for other trades for conduit or cable support except with permission of other trade and approval of Departmental Representative.

.13 Install fastenings and supports as required for each type of equipment cables and conduits, and in accordance with manufacturer's installation recommendations.

.14 Powder actuated fasteners are not acceptable.

END OF SECTION

Part 1 General

1.1 RELATED SECTIONS

.1 Division 01 – General Requirements.

.2 Section 26 05 01 – Common Work Results – Electrical.

Part 2 Products

2.2 JUNCTION AND PULL BOXES

.1 Welded steel construction with screw-on flat covers for surface mounting.

.2 Covers with 25 mm minimum extension all around, for flush-mounted pull and junction boxes.

Part 3 Execution

3.1 MANUFACTURER'S INSTRUCTIONS

.1 Compliance: comply with manufacturer's written recommendations or specifications, including product technical bulletins, handling, storage and installation instructions, and datasheet.

3.2 JUNCTION AND PULL BOXES INSTALLATION

.1 Install pull boxes in inconspicuous but accessible locations.

.2 Install pull boxes so as not to exceed 30 m of conduit run or 2-90° bends between pull boxes.

3.3 IDENTIFICATION

.1 Provide equipment identification in accordance with Section 26 05 01 - Common Work Results – Electrical.

.2 Install size 2 identification labels for splitters indicating equipment served, voltage, phase and amperage.

END OF SECTION

Part 1 General

1.1 REFERENCES

.1 CSA C22.1- 2018, Canadian Electrical Code, Part 1.

1.2 WASTE MANAGEMENT AND DISPOSAL

.1 Separate and recycle waste materials in accordance with Section 01 74 21 - Construction/Demolition Waste Management and Disposal, and with the Waste Reduction Workplan.

.2 Collect and separate plastic, paper packaging and corrugated cardboard in accordance with Waste Management Plan.

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 special devices.

.3 Gang boxes where wiring devices are grouped.

.4 Blank cover plates for boxes without wiring devices.

.5 347 V outlet boxes for 347 V switching devices.

.6 Combination boxes with barriers where outlets for more than one system 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 38mm or as indicated. 102mm square outlet boxes when more than one conduit enters one side with extension and plaster rings as required.

.2 Electro-galvanized steel utility boxes for outlets connected to surface-mounted EMT conduit, minimum size 102 x 54 x 48mm.

.3 102mm square outlet boxes with extension and plaster rings for flush mounting devices in finished plaster tile walls.

2.3 MASONRY BOXES

.1 Electro-galvanized steel masonry [single] [and multi] gang boxes for devices flush mounted in exposed block walls.

2.4 CONCRETE BOXES

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

2.5 CONDUIT BOXES

.1 Cast FS or FD aluminum feraloy boxes with factory-threaded hubs and mounting feet for surface wiring of switches and receptacle.

2.6 OUTLET BOXES FOR NON-METALLIC SHEATHED CABLE

.1 Electro-galvanized, sectional, screw ganging steel boxes, minimum size 76 x 50 x 63mm with two double clamps to take non-metallic sheathed cables.

2.7 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 32mm 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 RELATED SECTIONS

.1 Division 01 – General Requirements.

.2 Section 26 05 01 – Common Work Results – Electrical.

1.2 REFERENCES

.1 Canadian Standards Association (CSA) Latest Edition of the following:

.1 CAN/CSA C22.2 No. 18.3-04 Conduit, Tubing and Cable Fittings.

.2 CSA C22.2 No. 56-04 Flexible Metal Conduit and Liquid-Tight Flexible Metal Conduit.

.3 CSA C22.2 No. 83-M 1985 (R2003), Electrical Metallic Tubing.

.4 CSA C22.2 No. 211.2-M 1984 (R2003), Rigid PVC (Unplasticized) Conduit.

Part 2 Products

2.1 CONDUITS

.1 Electrical metallic tubing (EMT): to CSA C22.2 No. 83 – M 1985 (R2003), with couplings.

.2 Flexible metal conduit: to CSA C22.2 No. 56-04, steel and liquid-tight flexible metal.

2.2 CONDUIT FASTENINGS

.1 One-hole steel straps to secure surface conduits 51 mm and smaller. Two hole steel straps for conduits larger than 51 mm.

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

.3 Channel type supports for two or more conduits at 1.5 m oc.

.4 Threaded rods, 6 mm diameter, to support suspended channels.

2.3 CONDUIT FITTINGS

.1 Rain tight EMT connectors shall be used on "vertical" sections of conduit runs where terminating into tops of electrical equipment incorporating drip shields or hoods.

.2 Fittings: Use set screw connectors and fittings for EMT. Coating: same as conduit.

.3 Factory "ells" where 90 degree bends are required for 25 mm and larger conduits.

.4 Connectors for flexible conduits, shall be set screw galvanized steel.

.5 Connectors for liquid tight flexible conduit shall be water tight, compression type galvanized steel.

.6 Threaded plastic or metal bushings to be installed on all EMT connector's sizes 35 mm and larger.

.7 Fittings: manufactured for use with conduit specified. Coating: same as conduit.

2.4 FISH CORD

.1 Polypropylene – tensile strength as required.

Part 3 Execution

3.1 MANUFACTURER'S INSTRUCTIONS

.1 Compliance: comply with manufacturer's written recommendations or specifications, including product technical bulletins, handling, storage and installation instructions, and datasheet.

3.2 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 and in unfinished areas.

.3 EMT shall be installed as a complete system.

.4 Support of electrical systems raceway shall be independent of any type of suspended ceiling support rods, wires, etc. and mechanical piping or duct systems.

.5 Use electrical metal tubing (EMT) for all work, unless otherwise indicated. Provide a separate green ground for all conduit systems, including E.M.T.

.6 Flexible Metal Conduit:

.1 Flexible metal conduits, permitted above T-bar ceilings, for drops to various fire alarm devices mounted on flush outlet boxes in finished ceiling. Minimum size of flexible conduit: 22 mm, Maximum length of drop: 1.5 m.

.7 Use liquid tight flexible metal conduit for connection to motors or vibrating equipment, furniture and transformers. Include a separate ground wire.

.8 Minimum conduit size for lighting and power circuits: 16 mm.

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

.10 Mechanically bend steel conduit over 22 mm dia.

.11 Field threads on rigid conduit must be of sufficient length to draw conduits up tight.

.12 Install fish cord in empty conduits.

.13 Remove and replace blocked conduit sections. Do not use liquids to clean out conduits.

.14 Dry conduits out before installing wire.

.15 Securely fasten in place within 83 mm of each outlet box, junction box, cabinet, coupling or fitting, maximum spacing between supports as follows:

.1 1.5 m for 21 mm trade size conduit and smaller.

.2 2 m for 27 mm to 35 mm trade size conduit.

.3 3 m for 41 mm trade size and larger.

.16 Ground Wires:

.1 Provide a separate green ground wire in all conduits, including EMT.

3.3 SURFACE CONDUITS

.1 Run parallel or perpendicular to building lines.

.2 Run conduits in flanged portion of structural steel.

.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 76 mm parallel to steam or hot water lines with minimum of 25 mm clearance at crossovers.

3.4 CONCEALED CONDUITS

.1 Run parallel or perpendicular to building lines.

.2 Do not install horizontal runs in masonry walls.

.3 Do not install conduits in terrazzo or concrete toppings.

END OF SECTION

Part 1 General

1.1 RELATED SECTIONS

.1 Division 01 – General Requirements.

.2 Section 26 05 01 – Common Work Results – Electrical.

1.2 SECTION INCLUDES

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

1.3 REFERENCES

.1 Canadian Standards Association (CSA International) Latest Edition of the following:

.1 CSA-C22.2 No.42.1-00 (R2004), Cover Plates for Flush-Mounted Wiring Devices (Bi-national standard, with UL 514D).

.2 CSA-C22.2 No.55-M 1986 (R2003), Special Use Switches.

.3 CSA-C22.2 No.111-00, General-Use Snap Switches (Bi-national standard, with UL 20, twelfth edition).

.4 CSA-C22.2 No. 42-99 (R2004) general use receptacles, attachment plugs and similar devices.

1.4 SUBMITTALS

.1 Submit shop drawings in accordance with Section 26 05 01 – Common Work Results – Electrical.

Part 2 Products

2.1 COVER PLATES

.1 Cover plates for wiring devices to: CSA-C22.2 No.42.1.

.2 Cover plates from one manufacturer throughout project.

.3 FS-type cover plates for wiring devices installed in surface-mounted FS-type outlet boxes.

.4 Sheet steel utility box cover for wiring devices installed in surface mounted utility boxes.

.5 Sheet metal cover plates for wiring devices mounted in surface mounted FS or FD type conduit boxes.

2.2 EQUIPMENT IDENTIFICATION

.1 Provide equipment identification in accordance with Section 26 05 01 – Common Work Results – Electrical.

.2 Label size: 1.

.3 Provide one label for each wiring device (light switches and receptacles) indicating circuit number that the wiring device is connected to. Example: “A-23”.

2.3 RECEPTACLES

.1 Specification grade U-ground duplex receptacles, CSA Types 5-20R 125V to CSA-C22.2 No. 42 with following features:

- .1 Impact resistant nylon face.
- .2 Thermoplastic back body.
- .3 White urea moulded housing.
- .4 Suitable for No. 10 AWG for back and side wiring.
- .5 Break-off links for use as split receptacles.
- .6 Triple wipe contacts and riveted grounding contacts.
- .7 Plated steel mounting strap with integral ground contacts.
- .8 Color: White

.2 Receptacles of one manufacturer throughout project.

.3 Switches and dimmers:

- .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 specified in Section 26 05 01 - Common Work Results - Electrical or as indicated.
- .4 Install 3-way switches such that load is “OFF” when both toggles are down.

.4 Receptacles:

- .1 Install receptacles in gang type outlet box when more than one receptacle is required in one location.
- .2 Where 2 receptacles are fed from different panelboards and installed in a common 2-gang outlet box, install voltage barrier between the receptacles.
- .3 Mount receptacles at height specified in Section 26 05 01 - Common Work Results - Electrical or as indicated.
- .4 All receptacles shall be installed with the “U” ground at the top.
- .5 All receptacles mounted horizontal shall be oriented with ground to the left.

2.4 SWITCHES

.1 15A, 120V single-pole switches, commercial specification grade to CSAC 22.2 No. 55 and CSA C22.2 No. 111.

.2 Manually operated commercial specification grade AC switches with the following features:

- .1 Terminal holes approved for #10 AWG wire.
- .2 Silver alloy contacts.
- .3 High strength thermoplastic polycarbonate toggle.
- .4 Urea or melamine moulding for parts subject to carbon tracking.
- .5 Suitable for back and side wiring.
- .6 Toggle colour: white.

2.5 EMERGENCY STOP PUSHBUTTON

.1 Jumbo red mushroom head, push-pull pushbutton with wording “E-Stop” with the following features:

.1 Red colour cap.

.2 One normally open and one normally closed contact block.

.3 Complete with stainless steel jumbo protection guard.

Part 3 Execution

3.1 MANUFACTURER'S INSTRUCTIONS

.1 Compliance: comply with manufacturer's written recommendations or specifications, including product technical bulletins, handling, storage and installation instructions, and datasheets.

3.2 INSTALLATION

.1 Cover plates:

.1 Protect 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.

.2 General:

.1 All surface mounted wiring devices shall be installed in FS-type outlet boxes, c/w FS-type coverplates.

END OF SECTION

Part 1 General

1.1 SECTION INCLUDES

.1 Materials for moulded-case circuit breakers.

1.2 RELATED SECTIONS

.1 Division 01 – General Requirements.

.2 Section 26 05 01 – Common Work Results – Electrical.

1.3 REFERENCES

.1 Canadian Standards Association (CSA International) Latest Edition of the following:

.1 CSA-C22.2 No. 5-2 (R2007), Moulded-Case Circuit Breakers, Moulded-Case Switches and Circuit-Breaker Enclosures (Tri-national standard with UL 489, tenth edition, and the second edition of NMX-J-266-ANCE).

.2 CAN/CSA-C22.2 No. 144-M91 (R2001), Ground Fault Circuit Interrupters.

1.4 SUBMITTALS

.1 Prior to any installation of circuit breakers in either a new or existing installation, Contractor must submit three (3) copies of a certificate of origin, from the manufacturer, duly signed by the factory and the local manufacturer's representative, certifying that all circuit breakers come from this manufacturer, they are new and they meet standards and regulations. These certificates must be submitted to the Departmental Representative for approval.

.2 A delay in the production of the certificate of origin won't justify any extension of the contract and additional compensation.

.3 Any work of manufacturing, assembly or installation should begin only after acceptance of the certificate of origin by Departmental Representative. Unless complying with this requirement, Departmental Representative reserves the right to mandate the manufacturer listed on circuit breakers to authenticate all new circuit breakers under the contract, and that, to Contractor's expense.

.4 In general, the certificate of origin must contain:

.1 The name and address of the manufacturer and the person responsible for authentication. The responsible person must sign and date the certificate;

.2 The name and address of the licensed dealer and the person of the distributor responsible for the Contractor's account.

.3 The name and address of the Contractor and the person responsible for the project.

.4 The name and address of the local manufacturer's representative. The local representative must sign and date the certificate.

.5 The name and address of the building where circuit breakers will be installed:

.1 Project title.

.2 End user's reference number.

.5 The list of circuit breakers.

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°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.

2.2 ACCEPTABLE MATERIALS

.1 Breakers shall be compatible with existing panelboards and shall have short circuit interrupting ratings to match the existing panelboards in which they are installed.

.2 Provide all required mounting hardware and accessories.

Part 3 Execution

3.1 MANUFACTURER'S INSTRUCTIONS

.1 Compliance: comply with manufacturer's written recommendations or specifications, including product technical bulletins, handling, storage and installation instructions, and datasheets.

3.2 INSTALLATION

.1 Install circuit breakers as indicated.

END OF SECTION

Part 1 General

1.1 SECTION INCLUDES

.1 Materials and installation for fused and non-fused disconnect switches.

1.2 RELATED SECTIONS

.1 Section 01 33 00 – Submittal Procedures.

.2 Section 01 35 29 – Health and Safety Requirements.

.3 Section 01 74 21 – Construction/Demolition Waste Management and Disposal.

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

1.3 REFERENCES

.1 Canadian Standards Association (CSA International):

.1 CAN/CSA C22.2 No.4-M89 (R2000), Enclosed Switches.

.2 CSA C22.2 No.39-M89 (R2003), Fuseholder Assemblies.

1.4 SUBMITTALS

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

1.5 HEALTH AND SAFETY

.1 Do construction occupational health and safety in accordance with Section 01 35 29 – Health and Safety Requirements.

1.6 WASTE MANAGEMENT AND DISPOSAL

.1 Separate waste materials for reuse and recycling in accordance with Section 01 74 21 - Construction/Demolition Waste Management and Disposal.

.2 Remove from site and dispose of packaging materials at appropriate recycling facilities.

.3 Collect and separate for disposal paper, plastic, polystyrene corrugated cardboard packaging material in appropriate on-site bins for recycling in accordance with Waste Management Plan.

.4 Separate for reuse and recycling and place in designated containers Steel, Metal and Plastic waste in accordance with Waste Management Plan.

.5 Fold up metal banding, flatten and place in designated area for recycling.

Part 2 Products

2.1 DISCONNECT SWITCHES

.1 Non-fusible, horsepower rated disconnect switch in CSA Enclosure, to CAN/CSA C22.2 No.4 size as indicated.

.2 Provision for padlocking in on-off, off switch position by three locks.

.3 Mechanically interlocked door to prevent opening when handle in ON position.

.4 Quick-make, quick-break action.

.5 ON-OFF switch position indication on switch enclosure cover.

2.2 EQUIPMENT IDENTIFICATION

.1 Provide equipment identification in accordance with Section 26 05 01 – Common Work Results - Electrical.

.2 Indicate name of load controlled on size 4 nameplate.

Part 3 Execution

3.1 INSTALLATION

.1 Install disconnect switches as indicated on drawings. Maintain one (1) meter clearance in front of disconnect switches.

END OF SECTION

Part 1 General

1.1 SECTION INCLUDES

.1 Materials and installation for contactors for system voltages up to 600V.

1.2 RELATED SECTIONS

.1 Division 01 – General Requirements.

.2 Section 26 05 01 – Common Work Results – Electrical.

1.3 REFERENCES

.1 Canadian Standards Association (CSA International)

.1 CSA C22.2 No.14-95 (R2005), Industrial Control Equipment.

1.4 SUBMITTALS

.1 Submit Shop Drawings in accordance with Section 26 05 01 – Common Work Results – Electrical.

Part 2 Products

2.1 CONTACTORS

.1 Contactors: to CSA C22.2 No.14.

.2 Electrically held controlled by pilot devices as indicated and rated for type of load controlled. Half size contactors not accepted.

.3 Number of poles as indicated.

.4 Complete with 2 normally open and 2 normally closed auxiliary contacts unless indicated otherwise.

.5 Mount in CSA Type 1 Enclosure unless otherwise indicated.

.6 Include following options in cover:

.1 Red indicating lamp.

.2 Hand-Off-Auto selector switch.

.7 Control transformer: Confirm coil voltage prior to ordering.

2.2 EQUIPMENT IDENTIFICATION

.1 Provide equipment identification in accordance with Section 26 05 01 - Common Work Results - Electrical.

.2 Size 4 nameplate indicating name of load controlled as indicated.

Part 3 Execution

3.1 MANUFACTURER'S INSTRUCTIONS

.1 Compliance: comply with manufacturer's written recommendations or specifications, including product technical bulletins, handling, storage and installation instructions, and datasheets.

3.2 INSTALLATION

.1 Install contactors and connect auxiliary control devices.

END OF SECTION

Part 1 General

1.1 RELATED SECTIONS

.1 Division 01 – General Requirements.

.2 Section 26 05 01 – Common Work Results – Electrical.

1.2 SUBMITTALS

.1 Submit Shop Drawings in accordance with Section 26 05 01 – Common Work Results – Electrical.

.2 Shop Drawings shall indicate:

.1 Mounting method and dimensions.

.2 Starter size and type.

.3 Layout of identified internal and front panel components.

.4 Enclosure types.

.5 Wiring diagram for each type of starter.

.6 Interconnection diagrams.

1.3 OPERATION AND MAINTENANCE DATA

.1 Provide operation and maintenance data for motor starters for incorporation into Operation and Maintenance Manual specified in Division 01- General Requirements.

.2 Include operation and maintenance data for each type and size of starter.

Part 2 Products

2.1 MATERIALS

.1 Starters: NEMA Type.

.2 Half size starters not acceptable.

.3 I.E.C. rated starters not acceptable.

2.2 MANUAL MOTOR STARTERS

.1 Single phase manual motor starters of size, type, rating, and enclosure type as indicated, with components as follows:

.1 Switching mechanism, quick make and break.

.2 One overload heater, manual reset, trip indicating handle.

.2 Accessories:

.1 Toggle switch: standard.

.2 Indicating light: standard, red in color.

.3 Locking tab to permit padlocking in "ON" or "OFF" position.

2.3 EQUIPMENT IDENTIFICATION

.1 Provide equipment identification in accordance with Section 26 05 01 - Common Work Results - Electrical.

.2 Manual starter designation label, white face, black core (normal), size 1, engraved as indicated.

Part 3 Execution

3.1 MANUFACTURER'S INSTRUCTIONS

.1 Compliance: comply with manufacturer's written recommendations or specifications, including product technical bulletins, handling, storage and installation instructions, and datasheets.

3.2 INSTALLATION

.1 Install starters, connect power and control as indicated.

.2 Ensure correct fuses and overload device elements installed.

.3 Install manual starters recessed where possible.

3.3 TESTS

.1 Perform tests in accordance with Section 26 05 01 - Common Work Results - Electrical and manufacturer's instructions.

.2 Operate switches and contactors to verify correct functioning.

.3 Perform starting and stopping sequences of contactors and relays.

.4 Check that sequence controls, interlocking with other separate related starters, equipment, control devices, operate as indicated.

END OF SECTION

Part 1 General

1.1 RELATED SECTIONS

.1 Division 01 – General Requirements.

.2 Section 26 05 01 – Common Work Results – Electrical.

1.2 REFERENCES

.1 American National Standards Institute/Institute of Electrical and Electronics Engineers (ANSI/IEEE):

.1 ANSI/IEEE C62.41-1991, IEEE Recommended Practice for Surge Voltages in Low-Voltage AC Power Circuits.

.2 United States of America, Federal Communications Commission (FCC):

.1 FCC (CFR47) EM and RF Interference Suppression.

.3 Illuminating Engineering Society of North America (IESNA):

.1 IESNA LM-79-19.

1.3 SUBMITTALS

.1 Submit shop drawings for each of the following:

.1 Luminaires.

.2 Luminaire shop drawings shall indicate: housing construction, driver type, LED chips, reflector type, and lens type and photo metrics.

.3 LED chip shop drawings shall indicate: type, initial lumens, mean lumen, CCT and CRI.

.4 Driver shop drawings shall indicate: driver type and input power.

.5 Submit complete photometric data prepared by independent testing laboratory for luminaires where specified, for review by Consultant.

1.4 QUALITY ASSURANCE

.1 LED Luminaires shall be provided with a five (5) year warranty covering LED's, drivers, parts and mechanical components.

Part 2 Products

2.1 TECHNICAL REQUIREMENTS FOR LED LUMINAIRES

.1 Electrical:

.1 Power Factor: The Luminaire shall have a power factor of 0.90 or greater.

.2 Photometric Requirements:

.1 All photometric data will be measured by the IESNA LM-79-19 standard.

.2 Luminous Flux: The luminous flux shall not decrease by more than 30% over the expected operating life.

.3 Light Color/Quality: The luminaire shall have a correlated color temperature (CCT) as indicated in symbol legend. The color rendition index (CRI) shall be 80 or greater. (See symbol legend).

.3 Thermal Management:

.1 The thermal management of the heat generated by the LEDs shall be of sufficient capacity to assure proper operation of the Luminaire over the expected useful life.

2.2 LUMINAIRES

.1 LED strip luminaire complete with lens, 3000 lumens, 120V, 80 CRI, 3500 K and a white finish.

Part 3 Execution

3.1 MANUFACTURER'S INSTRUCTIONS

.1 Compliance: comply with manufacturer's written recommendations or specifications, including product technical bulletins, handling, storage and installation instructions, and datasheet.

3.2 INSTALLATION

.1 Locate and install luminaires as indicated.

3.3 WIRING

.1 Connect luminaires to lighting circuits as indicated.

3.4 LUMINAIRE SUPPORTS

.1 Provide all supports and brackets for mounting luminaries. Confirm mounting method for all luminaires with Engineer prior to rough-in.

3.5 LUMINAIRE ALIGNMENT

.1 Align luminaries mounted in continuous rows to form straight uninterrupted line.

.2 Align luminaries mounted individually parallel or perpendicular to building grid lines.

END OF SECTION