



May 07, 2026

Project No. 25-055

TO: All Bidders

PROJECT: Marathon WWTP Upgrades

This addendum forms part of the Contract Documents. Include the related costs in the Tender Prices. Insert the Addendum behind the front page of the Contract Documents.

Electrical

This addendum includes National Master Specification (NMS) requirements. See below.

END OF ADDENDUM #1

1 GENERAL

1.1 Conform to Sections of Division 01, as applicable.

1.1.1 Section 26 05 01 shall apply to and govern work of all Sections of Division 26 as applicable.

1.1.2 Provide a complete electrical system including all materials, equipment, services and labour necessary as shown or implied for a complete installation.

1.2 RELATED SECTIONS

1.2.1 Canadian Electrical Code (23rd edition) 2015.

1.2.2 Ontario Electrical Safety Code (26th edition) 2015.

1.2.3 Firestopping and smoke seals: as specified.

1.2.4 Flashings for electrical work located on or passing through roof: as specified.

1.2.5 Temporary sheet steel covers: as specified.

1.2.6 Excavating, Backfilling and Rough Grading for electrical work: as specified.

1.2.7 Concrete for electrical work: as specified.

1.2.8 Base courses and paving over backfilled and graded electrical work: as specified.

1.3 SYSTEM DESCRIPTION

1.3.1 Incoming Service Data

1.3.1.1 Available electric service is 347/600 volts, 60 Hz, 3 phase, 4 wire.

1.3.1.2 Coordinate ratings and characteristics of all pertinent electrical equipment to ensure safe and satisfactory operations.

1.3.1.3 Incoming utilization supply for communication system, signal and television systems is as indicated on Drawings.

1.4 SHOP DRAWINGS

1.4.1 Submit shop drawings in accordance with the General Conditions of the Contract and as specified in each section of Division 26.

1.4.2 When equipment and apparatus of one system must be coordinated with or installed in a given area with equipment and apparatus of other system(s), prepare and submit necessary coordinated composite drawings for checking interferences.

1.5 AS-BUILT DRAWINGS

1.5.1 Submit "as built" drawings in accordance with the specifications.

1.5.1.1 For underground installations, dimension location with respect to building walls and mark levels with respect to elevation of finished floor below where wiring is buried.

1.5.1.2 Colour code changes using red for additions, and green for deletions.

1.6 OPERATION AND MAINTENANCE DATA

1.6.1 Submit operation and maintenance data in accordance with the specifications. Make changes or submit additional information if required.

1.6.2 Review instructions with Owner's Designee to ensure a thorough understanding of equipment and its operation.

1.7 REGULATORY REQUIREMENTS

1.7.1 Materials and workmanship shall be in accordance with requirements and recommendations of applicable rules, regulations, standards and codes as specified hereunder. All products shall bear certification label of CSA, ULC, and The Electrical Safety Authority, as applicable.

The Electrical Safety Code (OESC)-publication containing Canadian Electrical Code and The Electrical Safety Authority Supplements.

Canadian Standards Association (CSA)

Underwriter's Laboratories of Canada (ULC)

Electrical and Electronic Manufacturers Association of Canada (EEMAC)

Joint Industrial Council (JIC)

Ontario Building Code (OBC)

Ontario Fire Code (OFC)

Association of Edison Illuminating Companies (AEIC)

American Society for Testing and Materials (ASTM)

Insulated Power Cable Engineers Association (ICEA)

Boards, Service Companies or other Authorities having jurisdiction.

1.7.2 Permits, Fees and Certificates: Except as provided in the General Conditions of the Contract, give notices, obtain permits, pay fees required for work of Division 26. Before final certificate of payment is issued by Owner, furnish certificates as evidence that work installed conforms with laws and regulations of all governing authorities. Determine detailed requirements of local authorities having jurisdiction and conform to those requirements.

1.8 **QUALIFICATIONS**

1.8.1 Work shall be executed by Electrical Contractor or his designated sub-contractor, holding a valid Contractors' license (Master License).

1.8.2 Work shall be performed by qualified Electricians holding valid Ontario certificates of qualifications.

1.8.3 Work on signal, communication, related control and other similar systems shall be performed by relevant competent tradesmen.

1.9 **PROJECT/SITE CONDITIONS**

1.9.1 **Existing Conditions**

1.9.1.1 Examine Site and Contract Documents in accordance with Instructions to Bidders.

1.9.1.2 Electrical installations in areas classified as hazardous locations, corrosive environments, and other special area application, shall be governed by relevant Industry Standards and Regulatory Requirements.

2 **PRODUCTS**

2.1 **MATERIALS**

2.1.1 **Inserts:** Supply and deliver inserts, anchors, bolts, sleeves, ferrules and other items to be built into the work of other Divisions, with necessary templates, adequate instructions and assistance for locating and installing.

2.1.2 **Access Panels:** For ceilings and/or masonry walls, 12-gauge steel, size 460 mm x 460 mm unless indicated on Drawings, concealed hinges, key-locked type, prime coated, to match ceiling and/or wall finish.

2.1.3 **"Lamacoid" Nameplates:** 3 mm thick, white capitalized inscribed letterings against black background, sized to accommodate specified nomenclature, as described in other Sections of Division 26, or as indicated on Drawings.

Nameplate sizes shall be as follows;

| | | | |
|--------|------------|--------|-------------------|
| 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 |

Nameplates for panelboards indicating the following;

- Panelboard Identifier
- Amperage of Feeder (Breaker/Fuse Size)
- Voltage
- Phase
- 'Fed from' location

Nameplates for terminal cabinets and junction boxes to indicate system and/or voltage characteristics.

Nameplates for disconnects, starters and contactors: indicate equipment being controlled and voltage.

Nameplates for terminal cabinets and pull boxes: indicate system and voltage.

Nameplates for dry type transformers to be Size 7, labelled as follows (refer to drawings for transformer number and kVA rating number);

TR# - ### kVA

600 – 120/208V 3-PHASE

2.1.4 **Duplex Receptacle Identification:** Identify panel and circuit number on all duplex receptacles face plates with black printed lettering on clear labelling tabs (P-tabs).

2.1.5 **Wall Mounting Panels:** 19 mm thick minimum, "Fir" plywood panel, good 1-side painted with 2-coats standard equipment grey colour, cut size to suit, for group-mounting any combinations of surface wall-mounted enclosed disconnect switches and/or circuit breakers, motor starters and/or contractors, small control cabinets or control panels, utility metering cabinets, panelboards and other similar device enclosures.

3 EXECUTION

3.1 EXAMINATION

3.1.1 Where any parts of systems and/or pieces of equipment are located by dimensions on Drawings, check and verify such dimensions at Site.

3.1.2 Notify Owner's Designee before proceeding further if any discrepancy or interference with other equipment is found which will necessitate revision in or deviation from Work as

indicated or specified.

- 3.1.3 Location of conduit, raceways, wiring and other equipment shall be altered without charge to Owner if so, directed by Owner's Designee provided change is ordered before installation, and does not necessitate additional labour and material.

3.2 CUTTING AND PATCHING

- 3.2.1 Cutting of holes up to 200 mm (8") in diameter and related patching shall be done under Division 26.

- 3.2.2 Holes and other openings larger than 200 mm (8") in diameter, chases, bulkheads, furring and related patching will be done under Sections whose work is to cut and patched.

- 3.2.3 Supply measurements of equipment to other Sections to allow for necessary openings to be left in work of other Sections.

3.3 FIRESTOPPING AND SMOKE SEAL

- 3.3.1 Be responsible for installation of Firestopping and smoke seal inside electrical assemblies (i.e. inside bus ducts).

- 3.3.2 Firestopping and smoke seals around outside of electrical assemblies, where they penetrate fire rated separations, and Penetration Firestopping shall be carried out under supervision of this Division.

- 3.3.3 Be responsible for any additional cost incurred as a result of over sizing of openings during cutting and patching operation of openings to be fire stopped up to 200 mm (8") in diameter.

- 3.3.4 Install sheet steel covers and Miscellaneous Metals over temporarily unused sleeves provided in fire separations for future electrical installations.

3.4 INSTALLATION

- 3.4.1 Verify dimensions of equipment to be installed.

- 3.4.2 Each room containing electrical equipment and each working space around equipment shall have unobstructed means of egress per OESC Rule 2-310.

- 3.4.3 Maintain a minimum working space of 1 meter with secure footing about electrical equipment such as switchboards, panelboards, control panels and motor control centers which are enclosed in metal per OESC Rule 2-308.

- 3.4.4 Protect existing work and equipment during construction.

- 3.4.5 Co-ordinate electrical requirements for all equipment supplied by owner or other trades.

Notify engineers of any conflicts prior to installation.

- 3.4.6 Instruct and supervise other Sections doing related work.
- 3.4.7 Electrical products and methods of installation shall be in accordance with relevant Sections of Division 26, and applicable requirements of other Divisions.
- 3.4.8 Correct installed work as directed by authorized inspectors of such authorities.
- 3.4.9 Notwithstanding the General Conditions of the Contract, no increase to Contract Price shall apply for electrical items relocated from location indicated and prior to installation requiring extra labour and material up to 3 meters (10'-0") from original location, nor will decrease to Contract Price apply where relocation up to 3 meters (10'-0") reduces materials and labour.
- 3.4.10 Electrical drawings are to be read in conjunction with the mechanical drawings to determine overall extent of work.

3.5 EQUIPMENT IDENTIFICATIONS

- 3.5.1 Electrical equipment and auxiliaries shall be identified in accordance with designations indicated on Drawings or as specified in other Sections of Division 26.
- 3.5.2 Identify electrical equipment, control cabinets, panels, enclosures, switchboards, switchgears, motor control centres, starters, designated boxes, and other similar items, using Lamacoid plates.
- 3.5.3 Fasten Lamacoid nameplates using self-tapping screws for metal sheet enclosures or glued to PVC or fibreglass construction.
- 3.5.4 Panelboards shall have Lamacoid plates mounted on top outside trim of door indicating function and voltage of panelboard.
- 3.5.5 Disconnect switches and motor starters shall have Lamacoid nameplates mounted on front cover indicating name of equipment, horsepower, voltage and phase.
- 3.5.6 Terminal boards, blocks, and strips, shall have group marker and indexed markers, as applicable.
- 3.5.7 Mark clearly and permanently all feeder phase identifications at both ends, using standard colour or letter designations.
- 3.5.8 Identify wiring, as required, using standard indelible wire markers at each termination, in accordance with schematic and/or connection wiring diagrams.

3.6 PAINTING WORK SUPPLIED UNDER DIVISION 26

- 3.6.1 Touch up minor chips or damage to electrical equipment, installed in this Division, with

standard, factory supplied, enamel finish.

3.6.2 Colour code, as specified herein, outlet boxes, pull boxes, junction boxes by applying a small dab of paint to inside of each item during installation.

3.6.3 Colour code, as specified herein, all exposed ducts, conduits, outlet boxes, and similar items by applying a 25 mm (1") wide band of paint around ducts and conduits adjacent to boxes described in above paragraph and on both sides of wall penetration.

3.6.4 Use following paint colour-code:

- Red: Fire Detection and Alarm System
- Blue: Communication System (Voice, Data, Electronics, etc.)
- Yellow: Emergency Power System
- Purple: Security System
- Green: Life Communications System

3.7 PAINTING WORK

3.7.1 Priming and finish painting of exposed unfinished raceways, fitting, outlet boxes, junction boxes, pull boxes and similar items.

3.7.2 Division 26 shall assist in form of supervision; painting works by other project specifications.

3.8 SYMBOLS

3.8.1 Electrical work is indicated generally on Drawings using standard symbols.

3.8.2 For lighting layout Drawings, letters in a circle indicate type of fixture to be supplied. Letters and numbers outside and adjacent to circle indicate panel and circuit number.

3.9 MOUNTING HEIGHTS

3.9.1 Measure mounting height dimension from operator's working floor level (finish) to centre-line of electrical device or enclosure, unless otherwise indicated or specified herein.

3.9.2 Heights are subject to change to suit structural requirements, and other Site conditions, and therefore as work progresses, and before installing equipment, obtain instructions or directions from Owner's Designee for alternative heights or relocation.

3.9.3 Mounting heights shall be as follows, unless otherwise indicated or specified as directed on site:

| | |
|--------------------|--|
| Lighting Switches | 1200mm |
| Wall Receptacles | 400mm |
| Voice/Data Outlets | 400mm |
| Exit Lights | 2100mm |
| Panelboards | 1980mm to top (maximum 1700mm to highest breaker handle) |

3.10 MOUNTING OF EQUIPMENT

- 3.10.1 Lighting panels, power panels, annunciators, control panels and cabinets, electrical enclosures, boxes, and other similar items, indicated to be installed in areas with finished walls, shall be flush-mounted and fitted with suitable flush trim and doors.
- 3.10.2 Lighting panels, power panels, annunciators, control panels and cabinets, electrical enclosures, boxes, and other similar items indicated to be installed in pipe spaces or other areas where an exposed type of wiring is specified shall be surface mounted.
- 3.10.3 Use wall mounting panel for surface wall group-mounting of electrical control equipment, enclosures, and similar devices as indicated in Drawings, specified herein, or as directed on Site by Owner's Designee.

3.11 GROUNDING

- 3.11.1 Ground electrical equipment in accordance with requirements of The Electrical Safety Authority Electrical Safety Code.
- 3.11.2 Arrange grounds so that under normal operating conditions, no injurious amount of current will flow in any grounding conductor. Connect single phase loads so that there is least possible unbalance of supply.
- 3.11.3 Grounding equipment to CSA C22.2 No. 41.
- 3.11.4 Copper grounding conductors to: CSA 22.2 Section 10 latest edition.
- 3.11.5 For standard duplex receptacles provide insulated ground conductor, size for equipment ground in accordance with electrical code minimum conductor size #12 with green insulation. Ground conductor to be connected under a bonding screw to outlet box(es) and panelboard.
- 3.11.6 For isolated ground duplex receptacles provide equipment grounding conductor as for standard receptacles and separate insulated ground conductor; size to match line conductors with green insulation and yellow strip. Isolated ground conductor to be

connected to isolated ground terminal strip provided in panel.

- 3.11.7 In panelboard isolated ground bus and equipment ground bus to be tied together with #1/0 insulated conductor.
- 3.11.8 Install separate "green" ground conductor in same conduit with circuit (power wiring) conductors. Bond securely to ground screw in each outlet, junction, pull box, and equipment enclosure ground conductor equal in ampacity to size of circuit ampacity or in accordance with code for equipment grounding.
- 3.11.9 Bond single conductor, metallic armoured cables to cabinet at supply end, and provide non-metallic entry plate at load end.

3.12 COORDINATION

- 3.12.1 Co-ordinate all work with Synergy North, ESA, the engineer and the owner.
- 3.12.2 Co-ordinate all work with utilities.
- 3.12.3 ESA to inspect work as required.
- 3.12.4 Necessary service interruptions to perform work shall be co-ordinated with the owner, engineer, ESA and Synergy North. Service interruptions shall be planned to be of minimum duration. All parties involved shall be contacted 72 hours in advance of the service interruption.

3.13 FIELD QUALITY CONTROL

3.13.1 Trial Usage

- 3.13.1.1 Trial usage by Owner's Designee of any electrical device, machinery, apparatus, equipment and other work supplied under this Division before final completion and written acceptance by Owner's Designee is not to be construed as evidence of acceptance by Owner.
- 3.13.1.2 Owner shall have privilege of such trial usage as soon as Contractor claims that said work is completed, in accordance with Drawings and specifications for such reasonable length of time as Owner's Designee deems sufficient for making a complete test.
- 3.13.1.3 No claim for damage shall be made for injury to or breaking of any parts of such tested work, whether caused by weakness or inaccuracy of structural parts or by defective materials or workmanship of any kind whatsoever.

3.13.2 Tests

- 3.13.2.1 At completion of installation, conduct grounding resistance test, voltage test, and empty conduit test in presence of Owner's Designee and make corrections where necessary and as directed.

- 3.13.2.2 Resistance of ground electrodes shall not exceed maximum permissible values for each type of installation or equipment concerned and if necessary change arrangement until satisfactory results are obtained.
- 3.13.2.3 Voltage provided to equipment in installation shall not exceed minimum and maximum permissible limits for equipment.
- 3.13.2.4 Perform insulation tests for installed wiring and equipment with appropriate "Megger" testing equipment. Megger lighting and power circuit feeders and if resistance to ground is less than recommendations on any lighting or power circuit, consider such circuit defective and replace it.
- 3.13.2.5 Test performance of equipment for mechanical and electrical defects. Make adjustments necessary for such equipment. When equipment has been placed in permanent operation give to operating personnel all necessary tuition and instructions for its operation and maintenance.
- 3.13.2.6 Test conduits which are required to be installed but left empty for clear bore, using ball mandrel, brushes and snake. Use lignum vitae ball of diameter equal to approximately 85% of conduit inside diameter. Clear any conduit which rejects ball mandrel in an approved manner and without damage thereto.
- 3.13.2.7 Furnish labour, materials, instruments and bear other costs in connection with all tests, obtain required certificates of approval, acceptance, and compliance with regulations of agencies having jurisdiction and as specified. Work shall not be deemed complete and final certificate of acceptance will not be issued, until such certificates have been delivered to Owner's Designee.
- 3.14 **CLEANING**
- 3.14.1.1 Before starting and commissioning operations, installed new electrical enclosures, equipment and control devices, open-frame motors shall be air-blown and/or vacuum-cleaned.
- 3.14.1.2 Ensure no foreign objects, tools, and materials are left inside switchgears, cabinets, panelboards, control panels and similar enclosures before such equipment is energized.
- 3.14.2 Refer to specifications for other applicable final clean-up requirements

END OF SECTION

Part 1 General

1.1 SECTION INCLUDES

- .1 Materials and installation for wire and box connectors.

1.2 RELATED SECTIONS

- .1 Section 26 05 01 – Common Work Electrical

1.3 REFERENCES

- .1 Canadian Standards Association (CSA International)
 - .1 CAN/CSA-C22.2 No.18 - 92 (R2003), Outlet Boxes, Conduit Boxes, Fittings and Associated Hardware.
 - .2 CSA C22.2No.65 -13 Wire Connectors.
- .2 Electrical and Electronic Manufacturers' Association of Canada (EEMAC)
 - .1 EEMAC 1Y-2, 1961 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 aluminum sized to fit copper and aluminum conductors as required.
- .2 Fixture type splicing connectors to: CSA C22.2 No.65, with current carrying parts of copper sized to fit copper conductors 10 AWG or less.
- .3 Bushing stud connectors: to EEMAC 1Y-2 to consist of:
 - .1 Connector body and stud clamp for copper and aluminum conductors.
 - .2 Clamp for copper conductors.
 - .3 Clamp for stranded aluminum conductors.
 - .4 Stud clamp bolts.
 - .5 Bolts for copper conductors.
 - .6 Bolts for aluminum conductors.
 - .7 Sized for conductors as indicated.

- .4 Clamps or connectors for armoured cable, aluminum sheathed cable, mineral insulated cable, flexible conduit, non-metallic sheathed cable 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 Apply coat of zinc joint compound on aluminum conductors prior to installation of connectors.
 - .2 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.
 - .3 Install fixture type connectors and tighten. Replace insulating cap.
 - .4 Install bushing stud connectors in accordance with EEMAC 1Y-2.

END OF SECTION

Part 1 General

1.1 RELATED SECTIONS

- .1 Section 26 05 01 – Common Work Electrical.
- .2 Section 26 05 20 - Wire and Box Connectors.

1.2 REFERENCES

- .1 CSA C22.2 No .0.3 – 09 (R2014), Test Methods for Electrical Wires and Cables.
- .2 CAN/CSA-C22.2 No. 131-14, Type TECK 90 Cable.

Part 2 Products

2.1 BUILDING WIRES

- .1 Conductors: stranded for 10 AWG and larger. Minimum size: 12 AWG.
- .2 Copper conductors: size as indicated, with 600 or 1000 V insulation of chemically cross-linked thermosetting polyethylene material rated RW90 or RWU90 as indicated.

2.2 TECK CABLE

- .1 Cable: to CAN/CSA-C22.2 No. 131.
- .2 Single or multi-conductor Teck 90 cables, 1000V insulation, aluminum sheath and overall PVC jacket. Insulation to be 1000V cross-linked polyethylene suitable for installation at a temperature down to minus 40 degrees Celsius. Teck 90 cables to be copper unless otherwise indicated.
- .3 Fastenings:
 - .1 One hole steel straps to secure surface cables 50 mm and smaller. Two-hole steel straps for cables larger than 50 mm.
- .4 Connectors:
 - .1 Watertight approved for TECK cable.
 - .2 Class 1 Division 1 Group D explosion proof approved for TECK cable

2.3 ARMoured CABLES

- .1 Conductors: insulated, copper size as indicated.
- .2 Type: AC90 - lead sheath over cable assembly and under armour.

Part 3 Execution

3.1 INSTALLATION OF BUILDING WIRES

- .1 15 amp, 120 volt receptacle branch circuit home runs shall be minimum #12 AWG. Home runs over 22 meters shall be minimum #10 AWG. Maximum length of branch circuit feeder from panel to furthest receptacle shall be 36 meters.
- .2 Ensure voltage drop does not exceed 2 percent.
- .3 Conductors required for the operation of life safety systems, as described in OESC Rule 46-002, shall be kept entirely independent of all other conductors and equipment and shall not enter luminaire, raceway, box, cabinet or unit equipment occupied by other conductors except where necessary in generator transfer switches, exit signs and emergency lights supplied by two sources, as detailed in OESC Rule 46-108(4).

3.2 INSTALLATION OF TECK CABLE 0 -1000 V

- .1 Group cables wherever possible on channels.
- .2 Install cable in trenches as indicated.
- .3 Terminate cables in accordance with Section 26 05 20 - Wire and Box Connectors - 0 - 1000 V.

3.3 INSTALLATION OF ARMOURED CABLES

- .1 Group cables wherever possible.
- .2 Install only in concealed ceiling space for final connection from a junction box or distribution box to luminaires, receptacles and all other electrical devices to a maximum length of 5 meters. AC90 cable shall not be used from distribution or junction boxes to a second junction box.
- .3 Terminate cables in accordance with Section 26 05 20 - Wire and Box Connectors - 0 - 1000 V.

END OF SECTION

Part 1 General

1.1 RELATED SECTIONS

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

Part 2 Products

2.1 SUPPORT CHANNELS

- .1 **Power wiring support channels:** Unistrut shape, size 41 x 41 mm, 2.5 mm thick, surface mounted, suspended or set in poured concrete walls and ceilings. Unistrut to be fastened to building structure and ceilings.
- .2 **Communications wiring support channels:** Wide-base "J" hook fasteners.

Part 3 Execution

3.1 INSTALLATION – Power Wiring

- .1 Secure equipment to hollow or solid masonry, tile and plaster surfaces with lead anchors.
- .2 Secure equipment to poured concrete with expandable inserts.
- .3 Secure equipment to hollow masonry walls or suspended ceilings with toggle bolts.
- .4 Secure surface mounted equipment with twist clip fasteners to inverted T bar ceilings. Ensure that T bars are adequately supported to carry weight of equipment specified before installation.
- .5 Support equipment, conduit or cables using clips, spring loaded bolts, cable clamps designed as accessories to basic channel members.
- .6 Unistrut shall be mounted directly to structure to facilitate mounting of conduits to building structure. Conduits shall be fastened to unitstrut using strut clamps.
- .7 Fasten exposed conduit or cables to building construction or support system using straps.
 - .1 One-hole steel straps to secure surface conduits and cables 50 mm and smaller.
 - .2 Two-hole steel straps for conduits and cables larger than 50 mm.
 - .3 Beam clamps to secure conduit to exposed steel work.
- .8 Suspended support systems.
 - .1 Support individual cable or conduit runs with 6 mm diameter threaded rods and spring clips.

- .2 Support 2 or more cables or conduits on channels supported by 6 mm diameter threaded rod hangers where direct fastening to building construction is impractical.
- .3 Supply and install lateral and longitudinal seismic restraint systems for suspended support systems in accordance with Gripple Canada's recommendations for the size and weight of the installation.
- .9 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 Engineer.
- .13 Install fastenings and supports as required for each type of equipment cables and conduits, and in accordance with manufacturer's installation recommendations.

3.2 INSTALLATION – Non-Power Wiring

- .1 The section relates to video surveillance wiring, security wiring, voice/data wiring, life safety communications wiring.
- .2 Install wiring in conduit areas if the building accessible to the public.
- .3 In locations where cable tray exists, non-power wiring shall be installed in the cable tray.
- .4 For all other locations install wiring in conduit or attach the appropriate sized "J" hook fastener, whether for wall, stud, beam, flange or drop-wire mounting, to the supporting structure. Space fasteners to fall every 1220mm to 1524mm.

END OF SECTION

Part 1 General

1.1 GENERAL REQUIREMENTS

1.1.1 Conform to Section 26 05 01 – Common Work Electrical, as applicable.

1.1.2 Products described herein shall be suitable for dry indoor, non-hazardous area application, unless noted otherwise.

1.2 REFERENCES

CSA C22.2 No. 40 - M1989 (R2014) – Cutout, Junction and Pull Boxes

CSA C22.2 No. 94 - M91 (R2011) - Special Purpose Enclosures

NFPA 70 – National Electrical Code (most recent edition)

1.3 SUBMITTALS

1.3.1 Submit shop drawings for splitters, pull boxes, and other special enclosures used for mounting control devices and instruments, showing dimensional outline, details of cutouts if required, and mounting lugs or feet and accessories.

Part 2 Products

2.1 FABRICATIONS

2.1.1 **Special Purpose Enclosures:** CSA C22.2 No. 94, classified in accordance with EEMAC, JIC, and CSA Standards.

2.1.2 **Box Covers:** Types and sizes to match respective boxes, as required. Provide screwed covers, unless noted otherwise.

2.1.4 Provide approved neoprene gaskets, or applicable sealing materials, in boxes specified for damp, wet, weatherproof/tight, outdoor application, and other areas classified by OESC and other Authorities having jurisdiction.

2.1.5 Provide approved explosion proof equipment to be installed as indicated in Class 1 Division 1 Group D hazardous locations per NFPA 70.

Part 3 Execution

3.1 INSTALLATION

3.1.1 General

3.1.1.1 Size and install boxes, splitters, and enclosures in accordance with applicable section(s) of Ontario Electrical Safety Code (OESC) and manufacturer's recommended installation procedures.

- 3.1.1.2 Fasten and support boxes and enclosures independent from raceway supports and ensure rigid installation.
- 3.1.1.3 Cut and drill entrance holes into boxes and enclosures for raceways and cutouts as per approved shop drawings on specified special boxes and enclosures.
- 3.1.1.4 Install boxes and enclosures so as to be accessible after building is complete, set flush with finished surface where recessed, aligned and levelled where surface mounted.
- 3.1.1.5 Use bushing and double locknuts to terminate conduits in metallic sheet boxes with conduit knockouts or drilled holes.
- 3.1.1.6 Provide approved hole plugs in unused conduit openings and holes.
- 3.1.1.7 Furnish boxes and enclosures with corrosion resistant machine screws.
- 3.1.1.8 Boxes and enclosures embedded in concrete for flush-mounting, shall be secured properly with connecting conduits and related works set in place before concrete is poured. Forms, when used, shall be able to be removed without disturbing installed boxes or enclosures.
- 3.1.1.9 In general, install boxes and enclosures to suit raceway installation, and location of communication, signal, and electrical equipment, luminaires, and operational requirement, as shown on Drawings.
- 3.1.1.10 Provide correct size of openings in boxes for conduit, armoured and non-metallic sheathed cables and terminate with approved connectors or clamps. Do not use reducing washers.
- 3.1.1.11 Openings in all electrical metal boxes shall be punched or cut. Burring of holes is not permitted.
- 3.1.1.12 Identify source, voltage and load on all junction boxes. Use of indelible marker for these locations is acceptable.
- 3.2 **TESTING AND INSPECTION**
- 3.2.1 Test overall installation using megger instrument for ground continuity after boxes and raceways are completely installed.

END OF SECTION

Part 1 General

1.1 REFERENCES

- .1 Conform to Section 26 05 01 – Common Work Electrical as applicable.

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. 102 mm 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.
- .3 102 mm square or octagonal outlet boxes for lighting fixture outlets.
- .4 102 mm square outlet boxes with extension and plaster rings for flush mounting devices in finished 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 FLOOR BOXES

- .1 All floor boxes to meet requirements of 26 27 26 item 2.8

2.6 CONDUIT BOXES

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

2.7 OUTLET BOXES FOR NON-METALLIC SHEATHED CABLE

- .1 Electro-galvanized, sectional, screw ganging steel boxes with two double clamps to take non-metallic sheathed cables.

2.8 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

1 GENERAL

1.0 Conform to Sections of Division 01, as applicable.

1.0.1 Conform to Section 26 05 01 – Common Work Electrical, as applicable.

1.0.2 Conform to Section 26 05 32 – Outlet Boxes, Conduit Boxes and Fittings, as applicable.

1.1 REFERENCES

| | |
|--------------------------------------|--|
| CSA C22.2 No. 18-92 (latest edition) | Outlet Boxes, Conduit Boxes, and Fittings |
| CSA C22.2 No. 26-1952 | Construction and Test of Wireways, Auxiliary Gutters and Associated Fittings |
| CSA C22.2 No. 40-M1989 (R2009) | Cutout, Junction and Pull Boxes |
| CSA C22.2 No. 45-M1981 (R2012) | Rigid Metal Conduit |
| CSA C22.2 No. 56-04 | Flexible Metal Conduit and Liquid-Tight Flexible Metal Conduit |
| CSA C22.2 No. 62-93 | Surface Raceway Systems |
| CSA C22.2 No. 83-M1985 (R2013) | Electrical Metallic Tubing |
| CAN/CSA C22.2 No. 85-M89 | Rigid PVC Boxes and Fittings |
| CSA C22.2 No. 211.2-06 (R2011) | Rigid PVC (Unplasticized) Conduit |
| CSA C22.2 No. 227.1-06 (R2011) | Electrical Non-Metallic Tubing |
| CSA C22.2 No. 211.1-06 (R2011) | Rigid Types EB1 and DB2/ES2 PVC Conduit |
| CSA C22.2 No. 30 (R2020) | Explosion-Proof Equipment |

1.2 SUBMITTALS

1.2.1 Product Data

1.2.1.1 Ensure that raceway system manufacturers provide complete information regarding raceway assembly requirements. Owner will not be responsible for added cost of raceways and changes due to additional manufacturer's requirements.

1.3 QUALITY ASSURANCE

1.3.1 Use only products of one manufacturer for any or combination of packaged-type system such as surface raceways assembly, wireway system, cable trough for tray system.

2 PRODUCTS

2.1 MATERIALS

- 2.1.1 **Electrical Metallic Tubing (EMT), Couplings and Connectors:** CSA C22.2 No. 83.
- 2.1.2 **Rigid Metal Conduits and Fittings:** Steel, galvanized heavy wall, CSA C22.2 No. 45.
- 2.1.3 **Flexible Metallic Conduits:** CSA C22.2 No. 56.
- 2.1.4 **Liquid-Tight Flexible Metal Conduits:** CSA C22.2 No. 56.
- 2.1.5 **Rigid Poly Vinyl Chloride (PVC) Conduits:** CSA C22.2 No. 211.2, unplasticized, schedule (40) (80), and **Rigid PVC Boxes and Fittings:** CAN/CSA C22.2 No. 85.
- 2.1.6 **Rigid Aluminum Conduit:** CSA C22.2 No. 45.2.
- 2.1.7 **Outlet Boxes and Fittings:** CSA C22.2 No. 18, electro-galvanized sheet steel, sizes and types in accordance with OESC requirement.
- 2.1.8 **Conduit Boxes and Fittings:** CSA C22.2 No. 18, cast-type ferrous, type 'FS' 50mm (2") deep or type 'FD' 70mm (2-3/4") deep, standard factory-threaded hubs or EMT-to-conduit adapters, as required.
- 2.1.9 **Junction Boxes:** C22.2 No. 40, galvanized sheet steel construction, with screwed-on covers, and standard knockouts.
- 2.1.10 **Rigid PVC Boxes and Fittings:** CAN/CSA C22.2 No. 85.
- 2.1.11 **Box Covers:** Types and sizes to match respective boxes and wiring devices as required. Provide screwed covers, unless noted otherwise.
- 2.1.12 **Splitter Boxes/Troughs:** CSA C22.2 No. 76, welded sheet metal enclosure, complete with required mains and branch aluminium bus bars and lugs or terminal blocks, 600V max.
- 2.1.13 **Explosion Proof Fittings:** CSA C22.2 No. 30
- 2.1.14 Sizes indicated on Drawings are minimum. Do not reduce without written approval of Owner's Designee.
- 2.1.15 Use only products of one manufacturer for any or combination of assembled system such as surface raceways assembly, wireway system, and cable tray system.
- 2.2 **Accessories**
- 2.2.1 Pulling cord, polypropylene, 800lb - 2700lb tensile strength, Ideal "Pro-Pull".
- 2.2.2 Expansion Fittings, weatherproof, with integral bonding assembly.

3 EXECUTION

3.1 EXAMINATION

3.1.1 Raceway runs are indicated diagrammatically on Drawings. Co-ordinate with other Divisions concerned and field-verify routing to check for possible obstruction or interference.

3.2 INSTALLATION

3.2.1 General

3.2.1.1 Install raceways system and boxes complete with appropriate fittings such as connectors, bushings, elbows, couplings, locknuts, expansion fittings, fasteners and supports and accessories supplied as necessary to comply with OESC and other Regulatory Authorities requirements.

3.2.1.2 Neatly install exposed raceway running parallel to and at right angles to building lines and equally spaced in groups.

3.2.1.3 Keep raceway ends parallel and on proper spacing to suit knockouts or raceway openings in equipment or enclosure.

3.2.1.4 Keep raceways at least 150 mm clear of steam pipes, flues and hot item surfaces. Locate conduits behind infrared or gas fire heaters with 1.5 meter clearance.

3.2.1.5 Conceal raceways in floor, wall and ceiling construction unless otherwise specified or indicated. Raceways may run exposed in crawl spaces, fan rooms, penthouses, electrical and mechanical rooms. Do not install horizontal runs in masonry walls. Obtain approval from the Owner's Designee prior to installation of any surface raceway in locations other than above specified areas.

3.2.1.6 Provide expansion couplings, with bonding jumper and ground clamps where raceways cross building control joints.

3.2.1.7 Use only metallic, enclosed raceway on installation that required shielding of electrical cables or where installed in ceiling used as return air plenum, as specified or indicated on Drawings.

3.2.1.8 Raceways shall have established positive low resistance paths to ground and effectively isolate conductors so that any short-circuit arc is confined.

3.2.1.9 Select appropriate fittings, such as grounding bushings, bonding and grounding straps, to maintain continuity and effectiveness of grounding of raceway system.

3.2.1.10 Provide necessary fasteners and supports acceptable for type and size of raceways and boxes, to ensure rigid and complete assembly.

3.2.1.11 Provide suitable inserts or expansion type machine bolts for fastening raceways, fittings, boxes and equipment to concrete surfaces. Do not use wood screws, lag screws, expansion shields, rawl plugs and nylon inserts.

- 3.2.1.12 Secure raceway and other associated work on tile and concrete block walls with approved toggle bolts.
- 3.2.1.13 Thoroughly clean raceway and dry clear obstructions before pulling cable or wire.
- 3.2.1.14 Install conduits to conserve headroom in exposed locations and cause minimum interference in spaces through which they pass.

3.2.2 Conduits and Tubing

- 3.2.2.1 In general, install power, control, lighting and signal wirings in EMT, unless otherwise specified herein or indicated on Drawings.
- 3.2.2.2 EMT and fittings: Use within the interior of the building for exposed and concealed surface installation not subject to mechanical stress or injury. Use concrete-tight type fittings where used in cast concrete. Provide ground wire for sizes over 50 mm (2").
- 3.2.2.3 Rigid metal conduits and fittings: Use where exposed installation is subject to mechanical injury, and other installation as permitted by Authorities having jurisdiction. Use rigid galvanized steel conduit for exterior use.
- 3.2.2.4 Rigid Aluminum Conduit: As indicated.
- 3.2.2.5 PVC conduits and fittings: Use for exposed installation in corrosive area, under concrete slab, and where specified or indicated on Drawings, within limits as recommended by Authorities having jurisdiction.
- 3.2.2.6 Flexible metallic conduits: Use for connection to motors, recessed light fixtures, in indoor, dry locations, to maximum lengths as allowed by OESC and other regulatory standards.
- 3.2.2.7 Liquid-tight flexible metal conduits: Use for connection to motors, in damp or wet location.
- 3.2.2.8 Electrical non-metallic tubing: Use only when specified herein or shown on Drawings, in accordance with OESC and other regulatory standards.
- 3.2.2.9 Do not use smaller than 13 mm (1/2") trade size, tubing, conduits and fittings.
- 3.2.2.10 Properly ream conduit ends. Provide necessary fittings, couplings, locknuts and bushings.
- 3.2.2.11 Use only concentric bends. Do not use angle fittings together with bends. Bends improperly formed not accepted. Do not bend over sharp objects.
- 3.2.2.12 Do not install conduits in terrazzo or in concrete toppings.
- 3.2.2.13 Concrete-encased conduit connections shall be made concrete tight.
- 3.2.2.14 Locate conduit to clear reinforcing steel when installing conduits in cast-in-place concrete.
- 3.2.2.15 Conduit runs below floor slab shall be encased in at least 75 mm concrete envelope, then filled

with 50 mm of sand between top of such envelope and underside of slab.

- 3.2.2.16 Protect conduits from damage where they stub out of concrete.
- 3.2.2.17 Provide oversized sleeve for conduits passing through waterproof membrane, before membrane is installed. Use cold mastic between sleeve and conduit.
- 3.2.2.18 Do not place conduits in slabs in which slab thickness is less than 4 times conduit diameter.
- 3.2.2.19 Encase conduits completely in concrete with minimum 25 mm concrete cover.
- 3.2.2.20 Organize conduits in slab to minimize cross-overs.
- 3.2.2.21 Install nylon or propylene fish cord in empty tubing or conduits, fasten cord at both ends and cap.
- 3.2.2.22 Use explosion proof flexible connection for connection to explosion proof motors.
- 3.2.2.23 Install sealing fittings in hazardous areas. Fill with compound.
- 3.2.2.24 Bend conduit cold. Replace conduit if kinked or flattened more than 1/10th of its original diameter.
- 3.2.2.25 Mechanically bend steel conduit over 19 mm diameter.
- 3.2.2.26 Field threads on rigid conduit must be of sufficient length to draw conduits up tight.
- 3.2.2.27 Remove and replace blocked conduit sections. Do not use liquids to clean out conduits.
- 3.2.2.28 Dry conduits out before installing wire.
- 3.2.2.29 Underground conduits shall be sloped to provide drainage. Waterproof joints (PVC accepted) with heavy coat of bituminous paint.
- 3.2.2.30 Conduit identification: Code with plastic tape or paint at points where conduits enter walls, ceilings or floors. Apply in 3.0 meter intervals. Refer to Section 26 05 01 – Common Works.

3.2.3 Boxes and Covers

- 3.2.3.1 Install boxes and accessories in accordance with applicable sections of OESC and box manufacturers' recommended installation methods.
- 3.2.3.2 Fasten and support boxes and similar enclosures independent from raceway supports.
- 3.2.3.3 Set boxes flushed when recessed in finished surface and aligned and levelled when surface mounted. Boxes shall be made accessible after completion of work.
- 3.2.3.4 Use bushing and double locknuts to terminate conduit in metallic sheet boxes.

- 3.2.3.5 Provide approved hole plugs in unused conduit openings and knockouts.
- 3.2.3.6 Supply corrosion-resistant machine screws for boxes and mounting accessories.
- 3.2.3.7 Flush-mounted boxes embedded in concrete: Set in-place and secure boxes and respective conduits before pouring concrete. Forms, when used, shall be removable without disturbing installed boxes and raceways.
- 3.2.3.8 Surface-mount boxes to suit EMT installation.
- 3.2.3.9* Use conduit boxes for surface installation on unfinished wall.
- 3.2.3.10 Ensure boxes mounted in ceiling cavities do not interfere with laying-in or removal of ceiling tiles.
- 3.2.3.11 Provide correct box opening sizes for conduits and sheathed cables to be terminated with approved clamps or connectors. Do not use reducing washers.
- 3.2.3.12 Use square outlet boxes for more than 1 conduit entering one side, and for outlets intended for luminaires.
- 3.2.3.13 Use masonry boxes for flush-mounting in block walls; concrete boxes for flush-mounting in concrete walls.
- 3.2.3.14 Provide neoprene gaskets in boxes installed outdoor.
- 3.2.4 Surface Metallic Raceway**
 - 3.2.4.1 Use surface metallic raceway assembly for accessible, dry, exposed wiring having not more than #6 AWG, maximum of 10 conductors, 300V and below.
 - 3.2.4.2 Install each type and size with complementary fittings barriers and accessories, along walls, inside ceiling, as required for power wiring, light, telephone, signal and/or instrumentation system.
 - 3.2.4.3 Boxes, covers, fittings, receptacles and other wiring devices shall be integrally supplied and installed with multi-outlet type distribution system as specified or indicated on Drawings.
 - 3.2.4.4 Insert protective bushings at raceway entrances.
 - 3.2.4.5 Use appropriate cover removal tool for each type of surface raceway.
 - 3.2.4.6 Mount raceway base to wall using raceway manufacturers recommended drive pin fasteners.
 - 3.2.4.7 Use overfloor pancake type raceway to extend floor or wall-mounted wiring system across open spaces only, where ceiling cavities are not available.
 - 3.2.4.8 Do not combine power and communications in one raceway, unless provided with barrier for this purpose.

3.2.4.9 Ceiling cavity distribution type raceways may be combined with pole type vertical raceway for power and telephone communication systems. Use only one manufacturer's products.

3.2.5 Conduits Inside Hazardous Zones

3.2.5.1 All conduit within the hazardous areas shall be Teck90.

END OF SECTION

Part 1 General

1.1 RELATED SECTIONS

- .1 Section 26 05 01 - Common Work 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 Pressure treated planks with water repellent preservative.

2.2 MARKERS

- .1 150mm red "Caution Tape".

Part 3 Execution

3.1 TRENCHING

- .1 Excavate trench with suitable machinery to depths and dimensions shown in trench details. Trench details are provided as a guide only. Confirm all depths are compliant with Section 12-012 and Table 53 of the Ontario Electrical safety code.
- .2 The minimum cover requirements for electrical cables may be permitted to be reduced by 150mm where mechanical protection is placed in the trench over the underground installation (OESC section 12-012(2)).
- .3 Cut and trim sides of trenches evenly and as near vertical as possible and shore as required to prevent cave-in.
- .4 Keep bottom of trenches clean and clear of loose material and slope or grade as required.
- .5 Sandfill shall be uniformly graded clean sand with a maximum aggregate size of 2.00 mm and maximum of 8% passing the number of 200 sieve.
- .6 No covering up or backfilling of electrical equipment shall be performed until the ESA inspector has been notified and permission to cover has been granted as per OESC Rule 2-310.
- .7 Backfill trench to the satisfaction of the owner.

3.2 DIRECT BURIAL OF CABLES

- .1 Direct buried cables shall be installed so that they run adjacent to each other and do not cross over each other and with a layer of screened sand with a maximum particle size of 4.75mm or screened earth at least 75mm deep both above and below the conductors.
- .2 After 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.
- .3 Provide offsets for thermal action and minor earth movements. Offset cables 150 mm for each 60 m run, maintaining minimum cable separation and bending radius requirements.
- .4 Minimum permitted radius at cable bends for rubber, plastic or lead covered cables, 8 times diameter of cable; for metallic armoured cables, 12 times diameter of cables or in accordance with manufacturer's instructions.
- .5 Cable separation:
 - .1 Maintain 190 mm minimum separation between cables of different circuits.
 - .2 Maintain 300 mm vertical or horizontal separation between high voltage cables and communication 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 75 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 communication cables crossing other cables, with communication cables in upper position.
 - .6 Install treated planks on lower cables 0.6 m in each direction at crossings.

3.3 CABLE INSTALLATION IN DUCTS

- .1 Install cables as indicated in ducts. 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 multiconductor 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-lead cables with moisture seal tape.
- .6 After installation of cables, seal duct ends with duct sealing compound.

3.4 MARKERS

- .1 Provide 150mm red "caution tape" buried halfway between cable installation and grade level covering the width of cables and or raceways installed. Refer to OESC Rule 12-012(11) and Bulletin 12-2-15.
- .2 Mark underground splices.
- .3 Where markers are removed to permit installation of additional cables, reinstall existing markers.

3.5 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.

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 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.42.1-13, Cover Plates for Flush-Mounted Wiring Devices (Bi-national standard, with UL 514D).
 - .3 CSA-C22.2 No.55-15, Special Use Switches.
 - .4 CSA-C22.2 No.111-10 (R2015), General-Use Snap Switches.

1.4 SHOP DRAWINGS AND PRODUCT DATA

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

Part 2 Products

2.1 SWITCHES

- .1 15A, 20A, 120 V, single pole, double pole, three-way, four-way specification grade toggle switches to: CSA-C22.2 No.55 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 Colour white.
- .3 Toggle operated, locking, fully rated for LED lamps, and up to 80% of rated capacity of motor loads.
- .4 Provide specification grade switches with pilot light as indicated.
- .5 Provide specification grade key switches as required.

- .6 Switches of one manufacturer throughout project.
- .7 Hubbell 1200 series for 120 volt and 1800 series for 347 volt.

2.2 RECEPTACLES

- .1 Duplex receptacles, CSA type 5-15 R, 125 V, 15A, U ground, to: CSA-C22.2 No.42 with following features:
 - .1 Coordinate colour with architect.
 - .2 Suitable for No. 10 AWG for back and side wiring.
 - .3 Break-off links for use as split receptacles.
 - .4 Eight back wired entrances, four side wiring screws.
 - .5 Triple wipe contacts and rivetted grounding contacts.
- .2 Duplex receptacles, CSA type 5-20 R, 125 V, 20A, U ground, to: CSA-C22.2 No.42 with following features:
 - .1 Coordinate colour with architect.
 - .2 Suitable for No. 10 AWG for back and side wiring.
 - .3 Eight back wired entrances, four side wiring screws.
 - .4 Triple wipe contacts and rivetted grounding contacts.
- .3 GFCI duplex receptacles, CSA type 5-15 R, 125 V, 15A, ground fault circuit interrupting to: CSA-C22.2 No.42 with following features:
 - .1 Coordinate colour with architect.
 - .2 Suitable for No. 10 AWG for back and side wiring.
 - .3 Eight back wired entrances, four side wiring screws.
 - .4 Triple wipe contacts and rivetted grounding contacts.
- .4 GFCI duplex receptacles, CSA type 5-20 R, 125 V, 20A, ground fault circuit interrupting to: CSA-C22.2 No.42 with following features:
 - .1 Coordinate colour with architect.
 - .2 Suitable for No. 10 AWG for back and side wiring.
 - .3 Eight back wired entrances, four side wiring screws.
 - .4 Triple wipe contacts and rivetted grounding contacts.
- .5 Quad receptacles and single receptacles as noted on drawings.
- .6 Other receptacle configurations, ampacities and voltages as indicated (i.e. dryer receptacle, range receptacle, welding receptacle, etc.). All devices to be specification grade.
- .7 Receptacles of one manufacturer throughout project.

2.3 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 Cast cover plates for wiring devices mounted in surface-mounted FS or FD type conduit boxes.
- .6 Where exposed to the weather, receptacles of configurations 5-15R, 5-20R, 5-20RA, 6-15R, 6-20R and 6-20A shall be provided with cover plates suitable for wet locations. Reference OESC Section 26 for details. SPEC NOTE: Most computer equipment is supplied complete with cab tire cord and male connector to allow for possible location adjustments. Type of connector used varies with computer manufacturers. Refer to computer manufacturer for wiring devices.

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 00 - Common Work Results – Electrical.
- .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 00 - Common Work Results - Electrical.
 - .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.
 - .4 Identify panel and circuit number on all duplex receptacles face plates with black printed lettering on clear labelling tabs (P-tabs).

END OF SECTION

Part 1 General

1.1 SECTION INCLUDES

- .1 Materials and installation for fused and non-fused 600 volt, 208 volt and 120 volt disconnect switches.

1.2 RELATED SECTIONS

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

1.3 REFERENCES

- .1 Canadian Standards Association (CSA International).
 - .1 CAN/CSA C22.2 No.4-04 (R2014), Overcurrent Protection, Enclosed Switches.
 - .2 CSA C22.2 No.39-13, Overcurrent Protection, Fuseholder Assemblies.

Part 2 Products

2.1 DISCONNECT SWITCHES - GENERAL

- .1 Fusible and non-fusible, horsepower rated as required disconnect switch in CSA Enclosure, to CAN/CSA C22.2 No.4, size as indicated.
- .2 Disconnect switches shall be of the visible-contacts type and shall be lockable in the "OPEN" position.
- .3 Mechanically interlocked door to prevent opening when handle in "ON" position.
- .4 Fuses: size as indicated.
- .5 Fuseholders: to CSA C22.2 No.39 for type and size of fuse indicated.
- .6 Quick-make, quick-break action.
- .7 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 Electrical.
- .2 Indicate name of load controlled on size 4 nameplate.

Part 3 Execution

3.1 INSTALLATION

- .1 Install disconnect switches complete with fuses if applicable.

END OF SECTION

1 GENERAL

1.1 GENERAL REQUIREMENTS

1.1.1 Conform to 26 05 01 – Common Work Electrical as applicable.

1.2 REFERENCES

CSA C22.2 No. 9 – 1996 (latest edition) Luminaires

C866-12 Performance of LED luminaires

CAN/CSA-C22.2 No. 250.13-14 LED Equipment for Lighting Applications

1.3 SUBMITTALS

1.3.1 **Shop Drawings:** Submit shop drawings in accordance with General Conditions of Contract for each type of luminaires, indicating following product data, including installation instructions and details.

2 PRODUCTS

2.1 MANUFACTURED UNITS

2.1.1 Light Fixtures

Refer to lighting fixture schedule on drawings.

2.1.2 Lighting Control Devices

Refer to lighting control device schedule on drawings.

3 EXECUTION

3.1 INSTALLATION – Lighting and Accessories

3.1.1 Install luminaires to conform to Ontario Electrical Safety Code and Ontario Building Code requirements, and in accordance with manufacturer's recommended installation procedures.

3.1.2 Install luminaires accurately, in line and level, complete with mounting appurtenances and hardware, free from undue interferences.

3.1.3 Align luminaires mounted in continuous rows to form straight uninterrupted line.

3.1.4 Align individually-mounted luminaires parallel or perpendicular to building grid lines.

3.1.5 Any luminaire which, in opinion of Owner's Designee are not installed properly shall be

corrected to his satisfaction, with no change to Contract Sum.

- 3.1.6 Luminaires indicated on Drawings shall be located to agree with approved reflected ceiling plan drawings. Co-ordinate installation of luminaires, plaster frames, and rings with metal furring, lath and plaster trades.
- 3.1.7 Confirm compatibility of specified luminaires with ceiling types used.
- 3.1.8 Preserve sufficient space during construction for proper installation of fixtures co-ordinate with related Sections to ensure clearances are maintained to accommodate luminaires.
- 3.1.9 Provide plaster frames and rings required for recessed fixtures for installation under the metal furring, lath and plaster contract.
- 3.1.10 Install luminaires after mechanical ducts, piping, and equipment in vicinity have been installed. Number of luminaires indicated on drawings shall be checked for exact location as approved by Owner's Designee prior to installation.
- 3.1.11 Verify catalogue numbers of luminaires prior to ordering. Check final ceiling finish in areas where recessed luminaires are indicated, in order to purchase correct ceiling trims, flanges and mounting brackets for particular ceiling construction.
- 3.1.12 Install lighting contactors per manufacturer's instructions.
- 3.1.13 Provide standard FS type outdoor rated junction box for installation of photocell.
- 3.2 **INSTALLATION – Lighting Control Devices**
 - 3.2.1 All sensor locations are approximate. Refer to manufacturer's instructions for best installation practices.
 - 3.2.2 Ultrasonic ceiling mount sensors should be located a minimum of 2743mm from HVAC supply/return grills.
 - 3.2.3 Sensors mounted over doorways should be placed a minimum of 305mm inside threshold.
 - 3.2.4 Sensors should be located 150mm away from power packs.
 - 3.2.5 Provide power packs and auxiliary relay packs as required per manufacturer's instructions based upon the load type and load quantity they are controlling. Contractor is responsible to provide relay packs as required to obtain lighting control scheme as indicated on drawings.
 - 3.2.6 Refer to the lighting control sequence of operation for equipment and operational requirements.

END OF SECTION