

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 120/240 volts, 60 Hz, 1 phase, 3 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, 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

- 1.8.1.1 Work shall be executed by Electrical Contractor or his designated sub-contractor, holding a valid Contractors' license (Master License).
- 1.8.1.2 Work shall be performed by qualified Electricians holding valid Ontario certificates of qualifications.
- 1.8.1.3 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 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 panel identifier, fed from and voltage.

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

Disconnects, starters and contactors: indicate equipment being controlled and voltage.

Terminal cabinets and pull boxes: indicate system and voltage.

Transformers: Indicate capacity, primary and secondary voltages.

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 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.
- 3.3.2 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.
- 3.3.3 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 engineer 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 inspector 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.
 - 3.6.2.1 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.
 - 3.6.2.2 Use following paint colour-code:
 - Blue: Communication System (Voice, Data, Electronics, etc.)
 - Yellow: Emergency Power System
 - Green: Security 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.

3.10 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 FIELD QUALITY CONTROL

3.12.1 Trial Usage

- 3.12.1.1 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.
- 3.12.1.2 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.
- 3.12.1.3 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.

3.12.2 Tests

- 3.12.2.1 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.
- 3.12.2.2 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.
- 3.12.2.3 Voltage provided to equipment in installation shall not exceed minimum and maximum

permissible limits for equipment.

- 3.12.2.4 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.
- 3.12.2.5 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.
- 3.12.2.6 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.
- 3.12.2.7 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.

3.13 CLEANING

- 3.13.1 Before starting and commissioning operations, installed new electrical enclosures, equipment and control devices, open-frame motors shall be air-blown and/or vacuum-cleaned.
- 3.13.2 Ensure no foreign objects, tools, and materials are left inside switchgears, cabinets, panelboards, control panels and similar enclosures before such equipment is energized.
- 3.13.3 Refer to specifications for other applicable final clean-up requirements.

END OF SECTION

Part 1 General

1.1 RELATED SECTIONS

- .1 Section 26 05 01 - Common Work Results - Electrical.
- .2 Section 26 05 29 – Hangars and Supports for Electrical Systems.

1.2 REFERENCES

- .1 Canadian Standards Association, (CSA International)
 - .1 CSA-T529-95(R2000), Telecommunications Cabling Systems in Commercial Buildings (Adopted ANSI/EIA TIA 568a with modifications).
 - .2 CSA-C22.2 No. 214-02, Communications Cables (Bi-national Standard, with UL 444).
 - .3 CAN/CSA-C22.2 No. 182.4-M90(R2001), Plugs, Receptacles, and Connectors for Communication Systems.
- .2 Telecommunications Industry Association (TIA)
 - .1 TIA/EIA-568-2001, Commercial Building Telecommunications Cabling Standards Set.

1.3 SYSTEM DESCRIPTION

- .1 System of telecommunications cables (copper and optical fibre) installed within buildings for distributing voice and data signals.
- .2 All cabling shall be FT4 riser rated.

Part 2 Products

2.1 IN-BUILDING TELECOMMUNICATIONS CABLE

- .1 CAT6 cable to be FT4 riser rated. Description as follows;
Uniprise Media 6 65N4+ Category U/UTP cable, riser, blue jacket, 4 pair count.

2.2 PATCH PANELS

- .1 Copper Patch Panels:
24 port loaded patch panel – CAT6 – MIO-1U.
Uniprise Part # - UNP-U-610-1U-24 or approved equal

2.3 WALL MOUNT RACKS

- .1 Middle Atlantic Products DWR Series wall mount racks, 22 inch depth, 16 unit rack space and c/w VFD-16 vented front door.

2.4 HORIZONTAL POWER STRIPS

- .1 Horizontal power strips complete with minimum five (5) front facing receptacles (NEMA 5-15) with minimum six foot 6 foot power cord. Quantity of one (1) to be provided with each wall mounted rack.

2.5 FACEPLATE

- .1 Mio flush faceplate, stainless steel.

Uniprise Part # M14SP-L or approved equal.

2.6 JACKS

- .1 Data jacks, blue colour for data and white colour for voice

Uniprise Part # UNJJ600 CAT6 U/UTP or approved equal.

Part 3 Execution

3.1 INSTALLATION OF IN-BUILDING CABLING

- .1 Each in wall voice/data receptacle box shall receive two (2) CAT6 cables in each location, unless otherwise indicated.
- .2 All CAT6 cables shall be labeled beginning at “C1”, in consecutive numbers upward.
- .3 A building prefix shall be included in the labelling, to be determined in advance of the final installation.
- .4 All CAT6 cables that terminate in a single voice/data receptacle will have consecutive numbers (i.e. a single jack with 2 cables will be C1, C2).
- .5 All CAT6 cables will be labelled in a consecutive logical manner, beginning with C1 being at one starting point and all other cables from that point will increase in a consecutive manner in either a clockwise or counter clockwise fashion (i.e. Office #1 has C1, C2, C3, C4 and Office #2 has C5, C6, C7, C8).
- .6 All patch panel labels will be consecutive numbers, beginning with C1.
- .7 All patch panels will be mounted to back boards in each building using minimum of 150mm hinged, welded wall mount bracket, unless a wall rack is designated.

- .8 Cables shall be mounted in conduit.
- .9 The maximum allowable length of CAT6 cable is 100 meters. This consists of 90 meters of solid “horizontal” cabling between patch panel and the wall jack, plus 10 meters of stranded patch cable between each jack and the attached device.
- .10 CAT 6 cable must not be kinked or bent too tightly. The bend radius should be at least four times the outer diameter of the cable. The wire pairs must not be untwisted and the outer jacket must not be stripped back more than 12.7mm.

3.2 TESTING OF IN-BUILDING CABLES

- .1 Provide tools, equipment, labour and materials required to inspect and test all voice/data cabling in accordance with industry standard and T529 procedures.
- .2 Test all voice/data cabling runs for end-to-end attenuation, noise, resistance and next measurements for CAT6 link compliance in accordance with CAN/CSA-T529 procedures.
- .3 Provide installation and supervision work supervised by telecommunication technicians qualified to install voice/data cabling systems and to perform related tests as required by the manufacturer.

END OF SECTION

Part 1 General

1.1 RELATED SECTIONS

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

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.

2.3 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 REFERENCES

- .1 Section 26 05 01- Common Work Results- Electrical
- .2 Copper grounding conductors to CSA 22.1 Section 10 latest edition.
- .3 Canadian Standards Association (CSA)
 - .1 CSA C22.2 No.0.41 13, Grounding and bonding of equipment.

Part 2 Products

2.1 EQUIPMENT

- .1 Clamps for grounding of conductor: size as indicated or as required to electrically conductive underground water pipe.
- .2 Grounding conductors: bare stranded copper, soft annealed, size as indicated.
- .3 Insulated grounding conductors: green, Type RW90
- .4 Ground bus: copper, size as indicated, complete with insulated supports, fastenings, connectors.
- .5 Non-corroding accessories necessary for grounding system, type, size, material as indicated, including but not necessarily limited to:
 - .1 Grounding and bonding bushings.
 - .2 Protective type clamps.
 - .3 Bolted type conductor connectors.
 - .4 Thermite welded type conductor connectors.
 - .5 Bonding jumpers, straps.
 - .6 Pressure wire connectors.

Part 3 Execution

3.1 INSTALLATION GENERAL

- .1 Install complete permanent, continuous grounding system including, conductors, connectors, 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 Make buried connections, and connections to conductive water main, using copper welding by thermite process.
- .5 Use mechanical connectors for grounding connections to equipment provided with lugs.
- .6 Soldered joints not permitted.
- .7 Install bonding wire for flexible conduit, connected at both ends to grounding bushing, solderless lug, clamp or cup washer and screw. Neatly cleat bonding wire to exterior of flexible conduit.
- .8 Install flexible ground straps for bus duct enclosure joints, where such bonding is not inherently provided with equipment.
- .9 Install separate ground conductor to outdoor lighting standards.
- .10 Connect building structural steel and metal siding to ground by welding copper to steel.
- .11 Make grounding connections in radial configuration only, with connections terminating at single grounding point. Avoid loop connections.
- .12 Bond single conductor, metallic armoured cables to cabinet at supply end, and provide non-metallic entry plate at load end.

3.2 EQUIPMENT GROUNDING

- .1 Install grounding connections to typical equipment included in, but not necessarily limited to following list: service equipment, transformers, switchgear, duct systems, frames of motors, motor control centres, starters, control panels, building steel work, generators, elevators and escalators, distribution panels, outdoor lighting.

3.3 GROUNDING BUS

- .1 Install copper grounding bus mounted on insulated supports on wall adjacent to the service entrance panelboard.
- .2 Ground items of electrical equipment in electrical room to ground bus with individual bare stranded copper connections sized as indicated on single line diagram.

3.4 COMMUNICATION SYSTEMS

- .1 Install separate #6 AWG insulated ground conductors to each telephone board for connection to voice and data systems.
- .2 Confirm #6 AWG insulated ground conductors are approved by system providers prior to ordering.

3.5 FIELD QUALITY CONTROL

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

END OF SECTION

Part 1 General

1.1 RELATED SECTIONS

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

Part 2 Products

2.1 SUPPORT CHANNELS

- .1 **Power wiring support channels:** U shape, size 41 x 41 mm, 2.5 mm thick, surface mounted, suspended or set in poured concrete walls and ceilings.

Part 3 Execution

3.1 INSTALLATION – Power and Communications 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 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 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.
- .6 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.
- .7 Provide metal brackets, frames, hangers, clamps and related types of support structures where indicated or as required to support conduit and cable runs.
- .8 Ensure adequate support for raceways and cables dropped vertically to equipment where there is no wall support.
- .9 Do not use wire lashing or perforated strap to support or secure raceways or cables.

- .10 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.
- .11 Install fastenings and supports as required for each type of equipment cables and conduits, and in accordance with manufacturer's installation recommendations.

END OF SECTION

Part 1 General

1.1 REFERENCES

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

Part 2 Products

2.1 OUTLET AND CONDUIT BOXES GENERAL

- .1 Size boxes in accordance with CSA C22.1.
- .2 102 mm square or larger outlet boxes as required for special devices.
- .3 Gang boxes where wiring devices are grouped.
- .4 Blank cover plates for boxes without wiring devices.
- .5 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-glavanized 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 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 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 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 Results - 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 (R2003)	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

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 **Poly Vinyl Chloride (PVC) DB2 duct:** CSA C22.2 No. 211.1.
- 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 alloy, 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 Sizes indicated on Drawings are minimum. Do not reduce without written approval of Owner's Designee.
- 2.1.14 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 communications 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 PVC DB2 Duct and fittings: Use for underground installations unless otherwise 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.

END OF SECTION

Part 1 General

1.1 RELATED SECTIONS

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

1.2 REFERENCES

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

Part 2 Products

2.1 CABLE PROTECTION

- .1 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 the Manitoba 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.
- .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 Manitoba Hydro 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-leaded 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 Materials and installation for standard and custom breaker type panelboards.

1.2 RELATED SECTIONS

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

1.3 REFERENCES

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

1.4 SHOP DRAWINGS

- .1 Submit shop drawings as noted.
- .2 Drawings to include electrical detail of panel, branch breaker type, quantity, ampacity and enclosure dimension.

Part 2 Products

2.1 PANELBOARDS

- .1 Panelboards: to CSA C22.2 No.29 and product of one manufacturer.
 - .1 Install circuit breakers in panelboards before shipment.
 - .2 In addition to CSA requirements manufacturer's nameplate must show fault current that panel including breakers has been built to withstand.
- .2 600 V and 208 V panelboards: bus and breakers rated for the following minimum (symmetrical) interrupting capacity;
 - All 240 Volt panelboards are to have main (if applicable) and distribution circuit breakers rated for 18 KA.
- .3 Sequence phase bussing with odd numbered breakers on left and even on right, with each breaker identified by permanent number identification as to circuit number and phase.
- .4 Panelboards: mains, number of circuits, and number and size of branch circuit breakers as indicated.
- .5 Two keys for each panelboard and key panelboards alike.
- .6 Aluminum bus with rating as indicated.

- .7 Neutral of same ampere rating as mains.
- .8 Mains: suitable for bolt-on breakers.
- .9 Ground Bar: Standard bolted aluminum, aluminum or copper cable.
- .10 Trim with concealed front bolts and hinges.
- .11 Trim and door finish: baked grey enamel.
- .12 NEMA Type 1 enclosure.
- .13 Surface wall mount as indicated.
- .14 Panelboard fronts to be code-gauge steel, ASA61 light grey painted finish.
- .15 Panelboard boxes to be code-gauge galvanized steel.

2.2 BREAKERS GENERAL

- .1 Bolt-on moulded case circuit breaker: quick-make, quick-break type, for manual and automatic operation with temperature compensation for 40 degrees C ambient.
- .2 Common-trip breakers: with single handle for multi-pole applications.
- .3 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.
- .4 Circuit breakers with interchangeable trips as indicated.
- .5 120/240 volt circuit breakers to have a minimum of 18,000A symmetrical rms interrupting capacity rating.

2.3 THERMAL MAGNETIC BREAKERS

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

2.4 BREAKERS

- .1 Breakers with thermal and magnetic tripping in panelboards except as indicated otherwise.
- .2 Main breaker: separately mounted on top or bottom of panel to suit cable entry. When mounted vertically, down position should open breaker.
- .3 Lock-on devices for emergency lighting and fire alarm circuits.

2.5 EQUIPMENT IDENTIFICATION

- .1 Provide equipment identification in accordance with Section 26 05 01 - Common Work Results - Electrical.
- .2 Nameplate for each panelboard Size 7 engraved. Nameplate to include;
 - Panel identifier
 - Fed From
 - Voltage
- .3 Nameplate for each circuit in distribution panelboards size 2 engraved as indicated.
- .4 Complete circuit directory with typewritten legend showing location and load of each circuit.

Part 3 Execution

3.1 INSTALLATION

- .1 Locate panelboards as indicated and mount securely, plumb, true and square, to adjoining surfaces.
- .2 Install surface mounted panelboards on plywood backboards. Where practical, group panelboards on common backboard.
- .3 Mount panelboards to height specified in Section 26 05 01 - Common Work Results - Electrical or as indicated.
- .4 Connect loads to circuits.
- .5 Connect neutral conductors to common neutral bus with respective neutral identified.
- .6 For multiple section panelboards, provide interconnecting cables from the through-feed lugs in first section to main lugs in 2nd section and terminate. Provide conduit nipple for cross wiring between panelboards as required.

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 type.
- .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 Grey colour.
- .3 Toggle operated, locking, fully rated for LED lamps, and up to 80% of rated capacity of motor loads.
- .4 Switches of one manufacturer throughout project.

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 White colour.
 - .2 Suitable for No. 10 AWG for back and side wiring.
 - .3 Break-off links for use as split receptacles.
 - .4 Eight back wired entranchates, 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 White colour.
 - .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 White colour.
 - .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 Twist lock receptacle, Nema L1-15R, 15A, 125 volt with following features;
 - .1 White colour.
 - .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 Other receptacle configurations, ampacities and voltages as indicated (i.e. welding receptacle). All devices to be specification grade.
- .6 Receptacles of one manufacturer throughout project.

2.3 HAND DRYERS

- .1 Die-cast aluminum hand dryer c/w epoxy painted finish with anti-microbial technology to inhibit the growth of bacteria, mold and fungus. Adjustable two-speed motor delivering 64 CFM @ 225 MPH, 120V input, 950W capable of drying hands in 12 seconds. Nichrome heating element protect with auto-reset high-limit thermal cutout. Activated by an automatic infrared sensor. Coordinate finish colour with architect.

World Dryer Verde Dri series or approved equal

2.4 COVER PLATES

- .1 Cover plates for wiring devices to: CSA-C22.2 No.42.1.
- .2 Cover plates from one manufacturer throughout project.
- .3 Sheet steel utility box cover for wiring devices installed in surface-mounted utility boxes.
- .4 Stainless steel, vertically brushed, 1 mm thick cover plates for wiring devices mounted in flush-mounted outlet box.
- .5 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.

2.5 SPLITTER

- .1 Sheet metal enclosure, welded corners and formed hinged cover suitable for locking in closed position.
- .2 200 amp rated, 120/240 volt, 1 phase. Main and branch lugs to match required size and number of incoming and outgoing conductors as indicated.

2.6 ELECTRIC BASEBOARD HEATER

- .1 Steel sloped top draft barrier baseboard heater, 120 volt, 750 watt, standard watt density, built-in thermostat, white colour.

Ouellet Cat. No. ODIA0752 or approved equal

2.7 CARD READER JUNCTION BOX

- .1 Provide a recessed mounted weatherproof card reader junction box at each exterior door for installation of a future card reader. Conduit connect the junction box to the telephone board. Provide pull cord in each conduit. Junction box to be complete with weatherproof cover.

Part 3 Execution

3.1 INSTALLATION

- .1 Switches:
 - .1 Install single throw switches with handle in "UP" position when switch closed.
 - .2 Install switches in gang type outlet box when more than one switch is required in one location.

- .3 Mount toggle switches at height in accordance with Section 26 05 01 - Common Works 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 01 - Common Works Electrical.
 - .3 Where split receptacle has one portion switched, mount vertically and switch upper portion.
 - .4 Provide 120 volt 15A locking receptacles mounted in ceiling for Type 'B' light fixtures in Boat Storage building.
- .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).
- .4 Splitters:
 - .1 Install splitters and mount plumb, true and square to the building lines.
 - .2 Extend splitters full length of equipment arrangement except where indicated otherwise.

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 Results - 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, service entrance rated as indicated.
- .2 Provision for padlocking in “OFF” switch position by one lock.
- .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.
- .8 CSA enclosure to be Nema 1 or Nema 3R as indicated.

2.2 DISCONNECT SWITCHES – ELEVATOR MOTOR AND VFD’S

- .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 Provision for padlocking in “OFF” switch position by one lock.
- .3 Mechanically interlocked door to prevent opening when handle in “ON” position.

- .4 Fuses: size as indicated.
- .5 Fuses for elevator motor to be dual element time delay fuses.
- .6 Fuseholders: to CSA C22.2 No.39 for type and size of fuse indicated.
- .7 Quick-make, quick-break action.
- .8 ON-OFF switch position indication on switch enclosure cover.
- .9 CSA enclosure to be Nema 1 or Nema 3R as indicated.

2.3 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 complete with fuses if applicable.

END OF SECTION

Part 1 General

1.1 SCOPE

- .1 Furnish and install Automatic Transfer Switches (ATS) as follows;

Automatic Transfer Switch #1

- 200 ampere continuous rating
- 2 poles, 1 phase
- 240 volt
- Nema Type 1 enclosure
- 22,000 amp withstand current rating
- Solid neutral

Automatic Transfer Switch #2

- 100 ampere continuous rating
- 2 poles, 1 phase
- 240 volt
- Nema Type 1 enclosure
- 22,000 amp withstand current rating
- Solid neutral

The ATS units shall consist of an inherently double throw power transfer switch unit and a microprocessor controller, interconnected to provide complete automatic operation. The ATS and control panel shall be the product of the same manufacturer.

1.2 ACCEPTABLE MANUFACTURERS

- .1 Automatic transfer switches shall be ASCO Series 300. Any alternate shall be submitted to the consulting engineer in writing at least 10 days prior to bid. Each alternate bid must list any deviations from this specification.

1.3 CODES AND STANDARDS

- .1 The automatic transfer switches and accessories shall conform to the requirements of:
- CSA Standards
 - UL 1008 - Standard for Automatic Transfer Switches
 - NFPA 70 - National Electrical Code
 - NFPA 110 - Emergency and Standby Power Systems
 - IEEE Standard 446 - IEEE Recommended Practice for Emergency and Standby Power Systems for Commercial and Industrial Applications.
 - NEMA Standard ICS10-1993 (formerly ICS2-447) - AC Automatic Transfer Switches
 - NEC Articles 700, 701, 702
 - International Standards Organization ISO 9001: 2000

Part 2 Products

2.1 MECHANICALLY HELD TRANSFER SWITCH

- .1 The transfer switch unit shall be electrically operated and mechanically held. The electrical operator shall be a single-solenoid mechanism, momentarily energized. Main operators which include overcurrent disconnect devices will not be accepted. The switch shall be mechanically interlocked to ensure only one of two possible positions, normal or emergency.
- .2 The switch shall be positively locked and unaffected by momentary outages so that contact pressure is maintained at a constant value and temperature rise at the contacts is minimized for maximum reliability and operating life.
- .3 All main contacts shall be silver composition. Switches rated 600 amperes and above shall have segmented, blow-on construction for high withstand current capability and be protected by separate arcing contacts.
- .4 Inspection of all contacts shall be possible from the front of the switch without disassembly of operating linkages and without disconnection of power conductors. A manual operating handle shall be provided for maintenance purposes. The handle shall permit the operator to manually stop the contacts at any point throughout their entire travel to inspect and service the contacts when required.
- .5 Designs utilizing components of molded-case circuit breakers, contactors, or parts thereof which are not intended for continuous duty, repetitive switching or transfer between two active power sources are not acceptable.
- .6 Where neutral conductors must be switched, the ATS shall be provided with fully-rated neutral transfer contacts.
- .7 Where neutral conductors are to be solidly connected, a neutral terminal plate with fully-rated AL-CU pressure connectors shall be provided.

2.2 MICROPROCESSOR CONTROLLER WITH MEBRANE INTERFACE PANEL

- .1 The controller shall direct the operation of the transfer switch. The controller's sensing and logic shall be controlled by a built-in microprocessor for maximum reliability, minimum maintenance, and inherent serial communications capability. The controller shall be connected to the transfer switch by an interconnecting wiring harness. The harness shall include a keyed disconnect plug to enable the controller to be disconnected from the transfer switch for routine maintenance.
- .2 The controller shall be enclosed with a protective cover and be mounted separate from the transfer switch unit for safety and ease of maintenance. Sensing and control logic shall be provided on printed circuit boards. Interfacing relays shall be industrial grade plug-in type with dust covers.

- .3 The controller shall meet or exceed the requirements for Electromagnetic Compatibility (EMC) as follows:
- ANSI C37.90A/IEEE 472 Voltage Surge Test
 - NEMA ICS - 109.21 Impulse Withstand Test
 - IEC801-2 Electrostatic discharge (ESD) immunity
 - ENV50140 and IEC 801 - 3 Radiated electromagnetic field immunity
 - IEC 801 - 4 Electrical fast transient (EFT) immunity
 - ENV50142 Surge transient immunity
 - ENV50141: Conducted radio-frequency field immunity

 - EN55011: Group 1, Class A conducted and radiated emissions
 - EN61000 -4 - 11 Voltage dips and interruptions immunity

2.3 ENCLOSURE

- .1 The ATS shall be furnished in a NEMA Type 1 enclosure unless otherwise shown on the plans.
- .2 Controller shall be flush-mounted display with LED indicators for switch position and source acceptability. It shall also include test and time delay bypass switches.

Part 3 Operation

3.1 VOLTAGE AND FREQUENCY SENSING

- .1 The voltage of each phase of the normal source shall be monitored, with pickup adjustable to 95% of nominal and dropout adjustable from 70% to 90% of pickup setting.
- .2 Single-phase voltage and frequency sensing of the emergency source shall be provided.

3.2 TIME DELAYS

- .1 An adjustable time delay shall be provided to override momentary normal source outages and delay all transfer and engine starting signals.
- .2 An adjustable time delay shall be provided on transfer to emergency, adjustable from 0 to 5 minutes for controlled timing of transfer of loads to emergency.
- .3 A generator stabilization time delay shall be provided after transfer to emergency.
- .4 An adjustable time delay shall be provided on retransfer to normal, adjustable to 30 minutes. Time delay shall be automatically bypassed if emergency source fails and normal source is acceptable.
- .5 A 5-minute cooldown time delay shall be provided on shutdown of engine generator.
- .6 All adjustable time delays shall be field adjustable without the use of special tools.

- .7 The time delays settings for the unit to be installed in the boat house are to match the time delay settings for the other automatic transfer switches connected to the site generator.

3.3 ADDITIONAL FEATURES

- .1 A set of contacts rated 5 amps, 32 VDC shall be provided for a low-voltage engine start signal. The start signal shall prevent dry cranking of the engine by requiring the generator set to reach proper output, and run for the duration of the cool down setting, regardless of whether the normal source restores before the load is transferred.
- .2 A push-button type test switch shall be provided to simulate a normal source failure.
- .3 A push-button type switch to bypass the time delay on transfer to emergency, the engine exerciser period on the retransfer to normal time delay whichever delay is active at the time the push-button is activated.
- .4 Terminals shall be provided for a remote contact which opens to signal the ATS to transfer to emergency and for remote contacts which open to inhibit transfer to emergency and/or retransfer to normal.
- .5 Auxiliary contacts, rated 10 amps, 250 VAC shall be provided consisting of one contact, closed when the ATS is connected to the normal source and one contact, closed, when the ATS is connected to the emergency source.
- .6 Indicating lights shall be provided, one to indicate when the ATS is connected to the normal source (green) and one to indicate when the ATS is connected to the emergency source (red). Also provide indicating lights for both normal and emergency source availability.
- .7 Terminals shall be provided to indicate actual availability of the normal and emergency sources, as determined by the voltage sensing pickup and dropout settings for each source.
- .8 Engine Exerciser - An engine generator exercising timer shall be provided, including a selector switch to select exercise with or without load transfer.
- .9 Inphase Monitor - An Inphase monitor shall be inherently built into the controls. The monitor shall control transfer so that motor load inrush currents do not exceed normal starting currents, and shall not require external control of power sources. The Inphase monitor shall be specifically designed for and be the product of the ATS manufacturer.
- .10 Selective Load Disconnect - A double throw contact shall be provided to operate after a time delay, adjustable to 20 seconds prior to transfer and reset 0 to 20 seconds after transfer. This contact can be used to selectively disconnect specific load(s) when the transfer switch is transferred. Output contacts shall be rated 6 amps at 28 VDC or 120 VAC.

- ## 4.1 WITHSTAND AND CLOSING RATINGS

1 General

1.1 GENERAL REQUIREMENTS

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

1.2 REFERENCES

CSA C22.2 No. 9 – 1996 (R2012) Luminaires

CSA C22.2 No. 43- 08 (R2013) Lampholders

CSA C22.2 No. 74-16 Equipment for Use with Electric Discharge Lamps

CAN/CSA C861-10 (R2015) Performance of Compact Fluorescent Lamps and Ballasted Adapters

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:

1.3.2 Product data, including installation instructions and details.

2 Products

2.1 MANUFACTURED UNITS

2.1.1 Light Fixtures

Type 'A'

173mm x 1316mm vapour tight LED light fixture, 6300 lumen LED array (64 watts), 4000K, 120 volt driver, CRI 80 minimum, 0-10 volt dimming. Light fixture to be mounted on suspended strut system.

Cree Cat. No. WS4-63L-50K- 10V-FD or Approved Equal

Type 'B'

452mm diameter suspended LED low-bay light fixture constructed of rugged cast aluminum. Light fixture to be complete with die cast aluminum heat sink, hook and cord mounting, 18000 lumen LED array (160 watts), 120 volt, 5000K colour temperature, 80 CRI minimum, aluminum reflector, wire guard, factory installed 15 amp 120 volt twist lock plug and safety cable.

Cree Cat. No. CXBA-HC-M-50K-8-UL-AP-L515P-CXBA16N-WG-A-SC-5 or Approved Equal

Type 'C'

1219mm long wall mounted LED light fixture, acrylic lens, white, 2500 lumen LED array (23 watts), 120 volt, 4000K, 120 volt.

Cree Cat. No. LS4-25L-35K or Approved Equal

Type 'D'

Exterior mounted LED wall light fixture, low profile design, weathertight LED driver compartment, Type II medium light distribution, 3820 lumen LED array (42 watts), 120 volt, 4000K colour temperature, 120 volt, black.

Cree Cat. No. XSPW-A-0-2-F-C-U-T or Approved Equal

Type 'D1'

Same as Type 'D' but 2500 lumen LED array (25 watts).

Metalux Cat. No. XSPW-A-0-2-F-G-U-T or Approved Equal

2.1.2 **Photocell – Exterior Lighting**

Provide flush mounted photocell, turns ON at 1 to 5 fc, time delay of up to 2 minutes to prevent false triggering, housing to be weather resistant molded lexan with ultrasonically welded seams, temperature range -40°C to +60°C, SPST, 2000 watt rating, 120 volt, includes plate and gasket for mounting in standard FS type outdoor junction box.

Torx Cat. No. 3010 or Approved Equal

2.1.3 **Occupancy Sensors**

- .1 Occupancy Sensor Type 'OC1'
 - .1 Wall switch mount, dual technology, passive infrared multi-way dual relay occupancy sensor 525 square foot range, ON/OFF, Manual ON/OFF, 0-1200 watt load, 120 volt. Sensor to be mounted in locations indicated. Sensor to be set for a 15-minute time delay. White colour.
 - .2 Wattstopper PW-203 or approved equal

3 EXECUTION

3.1 INSTALLATION – Lighting and Accessories

- 3.1.1 Install luminaires to conform to 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 – Occupancy Sensors

3.2.1 All sensor locations are approximate. Refer to manufacturer's instructions for best installation practices.

END OF SECTION

1 General

1.1 GENERAL REQUIREMENTS

1.1.1 Conform to Section 26 05 01 – Common Work Results - Electrical.

1.2 REFERENCES

CSA C22.2 No. 141-15 Unit Equipment for Emergency Lighting

1.3 SUBMITTALS

1.3.1 **Shop Drawings-** Submit shop drawings in accordance with General Conditions of the Contract.

1.3.1.1 Exit Signs: Product descriptions and data for each specified type of exit signs.

1.3.1.2 Emergency Lighting Units: Product descriptions and data for each specified type.

1.3.1.3 Central Emergency Lighting Inverter Systems: Product descriptions and data.

2 Products

2.1 MANUFACTURED UNITS

2.1.1 Exit Signs

2.1.1.1 Exit signs shall comply with requirements stated in Ontario Building Code Section 3.4.5.

2.1.1.2 Exit signs shall consist of a green pictogram and white graphic symbol meeting the visibility specification referred to in ISO 3864-1. Dimensions of the exit sign shall conform to ISO 7010.

2.1.1.3 Face plate: universal face.

2.1.1.4 Mounting: Wall or end to wall or ceiling, as indicated by respective symbols on Drawings.

2.1.1.5 Arrow Configuration: Right or left, as indicated by respective symbols on Drawings.

2.1.1.6 Symbols as indicated on Drawings shall correspond to specified mounting types, face plates and directional arrows.

2.1.1.7 Power supply: 120V, 1-phase, 60Hz. The 120 volt circuit shall serve no equipment other than emergency lighting in the area where exit signs are installed and shall be connected to an emergency power supply. Provide lock-on devices for circuit breakers feeding exit signs.

- 2.1.1.8 Durable injection moulded thermoplastic green pictogram exit sign c/w long life LED light source, self-powered battery backup, auto-test non-audible. Universal face and mounting.

Type 'EX1' - White housing

Emergi-Lite Cat No. EP3WI

2.1.2 **EMERGENCY LIGHTING BATTERY UNITS**

- 2.1.2.1 The emergency lighting unit shall be installed in such a manner that it will automatically be actuated upon failure of the power supply to the normal lighting in the area covered by that emergency lighting unit.

- 2.1.2.2 Emergency lighting units to be complete with sealed long-life maintenance free battery, CSA C22.2 No. 141 certified.

- 2.1.2.3 The emergency lighting unit shall be complete with integral heads as indicated.

- 2.1.2.4 Use No. 10AWG cable for all remote heads.

- 2.1.2.5 Provide lock-on devices for circuit breakers feeding emergency lighting circuits.

- 2.1.2.6 Type 'EM1', 'EM2', 'EM3', 'EM4', 'EM5'

Emergency lighting battery pack c/w 120 volt input, 12 volt output, 36W capacity, auto-test non-audible and 2-6W LED MR16 head.

Emergi-Lite Cat. No. 12ESL-36-UN/1LI or approved equal

- 2.1.2.7 Type #1 Remote Heads

Single thermoplastic injection moulded remote heads c/w 12 volt, 5 watt LED lamp(s).

Emergi-Lite Cat. No. EF9M-L1 or approved equal (Single)

3 Execution

3.1 INSTALLATION

- 3.1.1.1 Install equipment as per manufacturers' instructions.

- 3.1.1.2 Install exit signs at locations as indicated on Drawings, in accordance with Ontario Building Code requirement.

- 3.1.1.3 Use No. 10 awg RW90 cable for all remote heads.

- 3.1.1.4 Provide lock-on devices for circuit breakers feeding exit light circuit and emergency lighting

receptacles.

- 3.1.1.5 Install remote heads solidly to wall supported outlet boxes.

End of Section

1 General

1.1 GENERAL REQUIREMENTS

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

1.2 REFERENCES

Refer to relevant specifications sections in divisions 21, 22, 23 and 26 as required.

2 Products

2.1 GENERAL REQUIREMENTS

2.1.1 In accordance with specification sections in division 26.

3 EXECUTION

3.1 INSTALLATION

3.1.1 Service switches, disconnect switches, manual motor starters, magnetic motor starters, combination motor starters and variable frequency drives (VFD) are to be provided and installed by the electrical contractor unless explicitly stated otherwise.

3.1.2 Provide 120V power feed to low voltage transformers (provided by the mechanical division) for the operation of electronic flush valves and electronic faucets. Coordinate quantity and location with mechanical.

3.1.3 Provide 120V power feed to trap seal primer manifold TSPM-1.

3.1.4 Provide 120V power feed and GFI receptacle for water heater WH-1.

3.1.5 Provide 120V power feed and local service switch for each unit heater UH-1 through UH-3.

3.1.6 Provide 240V, one phase, power feed wired through local weatherproof disconnect switch for MUA-1. Provide a dedicated 120V power feed for the service receptacle installed within the unit.

3.1.7 Provide 120V, single phase power feed wired through a 120 volt occupancy sensor and a local disconnect switch exhaust fan EF-1.

3.1.8 Provide 240V, single phase power feed wired through local disconnect switch (provided for exhaust fans EF-2 and EF-3.

3.1.9 Provide 240V power feed and local service switch for each paddle fan PF-1 through PF-3. The wall control for the fans is by a standard CAT5 or higher Ethernet cable. The wall control comes standard with 150 feet of factory-assembled CAT5 Ethernet cable. Control wiring to be performed by Mechanical Division.

- 3.1.10 Provide a 120 volt, 20 amp receptacle for mobile welding filter cart. Coordinate final location with Owner.
- 3.1.11 Provide 240 volt, 60 amp circuits for welding receptacles. Confirm type of receptacle and current rating of circuit breaker prior to ordering panelboard.

END OF SECTION