

PART 1 - GENERAL

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| <u>1.1 REFERENCES</u> | .1 | Canadian Standards Association (CSA International)
.1 CSA C22.1-Latest Edition, Canadian Electrical Code, Part 1 (22nd Edition), Safety Standard for Electrical Installations.
.2 CAN/CSA-C22.3 No. 1-Latest Edition, Overhead Systems.
.3 CAN3-C235-83-Latest Edition, Preferred Voltage Levels for AC Systems, 0 to 50,000 V. |
| <u>1.2 DEFINITIONS</u> | .1 | Electrical and electronic terms: unless otherwise specified or indicated, terms used in these specifications, and on drawings, are those defined by IEEE SP1122. |
| <u>1.3 DESIGN REQUIREMENTS</u> | .1 | Operating voltages: to CAN3-C235. |
| | .2 | Motors, electric heating, control and distribution devices and equipment to operate satisfactorily at 60 Hz within normal operating limits established by above standard.
.1 Equipment to operate in extreme operating conditions established in above standard without damage to equipment. |
| | .3 | Language operating requirements: provide identification nameplates and labels for control items in English and French. |
| | .4 | Use one nameplate or label for each language. |
| <u>1.4 ACTION AND INFORMATIONAL SUBMITTALS</u> | .1 | Submittals: in accordance with Section 01 33 00 - Submittal Procedures. |
| | .2 | Product Data: submit WHMIS MSDS. |
| | .3 | Submit for review single line electrical diagrams under plexiglass and locate as indicated. |
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.1 Electrical distribution system in main electrical room.

- .4 Shop drawings:
 - .1 Submit drawings stamped and signed by professional engineer registered or licensed in Province of Prince Edward Island, Canada.
 - .2 Submit wiring diagrams and installation details of equipment indicating proposed location, layout and arrangement, control panels, accessories, piping, ductwork, and other items that must be shown to ensure co-ordinated installation.
 - .3 Indicate of drawings clearances for operation, maintenance, and replacement of operating equipment devices.
 - .4 Submit copies of drawings and product data to authority having jurisdiction.
 - .5 If changes are required, notify Departmental Representative of these changes before they are made.
- .5 Quality Control: in accordance with Section 01 45 00 - Quality Control.
 - .1 Provide CSA certified equipment and material.
 - .2 Where CSA certified equipment and material is not available, submit such equipment and material to authority having jurisdiction for special approval before delivery to site.
 - .3 Submit test results of installed electrical systems and instrumentation.
 - .4 Permits and fees: in accordance with General Conditions of contract.
 - .5 Submit, upon completion of Work, load balance report as described in PART 3 - LOAD BALANCE.
 - .6 Submit certificate of acceptance from authority having jurisdiction upon completion of Work to Departmental Representative.
- .6 Manufacturer's Field Reports: submit to Departmental Representative manufacturer's written report, within 3 days of review, verifying compliance of Work and electrical system and instrumentation testing, as described in PART 3 - FIELD QUALITY CONTROL.

1.5 QUALITY
ASSURANCE

- .1 Quality Assurance: in accordance with Section 01 45 00 - Quality Control.
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- .2 Qualifications: electrical Work to be carried out by qualified, licensed electricians who hold valid Master Electrical Contractor license or apprentices in accordance with authorities having jurisdiction as per the conditions of Provincial Act respecting manpower vocational training and qualification.
 - .1 Employees registered in provincial apprentices program: permitted, under direct supervision of qualified licensed electrician, to perform specific tasks.
 - .2 Permitted activities: determined based on training level attained and demonstration of ability to perform specific duties.
- .3 Site Meetings:
 - .1 Schedule site visits, to review Work, at stages listed.
 - .1 After delivery and storage of products, and when preparatory Work is complete but before installation begins.
 - .2 Twice during progress of Work at 25% and 60% complete.
 - .3 Upon completion of Work, after cleaning is carried out.
- .4 Health and Safety Requirements: do construction following occupational health and safety.
- .5 All work is to comply with NBEPC standard construction practices (underground), NBEPC service entrance standards, latest edition of Canadian electrical Code (CEC) and provincial and local codes and standards.
- .6 Contractor to provide to Departmental Representative a safety inspection certificate from the provincial electrical safety inspection authority.

1.6 DELIVERY,
STORAGE AND
HANDLING

- .1 Material Delivery Schedule: provide Departmental Representative with schedule within 2 weeks after award of Contract.
 - .2 Construction/Demolition Waste Management and Disposal: separate waste materials for reuse and recycling.
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1.7 SYSTEM STARTUP

- .1 Instruct Departmental Representative in operation, care and maintenance of systems, system equipment and components.
- .2 Arrange and pay for services of manufacturer's factory service engineer to supervise start-up of installation, check, adjust, balance and calibrate components and instruct operating personnel.
- .3 Provide these services for such period, and for as many visits as necessary to put equipment in operation, and ensure that operating personnel are conversant with aspects of its care and operation.

1.8 OPERATING INSTRUCTIONS

- .1 Provide for each system and principal item of equipment as specified in technical sections for use by operation and maintenance personnel.
- .2 Operating instructions to include following:
 - .1 Wiring diagrams, control diagrams, and control sequence for each principal system and item of equipment.
 - .2 Start up, proper adjustment, operating, lubrication, and shutdown procedures.
 - .3 Safety precautions.
 - .4 Procedures to be followed in event of equipment failure.
 - .5 Other items of instruction as recommended by manufacturer of each system or item of equipment.
- .3 Post instructions where directed.
- .4 For operating instructions exposed to weather, provide weather-resistant materials or weatherproof enclosures.

PART 2 - PRODUCTS

2.1 MATERIALS AND EQUIPMENT

- .1 Material and equipment to be CSA certified. Where CSA certified material and equipment is not available, obtain special approval from authority having jurisdiction before delivery to site and submit such approval as described in PART 1 - SUBMITTALS.
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- 2.2 ELECTRIC MOTORS, EQUIPMENT AND CONTROLS
- .1 Verify installation and co-ordination responsibilities related to motors, equipment and controls, as indicated.
 - .2 Control wiring and conduit: conduit, wiring and connections below 50 V which are related to control systems specified in mechanical sections and as shown on mechanical drawings.

- 2.3 WARNING SIGNS
- .1 Warning Signs: in accordance with requirements of authority having jurisdiction inspection authorities and Departmental Representative.
 - .2 Decal signs, minimum size 175 x 250 mm.
 - .3 Signage warning of potential risks of electrical and Arc flash hazards are to be met through requirements of CEC rule 2-306 and CSA work place electrical safety Z4622-08.
 - .4 Warning labels are to include Arc flash hazard warning (0-4) and the flash protection boundary as defined in NFPA 70E.

- 2.4 WIRING TERMINATIONS
- .1 Ensure lugs, terminals, screws used for termination of wiring are suitable for either copper conductors.

- 2.5 EQUIPMENT IDENTIFICATION
- .1 Identify electrical equipment with nameplates and labels as follows:
 - .1 Nameplates: lamicoid 3 mm, matt white finish face, black core, lettering accurately aligned and engraved into core.
 - .2 Sizes as follows:

NAMEPLATE SIZES

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

Size 6	25 x 100 mm	1 line	letters 12 mm high
Size 7	25 x 100 mm	2 lines	letters 6 mm high

- .2 Labels: embossed plastic labels with 6mm high letters unless specified otherwise.
- .3 Wording on nameplates and labels to be approved by Departmental Representative prior to manufacture.
- .4 Allow for minimum of twenty-five (25) letters per nameplate and label.
- .5 Nameplates for terminal cabinets and junction boxes to indicate system and/or voltage characteristics.
- .6 Identify equipment with Size 3 labels engraved as directed by Departmental Representative.
- .7 Disconnects, starters and contactors: indicate equipment being controlled and voltage.
- .8 Terminal cabinets and pull boxes: indicate system and voltage.
- .9 Transformers: indicate capacity, primary and secondary voltages.
- .10 Each receptacle is to have an Lamacoip label indicating panel source and circuit number. Label to be affixed to device by two sided tape, dyno tape label acceptable.

2.6 WIRING IDENTIFICATION

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

2.7 CONDUIT AND
CABLE
IDENTIFICATION

- .1 Colour code conduits, boxes and metallic sheathed cables.
- .2 Code with plastic tape or paint at points where conduit or cable enters wall, ceiling, or floor, and at 15 m intervals.
- .3 Colours: 25 mm wide prime colour and 20 mm wide auxiliary colour.
- .4 All junction box covers are to carry ID for the circuits contained therein. Panel ID and circuit number for each conduit.

	Prime	Auxiliary
up to 250 V	Yellow	
up to 600 V	Yellow	Green
up to 5 kV	Yellow	Blue
up to 15 kV	Yellow	Red
Telephone	Green	
Other	Green	Blue
Communication Systems		
Fire Alarm	Red	
Emergency	Red	Blue
Voice		
Other	Red	Yellow
Security Systems		

2.8 FINISHES

- .1 Shop finish metal enclosure surfaces by application of rust resistant primer inside and outside, and at least two coats of finish enamel.
 - .1 Paint outdoor electrical equipment "equipment green" finish.
 - .2 Paint indoor switchgear and distribution enclosures light grey to EEMAC 2Y-1.

PART 3 - EXECUTION

3.1 INSTALLATION

- .1 Do complete installation in accordance with CSA C22.1 except where specified otherwise.
- .2 Do not install panels, contactors or other electrical equipment in janitors closets.

- .3 Cutting, patching, core drilling and related costs shall be the responsibility of each individual trade.
- .4 19 mm plywood backboards pressure treated with a fire retardant for electrical equipment to be printed (both sides) with fire retardant paint prior to being affixed to walls.

3.2 NAMEPLATES AND LABELS

- .1 Ensure manufacturer's nameplates, CSA labels and identification nameplates are visible and legible after equipment is installed.
- .2 Use of rivets or self tapping screws to fasten identification to electrical equipment is not permitted, use double sided tape.

3.3 CONDUIT AND CABLE INSTALLATION

- .1 Install conduit and sleeves prior to pouring of concrete.
 - .1 Sleeves through concrete: sized for free passage of conduit, and protruding 50 mm.
- .2 If plastic sleeves are used in fire rated walls or floors, remove before conduit installation.
- .3 Install cables, conduits and fittings embedded or plastered over, close to building structure so furring can be kept to minimum.

3.4 LOCATION OF OUTLETS

- .1 Locate outlets in accordance with Section 26 05 32 - Outlet Boxes, Conduit Boxes and Fittings.
 - .2 Do not install outlets back-to-back in wall; allow minimum 150 mm horizontal clearance between boxes.
 - .3 Change location of outlets at no extra cost or credit, providing distance does not exceed 3000 mm, and information is given before installation.
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- .4 Locate light switches on latch side of doors.

3.5 MOUNTING HEIGHTS

- .1 Mounting height of equipment is from finished floor to centreline of equipment unless specified or indicated otherwise.
- .2 If mounting height of equipment is not specified or indicated, verify before proceeding with installation.
- .3 Install electrical equipment at following heights unless indicated otherwise.
 - .1 Local switches: 1400 mm.
 - .2 Wall receptacles:
 - .1 General: 300 mm.
 - .2 Above top of continuous baseboard heater: 200 mm.
 - .3 Above top of counters or counter splash backs: 175 mm.
 - .4 In mechanical rooms: 1400 mm.
 - .3 Panelboards: as required by Code or as indicated.
 - .4 Telephone and interphone outlets: 300 mm.
 - .5 Wall mounted telephone and interphone outlets: 1500 mm.
 - .6 Fire alarm stations: 1500 mm, installation in accordance with ULC S524.

3.6 CO-ORDINATION OF PROTECTIVE DEVICES

- .1 Ensure circuit protective devices such as overcurrent trips, relays and fuses are installed to required values and settings.

3.7 FIELD QUALITY CONTROL

- .1 Load Balance:
 - .1 Measure phase current to panelboards with normal loads (lighting) operating at time of acceptance; adjust branch circuit connections as required to obtain best balance of current between phases and record changes.
 - .2 Measure phase voltages at loads and adjust transformer taps to within 2% of rated voltage of equipment.
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- .3 Provide upon completion of work, load balance report as directed in PART 1 - SUBMITTALS: phase and neutral currents on panelboards, dry-core transformers and motor control centres, operating under normal load, as well as hour and date on which each load was measured, and voltage at time of test.
 - .2 Conduct following tests in accordance with Section 01 45 00 - Quality Control.
 - .1 Power distribution system including phasing, voltage, grounding and load balancing.
 - .2 Circuits originating from branch distribution panels.
 - .3 Lighting and its control.
 - .4 Motors, heaters and associated control equipment including sequenced operation of systems where applicable.
 - .5 Systems: fire alarm system and communications.
 - .6 Insulation resistance testing:
 - .1 Megger circuits, feeders and equipment up to 350 V with a 500 V instrument.
 - .2 Megger 350-600 V circuits, feeders and equipment with a 1000 V instrument.
 - .3 Check resistance to ground before energizing.
 - .3 Carry out tests in presence of Departmental Representative.
 - .4 Provide instruments, meters, equipment and personnel required to conduct tests during and at conclusion of project.
 - .5 Manufacturer's Field Services:
 - .1 Obtain written report from manufacturer verifying compliance of Work, in handling, installing, applying, protecting and cleaning of product and submit Manufacturer's Field Reports as described in PART 1 - SUBMITTALS.
 - .2 Provide manufacturer's field services consisting of product use recommendations and periodic site visits for inspection of product installation in accordance with manufacturer's instructions.
 - .3 Schedule site visits, to review Work, as directed in PART 1 - QUALITY ASSURANCE.
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- .6 Any testing agency for electrical systems shall be independent and qualified per INETA (inter national electrical testing association.)
- .7 Identify fault levels for motor control equipment and power distribution equipment.

3.8 CLEANING

- .1 Clean and touch up surfaces of shop-painted equipment scratched or marred during shipment or installation, to match original paint.
- .2 Clean and prime exposed non-galvanized hangers, racks and fastenings to prevent rusting.

PART 1 - GENERAL

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| <u>1.1 REFERENCES</u> | .1 | Canadian Standards Association (CSA International) |
| | .1 | CAN/CSA-C22.2 No.18 (various). |
| | .2 | CSA C22.2 No.65-03, Electrical Connectors. |
| | .2 | National Electrical Manufacturers Association (NEMA) |
| <u>1.2 WASTE MANAGEMENT AND DISPOSAL</u> | .1 | Separate and recycle waste materials. |
| | .2 | Remove from site and dispose of all packaging materials at appropriate recycling facilities. |
| | .3 | Collect and separate for disposal of paper, plastic, polystyrene, corrugated cardboard, and packaging material in appropriate on-site bins for recycling in accordance with Waste Management Plan. |
| | .4 | Divert unused wiring materials from landfill to metal recycling facility as approved by Departmental Representative. |

PART 2 - PRODUCTS

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| <u>2.1 MATERIALS</u> | .1 | Pressure type wire connectors to: CSA C22.2 No.65, with current carrying parts of copper sized to fit copper 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 NEMA to consist of: |
| | .1 | Connector body and stud clamp for stranded copper. |
| | .2 | Clamp for stranded copper conductors. |
| | .3 | Stud clamp bolts. |
| | .4 | Bolts for copper conductors. |
| | .5 | Bolts for aluminum conductors. |
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.6 Sized for conductors tubes as indicated.

- .4 Clamps or connectors for armoured cable, aluminum sheathed cable, flexible conduit, as required to: CAN/CSA-C22.2 No.18.

PART 3 - EXECUTION

3.1 INSTALLATION

- .1 Remove insulation carefully from ends of conductors and:
- .1 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 bushing stud connectors in accordance with NEMA.

PART 1 - GENERAL

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| <u>1.1 PRODUCT DATA</u> | .1 | Provide product data in accordance with Section 01 33 00 - Submittal Procedures. |
| <u>1.2 DELIVERY, STORAGE AND HANDLING</u> | .1 | Packaging Waste Management: remove for reuse and return by manufacturer of pallets crates padding and packaging materials. |

PART 2 - PRODUCTS

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| <u>2.1 BUILDING WIRES</u> | .1 | Conductors: stranded for 12 AWG and larger. Minimum size: 12 AWG, for power and #14 AWG for lighting controls. |
| | .2 | Copper conductors: size and type as indicated. |
| | .3 | Copper conductors: size as indicated, with thermoplastic insulation type T75 Nylon rated at 600 V, for 120/208 V systems. |
| | .4 | Copper conductors: size as indicated, with thermoplastic insulation type T75 Nylon rated at 1000 V, for 400 V and 247/600 V systems. |
| <u>2.2 ARMOURED CABLES</u> | .1 | Conductors: insulated, copper, size as indicated. |
| | .2 | Type: AC90; all conductors to be de-rated to 75c, CEC Table 2 column 3. |
| | .3 | Armour: interlocking type fabricated from galvanized steel or aluminum strip. |
| | .4 | Type: compliant to applicable Building Code classification for this project. |
| | .5 | Connectors: anti short connectors. |
| <u>2.3 CONTROL CABLES</u> | .1 | Type: LVT: 2 soft annealed copper conductors, sized as indicated: |
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- .1 Insulation: thermoplastic.
- .2 Type: low energy 300 V control cable: solid stranded annealed copper conductors sized as indicated LVT: 2 soft annealed copper conductors, sized as indicated:
- .3 Type: 600 V stranded conductors, sizes and type as indicated:

PART 3 - EXECUTION

3.1 FIELD QUALITY CONTROL

- .1 Perform tests in accordance with Section 26 05 00 - Common Work Results for Electrical.
- .2 Perform tests using method appropriate to site conditions and to approval of Departmental Representative and local authority having jurisdiction over installation.
- .3 Perform tests before energizing electrical system.

3.2 GENERAL CABLE INSTALLATION

- .1 Terminate cables in accordance with Section 26 05 20 - Wire and Box Connectors - (0-1000 V).
 - .2 Cable Colour Coding: to Section 26 05 00 Common Work Results for Electrical.
 - .3 Conductor length for parallel feeders to be identical.
 - .4 Lace or clip groups of feeder cables at distribution centres, pull boxes, and termination points.
 - .5 Wiring in walls: typically drop or loop vertically from above to better facilitate future renovations. Generally wiring from below and horizontal wiring in walls to be avoided unless indicated.
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- .6 Branch circuit wiring for surge suppression receptacles and permanently wired computer and electronic equipment to be 2-wire circuits only, i.e. common neutrals not permitted.
- .7 Provide numbered wire collars for control wiring. Numbers to correspond to control shop drawing legend. Obtain wiring diagram for control wiring.
- .8 ID neutrals in panels and junction boxes.

3.3 INSTALLATION OF BUILDING WIRES

- .1 Install wiring as follows:
 - .1 In conduit systems in accordance with Section 26 05 34 - Conduits, Conduit Fastenings and Conduit Fittings.
 - .2 Overhead service conductors in accordance with the drawings and requirements of local authority having jurisdiction over installation.

3.4 INSTALLATION OF TECK90 CABLE (0-1000 V)

- .1 Group cables wherever possible on channels.
- .2 Install cable , securely supported by straps or hangers.

3.5 INSTALLATION OF ARMoured CABLES

- .1 Group cables wherever possible on channels.

3.6 INSTALLATION OF ALUMINUM SHEATHED CABLE

- .1 Group cables wherever possible on channels.

3.7 INSTALLATION OF CONTROL CABLES

- .1 Install control cables in conduit.
- .2 Ground control cable shield.

PART 1 - GENERAL

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| <u>1.1 REFERENCES</u> | .1 | Canadian Standards Association (CSA International)
.1 CSA C22.2 No.41-07, Grounding and Bonding Equipment. |
| <u>1.2 PRODUCT DATA</u> | .1 | Submit product data in accordance with Section 01 33 00 - Submittal Procedures. |
| <u>1.3 WASTE MANAGEMENT AND DISPOSAL</u> | .1 | Separate and recycle waste materials. |
| | .2 | Remove from site and dispose of all packaging materials at appropriate recycling facilities. |
| | .3 | Collect and separate for disposal paper plastic polystyrene corrugated cardboard packaging material in appropriate on-site bins for recycling in accordance with Waste Management Plan. |
| | .4 | Divert unused metal and wiring materials from landfill to metal recycling facility as approved by Departmental Representative. |

PART 2 - PRODUCTS

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| <u>2.1 CONNECTORS AND TERMINATIONS</u> | .1 | Copper compression connectors to CSA as required sized for conductors. |
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PART 3 - EXECUTION

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| <u>3.1 INSTALLATION</u> | .1 | Install stress cones, terminations, and splices in accordance with manufacturer's instructions. |
| | .2 | Bond and ground as required. |

PART 1 - GENERAL

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| <u>1.1 WASTE
MANAGEMENT AND
DISPOSAL</u> | .1 | Separate and recycle waste materials. |
| | .2 | Remove from site and dispose of all packaging materials at appropriate recycling facilities. |
| | .3 | Collect and separate for disposal of paper, plastic, polystyrene, corrugated cardboard, and packaging material in appropriate on-site bins for recycling in accordance with Waste Management Plan. |
| | .4 | Divert unused metal materials from landfill to metal recycling facility as approved by Departmental Representative. |
| | .5 | Fold up metal banding, flatten and place in designated area for recycling. |

PART 2 - PRODUCTS

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| <u>2.1 NOT USED</u> | .1 | Not used. |
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PART 3 - EXECUTION

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| <u>3.1 INSTALLATION</u> | .1 | Secure equipment to solid masonry, tile and plaster surfaces with lead anchors or nylon shields. |
| | .2 | Secure equipment to poured concrete with expandable inserts. |
| | .3 | Secure equipment to hollow masonry walls or suspended ceilings with toggle bolts. |
| | .4 | Support equipment, conduit or cables using clips, spring loaded bolts, cable clamps designed as accessories to basic channel members. |
| | .5 | Fasten exposed conduit or cables to building construction or support system using straps.
.1 One-hole steel straps to secure surface conduits and cables 50 mm and smaller. |
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- .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 For surface mounting of two or more conduits use channels at 1.5 m on centre spacing.
- .8 Provide metal brackets, frames, hangers, clamps and related types of support structures where indicated or as required to support conduit and cable runs.
- .9 Ensure adequate support for raceways and cables dropped vertically to equipment where there is no wall support.
- .10 Do not use wire lashing or perforated strap to support or secure raceways or cables.
- .11 Do not use supports or equipment installed for other trades for conduit or cable support except with permission of other trade and approval of Departmental Representative.
- .12 Install fastenings and supports as required for each type of equipment cables and conduits, and in accordance with manufacturer's installation recommendations.

PART 1 - GENERAL

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| <u>1.1 REFERENCES</u> | .1 | Canadian Standards Association (CSA International)
.1 CSA C22.1-12, Canadian Electrical Code. |
| <u>1.2 ACTION AND INFORMATIONAL SUBMITTALS</u> | .1 | Provide submittals in accordance with Section 01 33 00 - Submittal Procedures. |
| | .2 | Product Data:
.1 Provide manufacturer's printed product literature, specifications and datasheet and include product characteristics, performance criteria, physical size, finish and limitations. |
| | .3 | Provide shop drawings: in accordance with Section 01 33 00 - Submittal Procedures.
.1 Provide drawings stamped and signed by professional engineer registered or licensed in the Province of Prince Edward Island, Canada. |
| <u>1.3 DELIVERY, STORAGE AND HANDLING</u> | .1 | Waste Management and Disposal:
.1 Separate waste materials for reuse and recycling. |

PART 2 - PRODUCTS

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| <u>2.1 JUNCTION AND PULL BOXES</u> | .1 | Covers Flush Mounted: 25 mm minimum extension all around. |
| | .2 | Covers Surface Mounted: screw-on flat or turned edge covers. |
| | .3 | Exterior junction boxes to be NEMA 3R rate. |

PART 3 - EXECUTION

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| <u>3.1 SPLITTER INSTALLATION</u> | .1 | Mount plumb, true and square to building lines. |
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- .2 Extend splitters full length of equipment arrangement except where indicated otherwise.

3.2 JUNCTION, PULL
BOXES AND CABINETS
INSTALLATION

- .1 Install pull boxes in inconspicuous but accessible locations.
- .2 Only main junction and pull boxes are indicated. Install additional pull boxes as required by CSA C22.1.

3.3 IDENTIFICATION

- .1 Equipment Identification: to Section 26 05 00- Common Work Results for Electrical.
- .2 Identification Labels: size 2 indicating system name voltage and phase or as indicated.

PART 1 - GENERAL

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| <u>1.1 REFERENCES</u> | .1 | Canadian Standards Association (CSA International)
.1 CSA C22.1-12, Canadian Electrical Code, Part 1, 22nd Edition. |
| <u>1.2 ACTION AND INFORMATIONAL SUBMITTALS</u> | .1 | Provide submittals in accordance with Section 01 33 00 - Submittal Procedures. |
| | .2 | Submit samples for floor box in accordance with Section 01 33 00 - Submittal Procedures. |
| <u>1.3 DELIVERY, STORAGE AND HANDLING</u> | .1 | Deliver, store and handle materials. |
| | .2 | Waste Management and Disposal:
.1 Separate waste materials for reuse and recycling. |

PART 2 - PRODUCTS

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| <u>2.1 OUTLET AND CONDUIT BOXES GENERAL</u> | .1 | Size boxes in accordance with CSA C22.1. |
| | .2 | 102 mm square or larger outlet boxes as required. |
| | .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. |
| <u>2.2 EXTERIOR ELECTRICAL BOXES</u> | .1 | All exterior electrical boxes to be NEMA 3R rated. |
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- 2.3 GALVANIZED STEEL OUTLET BOXES
- .1 One-piece electro-galvanized construction.
 - .2 Single and multi gang flush device boxes for flush installation, minimum size 76 x 50 x 38 mm or as indicated. 102 mm square outlet boxes when more than one conduit enters one side with extension and plaster rings as required.
 - .3 Utility boxes for outlets connected to surface-mounted EMT conduit, minimum size 102 x 54 x 48 mm.
 - .4 102 mm square or octagonal outlet boxes for lighting fixture outlets.
 - .5 Extension and plaster rings for flush mounting devices in finished plaster tile walls.
- 2.4 MASONRY BOXES
- .1 Electro-galvanized steel masonry single and multi gang boxes for devices flush mounted in exposed block walls.
- 2.5 CONCRETE BOXES
- .1 Electro-galvanized sheet steel concrete type boxes for flush mount in concrete with matching extension and plaster rings as required.
- 2.6 CONDUIT BOXES
- .1 Cast FS or FD aluminum boxes with factory-threaded hubs and mounting feet for surface wiring of devices.
- 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 35mm and pull boxes for larger conduits.
 - .4 Double locknuts and insulated bushings on sheet metal boxes.
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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. Do not install reducing washers.
- .5 Vacuum clean interior of outlet boxes before installation of wiring devices.
- .6 Identify systems for outlet boxes as required.
- .7 In steel stud walls install caddy (RBS) or equal steel stud box mounting brackets c/w extension rings.

PART 1 - GENERAL

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| <u>1.1 REFERENCES</u> | .1 | Canadian Standards Association (CSA)
.1 CAN/CSA C22.2 No. 18, Outlet Boxes, Conduit Boxes, and Fittings and Associated Hardware.
.2 CSA C22.2 No. 45, Rigid Metal Conduit.
.3 CSA C22.2 No. 56, Flexible Metal Conduit and Liquid-Tight Flexible Metal Conduit.
.4 CSA C22.2 No. 83, Electrical Metallic Tubing. |
| <u>1.2 WASTE MANAGEMENT AND DISPOSAL</u> | .1 | Place materials defined as hazardous or toxic waste in designated containers. |
| | .2 | Ensure emptied containers are sealed and stored safely for disposal away from children. |
| | .3 | Collect and separate plastic, paper packaging and corrugated cardboard in accordance with Waste Management Plan. |

PART 2 - PRODUCTS

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| <u>2.1 CONDUITS</u> | .1 | Rigid metal conduit: to CSA C22.2 No. 45, hot dipped galvanized steel threaded. |
| | .2 | Electrical metallic tubing (EMT): to CSA C22.2 No. 83, with couplings. |
| | .3 | Flexible metal conduit: to CSA C22.2 No. 56, liquid-tight flexible metal. |
| | .4 | Rigid PVC conduit: to CSAC22.2 No. 211.2. |
| <u>2.2 CONDUIT FASTENINGS</u> | .1 | One hole steel straps to secure surface conduits 50 mm and smaller. Two hole steel straps for conduits larger than 50 mm. |
| | .2 | Beam clamps to secure conduits to exposed steel work. |
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- .3 Channel type supports for two or more conduits at 2m oc.
- .4 Threaded rods, 6 mm dia., to support suspended channels.

2.3 CONDUIT FITTINGS

- .1 Fittings: manufactured for use with conduit specified. Coating: same as conduit.
- .2 Factory "ells" where 90° bends are required for NPS 1 25 mm and larger conduits.
- .3 Watertight connectors and couplings for EMT. Fittings to be insulated throat compression type, set-screws are not acceptable.

2.4 FISH CORD

- .1 Polypropylene.

PART 3 - EXECUTION

3.1 INSTALLATION

- .1 Install conduits to conserve headroom in exposed locations and cause minimum interference in spaces through which they pass.
 - .2 Use electrical metallic tubing (EMT) except where specified otherwise.
 - .3 Use flexible metal conduit for connection to motors in dry areas.
 - .4 Use liquid tight flexible metal conduit for connection to motors or vibrating equipment in damp, wet or corrosive locations.
 - .5 Install conduit sealing fittings in hazardous areas. Fill with compound.
 - .6 Minimum conduit size for lighting and power circuits is 21 mm and 27 mm for communications wiring.
 - .7 Bend conduit cold. Replace conduit if kinked or flattened more than 1/10th of its original diameter.
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- .8 Mechanically bend steel conduit over 19 mm dia.
- .9 Field threads on rigid conduit must be of sufficient length to draw conduits up tight.
- .10 Install fish cord in empty conduits.
- .11 Run 2-25 mm spare conduits up to ceiling space and 2-25 mm spare conduits down to ceiling space from each flush panel. Terminate these conduits in 152 x 152 x 102 mm junction boxes in ceiling space or in case of an exposed concrete slab, terminate each conduit in surface type box.
- .12 Remove and replace blocked conduit sections. Do not use liquids to clean out conduits.
- .13 Dry conduits out before installing wire.
- .14 Neutrals are to be counted when calculating conduit fill.

3.2 SURFACE CONDUITS

- .1 Run parallel or perpendicular to building lines.
- .2 Locate conduits behind infrared or gas fired heaters with 1.5 m clearance.
- .3 Run conduits in flanged portion of structural steel.
- .4 Group conduits wherever possible on surface channels.
- .5 Do not pass conduits through structural members except as indicated.
- .6 Do not locate conduits less than 75 mm parallel to steam or hot water lines with minimum of 25 mm at crossovers.

3.3 CONCEALED CONDUITS

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

3.4 CONDUITS IN
CAST-IN-PLACE
CONCRETE

- .1 Locate to suit reinforcing steel. Install in centre one third of slab.
- .2 Protect conduits from damage where they stub out of concrete.
- .3 Install sleeves where conduits pass through slab or wall.
- .4 Provide oversized sleeve for conduits passing through waterproof membrane, before membrane is installed. Use cold mastic between sleeve and conduit.
- .5 Do not place conduits in slabs in which slab thickness is less than 4 times conduit diameter.
- .6 Encase conduits completely in concrete with minimum 25 mm concrete cover.
- .7 Organize conduits in slab to minimize cross-overs.

PART 1 - GENERAL

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| <u>1.1 REFERENCES</u> | .1 | Section 01 33 00 - Submittal Procedures. |
| | .2 | Section 01 74 11 - Cleaning. |
| | .3 | Section 26 05 00 - Common Work Results for Electrical. |
| | .4 | Canadian Standards Association, (CSA International) |

<u>1.2 WASTE MANAGEMENT</u>	<u>AND DISPOSAL</u>
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| | .1 | Separate and recycle waste materials. |
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PART 2 - EXECUTION

<u>2.1 CABLE INSTALLATI</u>	<u>DUCTS</u>
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| | .1 | Install cables as indicated in ducts.
.1 Do not pull spliced cables inside ducts. |
| | .2 | Install multiple cables in duct simultaneously. |
| | .3 | Use CSA approved lubricants of type compatible with cable jacket to reduce pulling tension. |
| | .4 | To facilitate matching of colour coded 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. |
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2.2 FIELD QUALITY
CO

NTROL

- .1 Perform tests in accordance with Section 26 05 00 - Common Work Results - Electrical.
- .2 Perform tests using qualified personnel. Provide necessary instruments and equipment.
- .3 Check phase rotation and identify each phase conductor of each feeder.
- .4 Check each feeder for continuity, short circuits and grounds. Ensure resistance to ground of circuits is not less than 50 megohms.
- .5 Pre-acceptance tests.
 - .1 After installing cable but before splicing and terminating, perform insulation resistance test with 1000 V megger on each phase conductor.
 - .2 Check insulation resistance after each splice and/or termination to ensure that cable system is ready for acceptance testing.
- .6 Acceptance Tests
 - .1 Ensure that terminations and accessory equipment are disconnected.
 - .2 Ground shields, ground wires, metallic armour and conductors not under test.
 - .3 Leakage Current Testing.
 - .1 Raise voltage in steps from zero to maximum values as specified by manufacturer for type of cable being tested.
 - .2 Hold maximum voltage for specified time period by manufacturer.
 - .3 Record leakage current at each step.
- .7 Provide Departmental Representative with list of test results showing location at which each test was made, circuit tested and result of each test.
- .8 Remove and replace entire length of cable if cable fails to meet any of test criteria.

PART 1 - GENERAL

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| <u>1.1 REFERENCES</u> | .1 C22.2 61010-1 Safety Requirements for Electrical Equipment for Measurement, Control and Laboratory, Use - Part 1. |
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| <u>1.2 ACTION AND
INFOR</u> | <u>MATIONAL SUBMITTALS</u> |
| | .1 Submit in accordance with Section 01 33 00 - Submittal Procedures. |
| | .2 Product Data:
.1 Submit manufacturer's instructions, printed product literature and data sheets for metering and instruments and include product characteristics, performance criteria, physical size, finish and limitations.
.2 Include assembly detailed drawings and wiring diagrams. |

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| <u>1.3 DELIVERY,
STORAG</u> | <u>HANDLING</u> |
| | .1 Deliver, store and handle materials. |
| | .2 Delivery and Acceptance Requirements: deliver materials to site in original factory packaging, labelled with manufacturer's name and address. |
| | .3 Storage and Handling Requirements:
.1 Store materials off ground indoors in dry location and in accordance with manufacturer's recommendations in clean, dry, well-ventilated area.
.2 Store and protect metering and switchboard instruments from nicks, scratches, and blemishes.
.3 Replace defective or damaged materials with new. |
| | .4 Develop Construction Waste Management Plan related to Work of this Section. |
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- .5 Packaging Waste Management: remove for reuse and return by manufacturer of pallets, crates, padding, and packaging materials as specified in Construction Waste Management Plan.

PART 2 - PRODUCTS

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| <u>2.1 APPLICATION</u> | .1 Power meters to be supplied to monitor the power being consumed by the five new chillers: CH-1, CH-2, CH-3, CH-4 and CH-5. |
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| <u>2.2 EQUIPMENT METER</u> | .1 Energy and real time power meter. |
| | .2 Panel mounted with local display, self-contained. NEMA 1 assembly, complete with current transformers, shorting blocks, voltage lead fuses, and potential transformers if required. |
| | .3 Measured parameters to include KW Hours, KW, KVAR, KVA, power factor. |
| | .4 Measured voltage 600V: CH-1, CH-2 and CH-3, 480V:CH-4 and CH-5. |
| | .5 Measured current 0-500 amps. |

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| <u>2.3 TEST TERMINAL
BL</u> | <u>OCKS</u> |
| | .1 Test terminal blocks: as required. |

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| <u>2.4 METERING
TRANSDU</u> | <u>CERS, CONVERTERS</u> |
| | .1 Instrument transformers (PT's and CT's) as required by the supplied meters. |

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| <u>2.5 SHOP
INSTALLATION</u> | .1 Assemble all components into a self-contained package, with exception of the current transformers. |
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- .2 Ensure adequate spacing between current transformers installed on each phase. Current transformers to be shipped seperately and field installed.
- .3 Verify correctness of connections, polarities of meters, instruments, potential and current transformers, transducers, signal sources, electrical supplies.
- .4 Meterily assembly to be CSA certified.

PART 3 - EXECUTION

3.1 INSTALLATION

- .1 Power meter assemblies to be installed local to the equipment being monitored.
- .2 Current and voltage to be measured at the entry point to the equipment.

3.2 FIELD QUALITY CO

NTROL

- .1 Conduct tests in accordance with Section 26 05 00 - Common Work Results for Electrical and in accordance with manufacturer's recommendations.
- .2 Perform simulated operation tests with metering, instruments disconnected from permanent signal and other electrical sources.
- .3 Verify correctness of connections, polarities of meters, instruments, potential and current transformers, transducers, signal sources and electrical supplies.
- .4 Perform tests to obtain correct calibration.
- .5 Do not dismantle meters and instruments.

3.3 CLEANING

- .1 Leave Work area clean at end of each day.

- .2 Final Cleaning: upon completion remove surplus materials, rubbish, tools and equipment.
- .3 Waste Management: separate waste materials for reuse and recycling.
 - .1 Remove recycling containers and bins from site and dispose of materials at appropriate facility.

3.4 PROTECTION

- .1 Protect installed products and components from damage during construction.
- .2 Repair damage to adjacent materials caused by metering and assembly installation.

PART 1 - GENERAL

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| <u>1.1 RELATED REQUIREMENTS</u> | .1 | Section 26 05 00 - Common Work Results for Electrical. |
| <u>1.2 ACTION AND INFORMATIONAL SUBMITTALS</u> | .1 | Provide submittals in accordance with Section 01 33 00 - Submittal Procedures. |
| | .2 | Manufacturer's Instructions: provide to indicate special handling criteria, installation sequence, and cleaning procedures. |
| | .3 | Submit shop drawings and indicate:
.1 Outline dimensions.
.2 Schematic and wiring diagrams. |
| | .4 | Closeout Submittals: provide operation and maintenance data for incorporation into manual specified in Section 01 78 00 - Closeout Submittals.
.1 Include data for each type and style of starter. |
| <u>1.3 WASTE MANAGEMENT AND DISPOSAL</u> | .1 | Separate waste materials for reuse and recycling. |
| <u>1.4 EXTRA MATERIALS</u> | .1 | Provide maintenance materials accordance with Section 01 78 00 - Closeout Submittals. |

PART 2 - PRODUCTS

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| <u>2.1 SUPPLY CHARACTERISTICS</u> | .1 | 600V, 60Hz, wye connected, 3 phase, 3 wire, grounded neutral. |
| <u>2.2 MOTOR STARTERS AND DEVICES</u> | .1 | See Section 26 29 10 - Motor Starters to 600V. |
| | .2 | All devices to be protected by fuses. |
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2.3 STARTER UNIT
COMPARTMENTS

- .1 Units EEMAC size 5 and smaller, fused switch units 225A and smaller, plug-in type with self-disconnect to match existing MCC requirements. Guide rail supports for units to ensure that stabs make positive contact with vertical bus. Provision for units to be installed or removed, off load, while buses energized.
- .2 Unit mounting:
 - .1 Engaged position - unit stabbed into vertical bus.
 - .2 Withdrawn position - unit isolated from vertical bus but supported by structure. Terminal block accessible for electrical testing of starter.
 - .3 Provision for positive latching in either engaged or withdrawn position and padlocking in withdrawn position.
 - .4 Stab-on connectors free floating tin plated clips, self-aligning, backed up with steel springs.
- .3 External operating handle of circuit switch interlocked with door to prevent door opening with switch in "on" position. Provision for 3 padlocks to lock operating handle in "off" position and lock door closed.
- .4 Hinge unit doors on same side.
- .5 Overload relays manually reset from front with door closed.
- .6 Pushbuttons and indicating lights mounted on door front.
- .7 Devices and components by one manufacturer to facilitate maintenance.
- .8 Pull-apart terminal blocks for power and control to allow removal of starter units without removal of field wiring.

2.4 WIRING
IDENTIFICATION

- .1 Provide wiring identification in accordance with Section 26 05 00 - Common Work Results for Electrical.

2.5 EQUIPMENT IDENTIFICATION .1 Provide equipment identification in accordance with Section 26 05 00 - Common Work Results for Electrical.
.1 Motor control centre main nameplate: size No. 7.
.2 Individual compartment nameplates: size No. 5, engraved as indicated.

2.6 FINISHES .1 Apply finishes in accordance with Section 26 05 00 - Common Work Results for Electrical.
.2 Paint motor control centre exterior light gray and interiors white.

2.7 SOURCE QUALITY CONTROL .1 Provide manufacturer's type test certificates including short circuit fault damage certification up to short circuit values specified under bus bracing.

PART 3 - EXECUTION

3.1 INSTALLATION .1 Install new starters and fused switches assemblies into the identified compartments and/or spaces in the identified MCCs.
.2 Make field power and control connections as indicated.
.3 Ensure correct overload heater elements are installed.

3.2 FIELD QUALITY CONTROL .1 Perform tests in accordance with Section 26 05 00 - Common Work Results for Electrical.
.2 Ensure moving and working parts are lubricated where required.
.3 Operate starters in sequence to prove satisfactory performance of motor control centre during 8 hours period.

PART 1 - GENERAL

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| <u>1.1 REFERENCES</u> | .1 | Canadian Standards Association (CSA International).
.1 CSA-C22.2 No. 5, Moulded-Case Circuit Breakers, Molded-Case Switches and Circuit-Breaker Enclosures (Tri-national standard with UL 489, tenth edition, and the second edition of NMX-J-266-ANCE). |
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| <u>1.2 ACTION AND INFORMATIONAL SUBMITTALS</u> | .1 | Submit product data in accordance with Section 01 33 00 - Submittal Procedures. |
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| <u>1.3 WASTE MANAGEMENT AND DISPOSAL</u> | .1 | Separate waste materials for reuse and recycling. |
| | .2 | Collect and separate for disposal paper plastic polystyrene corrugated cardboard packaging material in appropriate on-site bins for recycling in accordance with Waste Management Plan. |
| | .3 | Separate for reuse and recycling and place in designated containers Steel Metal Plastic waste in accordance with Waste Management Plan. |

PART 2 - PRODUCTS

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| <u>2.1 BREAKERS GENERAL</u> | .1 | Moulded-case circuit breakers, Circuit breakers, and Ground-fault circuit-interrupters,: to CSA C22.2 No. 5 |
| | .2 | Bolt-on moulded case circuit breaker: quick-make, quick-break type, for manual and automatic operation with temperature compensation for 40 degrees C ambient. |
| | .3 | Common-trip breakers: with single handle for multi-pole applications. |
| | .4 | Magnetic instantaneous trip elements in circuit breakers to operate only when value of current reaches setting. |
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.1 Trip settings on breakers with adjustable trips to range from 3-8 times current rating.

.5 Circuit breakers with interchangeable trips as indicated.

.6 Circuit breakers to have minimum interrupting capacity rating as shown on the panel schedules.

2.2 THERMAL
MAGNETIC BREAKERS
DESIGN A

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

PART 3 - EXECUTION

3.1 INSTALLATION

.1 Install circuit breakers as indicated.

PART 1 - GENERAL

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| <u>1.1 REFERENCES</u> | .1 | Canadian Standards Association (CSA International).
.1 CAN/CSA C22.2 No.4-M89 (R2000), Enclosed Switches.
.2 CSA C22.2 No.39-M89 (R2003), Fuseholder Assemblies. |
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| <u>1.2 ACTION AND INFORMATIONAL SUBMITTALS</u> | .1 | Submit product data in accordance with Section 01 33 00 - Submittal Procedures. |
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| <u>1.3 WASTE MANAGEMENT AND DISPOSAL</u> | .1 | Separate waste materials for reuse and recycling |
| | .2 | Remove from site and dispose of packaging materials at appropriate recycling facilities. |
| | .3 | Collect and separate for disposal paper plastic polystyrene corrugated cardboard packaging material in appropriate on-site bins for recycling in accordance with Waste Management Plan. |
| | .4 | Separate for reuse and recycling and place in designated containers Steel Metal Plastic waste in accordance with Waste Management Plan. |
| | .5 | Fold up metal banding, flatten and place in designated area for recycling. |

PART 2 - PRODUCTS

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| <u>2.1 DISCONNECT SWITCHES</u> | .1 | Fusible, non-fusible, horsepower rated disconnect switch in CSA Enclosure, to CAN/CSA C22.2 No.4 size as indicated. |
| | .2 | Provision for padlocking in off switch position by three locks. |
| | .3 | Mechanically interlocked door to prevent opening when handle in ON position. |
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- .4 Fuses: size as indicated.
- .5 Fuseholders: to CSA C22.2 No.39 suitable without adaptors, for type and size of fuse indicated.
- .6 Quick-make, quick-break action.
- .7 ON-OFF switch position indication on switch enclosure cover.
- .8 Exterior disconnects to be rated NEMA 3R.

2.2 EQUIPMENT IDENTIFICATION

- .1 Provide equipment identification in accordance with Section 26 05 00 - 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.

PART 1 - GENERAL

1.1 REFERENCES

- .1 Section 01 33 00 - Submittal Procedures.
- .2 Section 01 74 11 - Cleaning.
- .3 Section 26 05 00 - Common Work Results for Electrical.

1.2 ACTION AND
INFOR

NATIONAL SUBMITTALS

- .1 Provide submittals in accordance with Section 01 33 00 - Submittal Procedures.
- .2 Product Data:
 - .1 Provide manufacturer's printed product literature, specifications and datasheet and include product characteristics, performance criteria, physical size, finish and limitations.
- .3 Shop Drawings:
 - .1 Provide shop drawings: in accordance with Section 01 33 00 - Submittal Procedures.
 - .1 Submit drawings stamped and signed by professional engineer registered or licensed in Province of Prince Edward Island, Canada.
 - .2 Provide shop drawings for each type of starter to indicate:
 - .1 Mounting method and dimensions.
 - .2 Starter size and type.
 - .3 Layout and components.
 - .4 Enclosure types.
 - .5 Wiring diagram.
 - .6 Interconnection diagrams.

1.3 CLOSEOUT
SUBMITT

ALS

- .1 Provide maintenance materials in accordance with Section 01 78 00 - Closeout Submittals.
 - .2 Submit operation and maintenance data for each type and style of motorstarter for incorporation into maintenance manual.
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1.4 DELIVERY,
STORAG

HANDLING

- .1 Deliver, store and handle in accordance with manufacturer's instructions.
- .2 Deliver materials to site in original factory packaging, labelled with manufacturer's name, address.
- .3 Packaging Waste Management: remove for reuse and return by manufacturer of pallets crates padding and packaging materials.

PART 2 - PRODUCTS

2.1 FULL VOLTAGE
MAG

NETIC STARTERS

- .1 Combination magnetic starters of size, type, rating and enclosure type as indicated with components as follows:
 - .1 Contactor solenoid operated, rapid action type.
 - .2 Motor overload protective device in each phase, manually reset from outside enclosure.
 - .3 Wiring and schematic diagram inside starter enclosure in visible location.
 - .4 Identify each wire and terminal for external connections, within starter, with permanent number marking identical to diagram.
 - .2 Combination type starters to include fused disconnect switch with operating lever on outside of enclosure to control disconnect and provision for:
 - .1 Locking in "OFF" position with up to 3 padlocks.
 - .2 Independent locking of enclosure door.
 - .3 Provision for preventing switching to "ON" position while enclosure door is open.
 - .3 Accessories:
 - .1 Pushbuttons Selector switches: standard labelled as indicated.
 - .2 Indicating lights: standard type and color as indicated.
 - .3 1-N/O and 1-N/C spare auxiliary contacts unless otherwise indicated.
 - .4 Hand-off-Auto (HOA) switches.
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.5 Phase loss protection for 3 phase motors 5 HP and larger.

2.2 ACCESSORIES

- .1 Pushbutton: as required.
- .2 Selector switches: as required.
- .3 Indicating lights: to match existing site standard.
- .4 All devices to be protected by fuses.

2.3 FINISHES

- .1 Apply finishes to enclosure in accordance with Section 26 05 00 - Common Work Results for Electrical.

2.4 EQUIPMENT IDENTIFICATION

IDENTIFICATION

- .1 Provide equipment identification in accordance with Section 26 05 00 - Common Work Results for Electrical.
- .2 Manual starter designation label, white plate, black letters, size 1, engraved as indicated.
- .3 Magnetic starter designation label, white plate, black letters, size as indicated.

PART 3 - EXECUTION

3.1 INSTALLATION

- .1 Install starters and control devices in accordance with manufacturer's instructions.
 - .2 Install and wire starters and controls as indicated.
 - .3 Ensure correct fuses installed.
 - .4 Confirm motor nameplate and adjust overload device to suit.
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3.2 FIELD QUALITY
CO

NTROL

- .1 Perform tests in accordance with Section 26 05 00 - Common Work Results for Electrical and manufacturer's instructions.
- .2 Operate switches and contactors to verify correct functioning.
- .3 Perform starting and stopping sequences of contactors and relays.
- .4 Check that sequence controls, interlocking with other separate related starters, equipment, control devices, operate as indicated.

3.3 CLEANING

- .1 Remove surplus materials, excess materials, rubbish, tools and equipment.
- .2 Waste Management: separate waste materials for reuse and recycling.