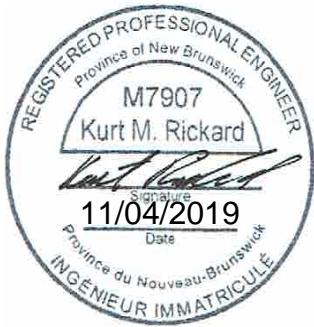


PART 1 - GENERAL

1.1 REFERENCES



- .1 Canadian Standards Association (CSA International)
 - .1 CSA C22.1-06, Canadian Electrical Code, Part 1 (Latest Edition), Safety Standard for Electrical Installations.
 - .2 CSA C22.2 - Latest Edition.
 - .3 CAN/CSA-C22.3 No. 1-01 (Update March 2005), Overhead Systems.
 - .4 CAN3-C235-83 (R2000), Preferred Voltage Levels for AC Systems, 0 to 50,000 V.
- .2 Electrical and Electronic Manufacturer's Association of Canada (EEMAC)
 - .1 EEMAC 2Y-1-1958, Light Gray Colour for Indoor Switch Gear.
- .3 Institute of Electrical and Electronics (IEEE)/National Electrical Safety Code Product Line (NESC)
 - .1 IEEE SP1122-2000, The Authoritative Dictionary of IEEE Standards Terms, 7th Edition.

1.2 DEFINITIONS

- .1 Electrical and electronic terms: unless otherwise specified or indicated, terms used in these specifications, and on drawings, are those defined by IEEE SP1122.

1.3 DESIGN REQUIREMENTS

- .1 Operating voltages: to CAN3-C235.
- .2 Motors, electric heating, control and distribution devices and equipment to operate satisfactorily at 60 Hz within normal operating limits established by above standard.
 - .1 Equipment to operate in extreme operating conditions established in above standard without damage to equipment.
- .3 Language operating requirements: provide identification nameplates for control items in English.

1.4 SUBMITTALS

- .1 Submittals: in accordance with Section 01 33 00 - Submittal Procedures.
- .2 Shop drawings:
 - .1 Submit number of copies of drawings and product data to authority having jurisdiction.
 - .2 If changes are required, notify Engineer of these changes before they are made.
- .3 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 inspection authorities for special approval before delivery to site.
 - .3 Permits and fees: in accordance with General Conditions of contract.

1.5 QUALITY ASSURANCE

- .1 Quality Assurance: in accordance with Section 01 45 00 - Quality Control.
- .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 and 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 Health and Safety Requirements: do construction occupational health and safety in accordance with Section 01 35 29.06 - Health and Safety Requirements.

1.6 SYSTEM STARTUP

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

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- | | | |
|--|----|---|
| <u>1.6 SYSTEM STARTUP
(Cont'd)</u> | .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 all aspects of its care and operation. |
| <hr/> | | |
| 1.7 OPERATING
<u>INSTRUCTIONS</u> | .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. |
| <hr/> | | |
| 1.8 ADDENDA AND
<u>REVISIONS</u> | .1 | All addenda, instructions and revisions issued during the tendering period shall become part of the Contract Documents and shall be included in the Tender, and shall take precedence over previous instructions. |
| | .2 | The Engineer reserve the right to make revisions to the drawings during the period of construction and these revisions shall take precedence over previously issued drawings. All revisions to work shall be executed by duly authorized change orders with the amount of addition or deduction to the contract amount approved before the execution of any work entailed in the revisions. |
-

1.9 SUBSTITUTIONS

- .1 It is the intent of these drawings to establish the required quality of materials. Where manufacturers names or catalogue references are used, it is done in order to establish the required quality, style, size or function. The decision as to suitability shall rest with the Engineer.
- .2 All material not meeting the standards as set down by these specifications shall not be allowed on the job site.
- .3 The listing of a manufacturer as acceptable does not imply acceptance of all products of that manufacturer and only products meeting the standards as set out in the specifications will be accepted.

1.10 SCOPE OF WORK

- .1 The Electrical Contractor shall furnish all labour, materials, tools, appliances and equipment to entirely complete and provide for the operation of the electrical systems.
- .2 The overall intention is to provide for a finished piece of work complete in all aspects, and all items reasonably inferable as called for by the plans and specifications, and by normally accepted good practice, notwithstanding that every item necessarily required may not be particularly mentioned. This Contractor shall fulfill his obligation and not take advantage of any unintentional errors or omissions should such exist, to the detriment of the Owner's interest. The work shall include but not be limited to:
 - .1 Replacement of existing electric boilers

1.11 ELECTRICAL
DRAWINGS

- .1 The drawings which constitute an integral part of this contract shall serve as working drawings. They indicate the general layout of the complete electrical system; arrangements of feeders, circuits, outlets, switches, controls, panelboards, service equipment, communications, underground duct banks, overhead pole lines, power centers, etc..

1.11 ELECTRICAL
DRAWINGS
(Cont'd)

- .2 Field verification of scale dimensions on plans is required since actual locations, distances, and levels will be governed by the field conditions.
- .3 All discrepancies related to the electrical work shall be promptly brought to the attention of the Engineer for clarification.

1.12 EXAMINATION OF
DRAWINGS AND
EXISTING CONDITIONS

- .1 The Electrical Contractor shall become completely familiar with the drawings and specifications, as well as construction methods of other trades related to his work to avoid possible conflicts on the project. Should drastic changes be necessary to resolve such conflicts, this Contractor shall notify the Engineer and secure written approval and agreement on necessary adjustments before the installation is started.
- .2 Before submitting his tender, this Contractor shall visit the site and become familiar with site conditions, availability of storage space and all other factors that might influence his tender.
- .3 The Contractor shall determine all working conditions and rigidly comply. Conditions requiring special consideration include but not be limited to:
 - .1 Dust.
 - .2 Noise.
 - .3 Vibration.
 - .4 Water.
 - .5 Use of powder actuated tools.
 - .6 Working hours.
 - .7 Access to working locations.
 - .8 Continuity of power.
 - .9 Project schedule.
 - .10 Physical protection of Owner's facility and equipment.
- .4 The exact roughing-in dimensions and connection points shall be determined from shop drawings and on-site measurements.

- 1.13 DISCREPANCIES .1 The contractor, finding any errors, omissions, or discrepancies in the plans, specifications or other documents, or having any doubt in the intent or meaning of any part thereof, shall immediately notify the Engineer, who will send written instructions or clarification. Where such discrepancies exist and it is evident that this Contractor could not have properly provided systems installation, without clarification and where such clarification was not requested, no extra to the contract will be considered in order to have the installation properly made. The Departmental Representative will not be responsible for oral instruction.

PART 2 - PRODUCTS

- 2.1 MATERIALS AND EQUIPMENT .1 Provide material and equipment in accordance with Section 01 61 00 - Common Product Requirements.
- .2 Material and equipment to be CSA certified. Where CSA certified material and equipment are not available, obtain special approval from inspection authorities before delivery to site and submit such approval as described in PART 1 - SUBMITTALS.
- .3 Factory assemble control panels and component assemblies.
- 2.2 ELECTRIC MOTORS, EQUIPMENT AND CONTROLS .1 Verify installation and co-ordination responsibilities related to motors, equipment and controls, as indicated.
- 2.3 WARNING SIGNS .1 Warning Signs: in accordance with requirements of authority having jurisdiction
- 2.4 WIRING TERMINATIONS .1 Ensure lugs, terminals, screws used for termination of wiring are suitable for either copper or aluminum conductors.

2.5 EQUIPMENT
IDENTIFICATION

.1 Identify electrical equipment with nameplates as follows:

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

.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 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

.2 Labels: embossed plastic labels with 6 mm high letters unless specified otherwise.

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

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

.5 Terminal cabinets and pull boxes: indicate system and voltage.

.6 Transformers: indicate capacity, primary and secondary voltages.

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.

2.6 WIRING
IDENTIFICATION
(Cont'd)

- .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.

	Prime	Auxiliary
up to 250 V	Yellow	
Other	Green	
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 to.
 - .2 Paint indoor switchgear and distribution enclosures light gray to EEMAC 2Y-1.

PART 3 - EXECUTION

3.1 INSTALLATION

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

3.2 NAMEPLATES AND LABELS

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

3.3 CONDUIT AND CABLE INSTALLATION

- .1 Install conduit and sleeves prior to pouring of concrete.

3.3 CONDUIT AND
CABLE INSTALLATION
(Cont'd)

- .1 (Cont'd)
 - .1 Sleeves through concrete: plastic, 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 FIELD QUALITY
CONTROL

- .1 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.
- .2 Carry out tests in presence of Engineer.
- .3 Provide instruments, meters, equipment and personnel required to conduct tests during and at conclusion of project.
- .4 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.

3.5 CLEANING

- .1 Clean and touch up surfaces of shop-painted equipment scratched or marred during shipment or installation, to match original paint.

<u>3.5 CLEANING</u> <u>(Cont'd)</u>	.2	Clean and prime exposed non-galvanized hangers, racks and fastenings to prevent rusting.
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<u>3.6 RECORD DRAWINGS</u>	.1	Refer to General Conditions.
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PART 1 - GENERAL

- 1.1 PRODUCT DATA .1 Provide product data in accordance with
Section 01 33 00 - Submittal Procedures.

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
V insulation of cross-linked thermosetting
polyethylene material rated RW90 XLPE,.

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 Engineer and
local authority having jurisdiction over
installation.
- .3 Perform tests before energizing electrical
system.
- 3.2 GENERAL CABLE INSTALLATION .1 Cable Colour Coding: to Section 26 05 00
Common Work Results for Electrical.
- .2 Conductor length for parallel feeders to be
identical.
- .3 Lace or clip groups of feeder cables at
distribution centres, pull boxes, and
termination points.
- .4 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.

3.3 INSTALLATION OF .1
BUILDING WIRES

Install wiring as follows:

.1 In conduit systems in accordance with Section 26 05 34 - Conduits, Conduit Fastenings and Conduit Fittings. Where larger conduits are used for multiple circuits the contractor shall adhere to Table 5C for the ampacity correction factors for conductors based on the current carrying capacity of Table 2. Conductor size shall be adjusted appropriately.

PART 1 - GENERAL

1.1 RELATED
SECTIONS

- .1 Section 01 74 19 - Construction/Demolition Waste Management And Disposal.
- .2 Section 26 05 01 - Common Work Results - Electrical.

1.2 REFERENCES

- .1 American National Standards Institute (ANSI)/Institute of Electrical and Electronics Engineers (IEEE)
 - .1 ANSI/IEEE 837-1989(R1996), Qualifying Permanent Connections Used in Substation Grounding.
- .2 Canadian Standards Association, (CSA International)
- .3 CAN/CSA Z32-1999, Electrical Safety and Essential Electrical Systems in Health Care Facilities.

1.3 WASTE
MANAGEMENT AND
DISPOSAL

- .1 Separate and recycle waste materials in accordance with Section 01 74 19 - Construction/Demolition Waste Management And Disposal.
- .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 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

2.1 EQUIPMENT

- .1 Grounding conductors: bare stranded copper, tinned, soft annealed, size as indicated.
- .2 Insulated grounding conductors: green, type RW90.
- .3 Non-corroding accessories necessary for grounding system, type, size, material as indicated, including but not necessarily limited to:
 - .1 Grounding and bonding bushings.
 - .2 Protective type clamps.
 - .3 Bolted type conductor connectors.
 - .4 Bonding jumpers, straps.
 - .5 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 Use mechanical connectors for grounding connections to equipment provided with lugs.
- .5 Soldered joints not permitted.
- .6 Make grounding connections in radial configuration only, with connections terminating at single grounding point . Avoid loop connections.
- .7 Ground secondary service pedestals.

3.2 EQUIPMENT
GROUNDING

- .1 Install grounding connections to typical equipment included in, but not necessarily limited to following list. transformers, , duct systems, frames of motors, starters, control panels.

3.3 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 Departmental Representative and local authority having jurisdiction over installation.
- .3 Perform tests before energizing electrical system.
- .4 Disconnect ground fault indicator during tests.

PART 1 - GENERAL

1.1 RELATED SECTIONS

- .1 Section 01 74 19 - Construction/Demolition Waste Management And Disposal.

1.2 WASTE MANAGEMENT AND DISPOSAL

- .1 Separate and recycle waste materials in accordance with Section 01 74 19 - Construction/Demolition Waste Management And Disposal.
- .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 materials from landfill to metal recycling facility as approved bthe Departmental Representative.
- .5 Fold up metal banding, flatten and place in designated area for recycling.

PART 2 - PRODUCTS

2.1 SUPPORT CHANNELS

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

PART 3 - EXECUTION

3.1 INSTALLATION

- .1 Secure equipment to 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.
-

3.1 INSTALLATION
(Cont'd)

- .4 Secure surface mounted equipment with twist clip fasteners to inverted T bar ceilings. Ensure that T bars are adequately supported to carry weight of equipment specified before installation.
- .5 Support equipment, conduit or cables using clips, spring loaded bolts, cable clamps designed as accessories to basic channel members.
- .6 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.
- .7 Suspended support systems.
 - .1 Support individual cable or conduit runs with 6 mm dia threaded rods and spring clips.
 - .2 Support 2 or more cables or conduits on channels supported by 6 mm dia threaded rod hangers where direct fastening to building construction is impractical.
- .8 For surface mounting of two or more conduits use channels.
- .9 Provide metal brackets, frames, hangers, clamps and related types of support structures where indicated or as required to support conduit and cable runs.
- .10 Ensure adequate support for raceways and cables dropped vertically to equipment where there is no wall support.
- .11 Do not use wire lashing or perforated strap to support or secure raceways or cables.
- .12 Do not use supports or equipment installed for other trades for conduit or cable support except with permission of other trade and approval of the Departmental Representative.
- .13 Install fastenings and supports as required for each type of equipment cables and conduits, and in accordance with manufacturer's installation recommendations.

PART 1 - GENERAL

- | | |
|-----------------------|---|
| <u>1.1 REFERENCES</u> | .1 Canadian Standards Association (CSA International)
.1 CSA C22.1-06, Canadian Electrical Code, Part 1, 20th Edition. |
| <u>1.2 SUBMITTALS</u> | .1 Provide submittals in accordance with Section 01 33 00 - Submittal Procedures. |

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 GALVANIZED
STEEL OUTLET BOXES</u> | .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.
.3 102 mm square or octagonal outlet boxes for lighting fixture outlets.
.4 Extension and plaster rings for flush mounting devices in finished plaster tile walls. |

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- | | | |
|-----------------------------------|----|---|
| <u>2.3 MASONRY BOXES</u> | .1 | Electro-galvanized steel masonry single and multi gang boxes for devices flush mounted in exposed block walls. |
|
 | | |
| <u>2.4 CONCRETE BOXES</u> | .1 | Electro-galvanized sheet steel concrete type boxes for flush mount in concrete with matching extension and plaster rings as required. |
|
 | | |
| <u>2.5 CONDUIT BOXES</u> | .1 | Cast FS or FD aluminum boxes with factory-threaded hubs and mounting feet for surface wiring of devices. |
|
 | | |
| <u>2.6 FITTINGS -
GENERAL</u> | .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 35 mm and pull boxes for larger conduits. |
| | .4 | Double locknuts and insulated bushings on sheet metal boxes. |

PART 3 - EXECUTION

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|-------------------------|----|---|
| <u>3.1 INSTALLATION</u> | .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, and armoured cable connections. Do not install reducing washers. |
-

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OUTLET BOXES,
CONDUIT BOXES
AND FITTINGS

Section 26 05 32
Page 3

- | | |
|--|--|
| <u>3.1 INSTALLATION</u>
<u>(Cont'd)</u> | <p>.5 Identify systems for outlet boxes as required.</p> <p>.6 Use FS boxes for surface mounded boxes.</p> |
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PART 1 - GENERAL

- | | | |
|-----------------------|----|---|
| <u>1.1 REFERENCES</u> | .1 | Canadian Standards Association (CSA International)
.1 CAN/CSA C22.2 No. 18-98(R2003), Outlet Boxes, Conduit Boxes, Fittings and Associated Hardware, A National Standard of Canada.
.2 CSA C22.2 No. 45-M1981(R2003), Rigid Metal Conduit.
.3 CSA C22.2 No. 56-04, Flexible Metal Conduit and Liquid-Tight Flexible Metal Conduit.
.4 CSA C22.2 No. 83-M1985(R2003), Electrical Metallic Tubing.
.5 CSA C22.2 No. 211.2-M1984(R2003), Rigid PVC (Unplasticized) Conduit.
.6 CAN/CSA C22.2 No. 227.3-05, Nonmetallic Mechanical Protection Tubing (NMPT), A National Standard of Canada (February 2006). |
| <u>1.2 SUBMITTALS</u> | .1 | Provide submittals in accordance with Section 01 33 00 - Submittal Procedures. |
| | .2 | Product data: submit manufacturer's printed product literature, specifications and datasheets.
.1 Submit cable manufacturing data. |
| | .3 | Quality assurance submittals:
.1 Test reports: submit certified test reports.
.2 Certificates: submit certificates signed by manufacturer certifying that materials comply with specified performance characteristics and physical properties.
.3 Instructions: submit manufacturer's installation instructions. |

PART 2 - PRODUCTS

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|---------------------|----|---|
| <u>2.1 CONDUITS</u> | .1 | Electrical metallic tubing (EMT): to CSA C22.2 No. 83, with couplings . |
|---------------------|----|---|
-

2.2 CONDUIT
FASTENINGS

- .1 One hole malleable iron steel straps to secure surface conduits 50 mm and smaller.
 - .1 Two hole steel straps for conduits larger than 50 mm.
- .2 Beam clamps to secure conduits to exposed steel work.
- .3 Channel type supports for two or more conduits at m on centre.
- .4 Threaded rods, 6 mm diameter, to support suspended channels.

2.3 CONDUIT
FITTINGS

- .1 Fittings: to CAN/CSA C22.2 No. 18, manufactured for use with conduit specified. Coating: same as conduit.
- .2 Ensure factory "ells" where 90 degrees bends for 25 mm and larger conduits.

2.4 FISH CORD

- .1 Polypropylene.

PART 3 - EXECUTION

3.1 MANUFACTURER'S
INSTRUCTIONS

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

3.2 INSTALLATION

- .1 Install conduits to conserve headroom in exposed locations and cause minimum interference in spaces through which they pass.
 - .2 Conceal conduits except in mechanical and electrical service rooms in unfinished areas.
 - .3 Surface mount conduits except.
-

3.2 INSTALLATION
(Cont'd)

- .4 Use electrical metallic tubing (EMT) except in inmate accessible areas. In inmate accessible areas Rigid Steel conduit shall be used.
- .5 Minimum conduit size for lighting and power circuits: 19 mm. Where larger conduits are used for multiple circuits the contractor shall adhere to Table 5C for the ampacity correction factors for conductors based on the current carrying capacity of Table 2. Conductor size shall be adjusted appropriately.
- .6 Bend conduit cold:
 - .1 Replace conduit if kinked or flattened more than 1/10th of its original diameter.
- .7 Mechanically bend steel conduit over 19 mm diameter.
- .8 Install fish cord in empty conduits.
- .9 Remove and replace blocked conduit sections.
 - .1 Do not use liquids to clean out conduits.
- .10 Dry conduits out before installing wire.

3.3 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 suspended 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.
-

<u>3.4 CONCEALED CONDUITS</u>	.1	Run parallel or perpendicular to building lines.
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<u>3.5 CLEANING</u>	.1	Proceed in accordance with Section 01 74 11 - Cleaning.
	.2	On completion and verification of performance of installation, remove surplus materials, excess materials, rubbish, tools and equipment.

PART 1 - GENERAL

1.1 SECTION
INCLUDES

- .1 Materials for moulded-case circuit breakers,.

1.2 RELATED
SECTIONS

- .1 Section 01 33 00 - Submittal Procedures.
.2 Section 01 74 21 - Construction/Demolition
Waste Management and Disposal.

1.3 REFERENCES

- .1 Canadian Standards Association (CSA
International).
.1 CSA-C22.2 No. 5-02, Moulded-Case Circuit
Breakers, Molded-Case Switches and
Circuit-Breaker Enclosures (Tri-national
standard with UL 489, tenth edition, and the
second edition of NMX-J-266-ANCE).

1.4 SUBMITTALS

- .1 Submit product data in accordance with Section
01 33 00 - Submittal Procedures.
.2 Include time-current characteristic curves for
breakers with ampacity of 400 A and over or
with interrupting capacity of 22,000 A
symmetrical (rms) and over at system voltage.

1.5 WASTE
MANAGEMENT AND
DISPOSAL

- .1 Separate waste materials for reuse and
recycling in accordance with Section 01 74 21
Construction/Demolition Waste Management and
Disposal.
.2 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

2.1 BREAKERS

GENERAL

- .1 Moulded-case circuit breakers, to CSA C22.2 No. 5
- .2 Bolt-on moulded case circuit breaker: quick-make, quick-break type, for manual and automatic operation .
- .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.
- .5 Circuit breakers with interchangeable trips as indicated.
- .6 Circuit breakers to have minimum 22000 amp symmetrical rms interrupting capacity rating.

2.2 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.

PART 3 - EXECUTION

3.1 INSTALLATION

- .1 Install circuit breakers as indicated.