

## **PART 1 - GENERAL**

### **1.1 RELATED REQUIREMENTS**

- .1 Section 26 05 32 - Outlet Boxes, Conduit Boxes and Fittings.
- .2 Section 27 05 28 - Pathways For Communications Systems.
- .3 Section 26 05 29 - Hangers and Supports for Electrical Systems.

### **1.2 REFERENCES**

- .1 Canadian Standards Association (CSA International)
  - .1 CAN/CSA C22.2 No. 18.1-13, Metallic Outlet Boxes.
  - .2 CSA C22.2 No. 45.1-07(R2012), Rigid Metal Conduit.
  - .3 CSA C22.2 No. 56-13, Flexible Metal Conduit and Liquid-Tight Flexible Metal Conduit.
  - .4 CSA C22.2 No. 83-M1985(R2013), Electrical Metallic Tubing.
  - .5 CSA C22.2 No. 211.2-06(R2011), Rigid PVC (Unplasticized) Conduit.
  - .6 CAN/CSA No. 18.3-12, Conduit, Tubing and Cable Fittings.
  - .7 CSA C22.2 No. 211.1-06(R2011), Rigid Types EB1 and DB2/ES2 PVC Conduit.

### **1.3 ACTION AND INFORMATIONAL SUBMITTALS**

- .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.

### **1.4 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.
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- .2 Place materials defined as hazardous or toxic waste in designated containers.
- .3 Ensure emptied containers are sealed and stored safely for disposal away from children.

## **1.5 LEED 2009 REQUIREMENTS**

- .1 LEED Documentation:
  - .1 Submit Material Safety Data Sheets (MSDS) or product data sheets, for all site applied interior paints, coatings, adhesives, sealants, sealant primers, concrete curing compounds, etc. to ensure compliance with LEED Requirements for low emitting materials as per Section 01 35 21.

## **PART 2 - PRODUCTS**

### **2.1 CABLES AND REELS**

- .1 Provide cables on reels or coils.
  - .1 Mark or tag each cable and outside of each reel or coil, to indicate cable length, voltage rating, conductor size, and manufacturer's lot number and reel number.
- .2 Each coil or reel of cable to contain only one continuous cable without splices.
- .3 Identify cables for exclusively dc applications.

### **2.2 CONDUITS**

- .1 Rigid metal conduit: to CSA C22.2 No. 45, hot dipped galvanized steel threaded.
  - .2 Epoxy coated conduit: to CSA C22.2 No. 45, with zinc coating and corrosion resistant epoxy finish inside and outside.
  - .3 Electrical metallic tubing (EMT): to CSA C22.2 No. 83, with couplings.
  - .4 Rigid pvc conduit: to CSA C22.2 No. 211.2. PVC conduits that are not concrete encased shall be Schedule 40.
  - .5 Flexible metal conduit: to CSA C22.2 No. 56, liquid-tight flexible metal.
  - .6 Concrete Encased Duct: Type DB2 to CSA C22.2 No. 211.1.
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### **2.3 CONDUIT FASTENINGS**

- .1 One hole steel straps to secure surface conduits 53 mm and smaller.
  - .1 Two hole steel straps for conduits larger than 53 mm.
- .2 Beam clamps to secure conduits to exposed steel work.
- .3 Channel type supports for two or more conduits in accordance with Section 26 05 29 - Hangers and Supports For Electrical Systems.
- .4 Threaded rods, 6 mm diameter, to support suspended channels.

### **2.4 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" (condulets) where 90 degrees bends for 27 mm and larger conduits, except for communications systems.
- .3 Conduit fittings (condulets) are not permitted for communications systems.
- .4 Watertight connectors and couplings for EMT.
  - .1 Set-screws are not acceptable.
  - .2 Steel with insulated throat.

### **2.5 EXPANSION FITTINGS FOR RIGID CONDUIT**

- .1 Watertight expansion fittings with integral bonding jumper suitable for linear expansion and 19 mm deflection.
- .2 Weatherproof expansion fittings for linear expansion at entry to panel.

### **2.6 COATED RIGID METAL CONDUIT**

- .1 Coated rigid metal conduit to: CSA C22.2 No 45, with zinc coating and corrosion resistant PVC or epoxy finish inside and outside.
  - .2 Fittings: Threaded, manufactured for use with conduit specified. Coating: same as conduit.
  - .3 Coated rigid metal 90° and 45° bends required.
  - .4 Coated rigid metal 5° angle couplings as required.
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- .5 Coated rigid metal sealing fittings with approved sealing compound. Rated Class I, Zone 2, Gr. IIA & IIB hazardous location.
- .6 Coated fittings required to make complete installation (e.g. unions).

## **2.7 FISH CORD**

- .1 Polypropylene.

## **2.8 LEED 2009 REQUIREMENTS**

- .1 All site applied interior paints, coatings, adhesives, sealants, sealant primers, concrete curing compounds, etc. to comply with LEED Requirements for low emitting materials as per Section 01 35 21 - LEED 2009 Requirements.

## **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 unfinished areas.
  - .3 Use rigid hot dipped galvanized steel threaded conduit where specified or subject to mechanical injury and in hazardous location areas.
  - .4 Use epoxy coated conduit as indicated.
  - .5 Use electrical metallic tubing (EMT) indoors where not subject to mechanical injury.
  - .6 Use rigid pvc conduit underground. Use DB2 ducts cast in concrete.
  - .7 Use liquid tight flexible metal conduit for connection to motors or vibrating equipment.
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- .8 Minimum conduit size for lighting and power circuits: 21 mm. Minimum conduit size for communications systems: 27 mm.
- .9 Bend conduit cold:
  - .1 Replace conduit if kinked or flattened more than 1/10th of its original diameter.
- .10 Mechanically bend steel conduit over 21 mm diameter.
- .11 Field threads on rigid conduit must be of sufficient length to draw conduits up tight.
- .12 Install fish cord in empty conduits.
- .13 Remove and replace blocked conduit sections.
  - .1 Do not use liquids to clean out conduits.
- .14 Dry conduits out before installing wire.
- .15 Do not secure conduits to mechanical systems piping or ducts, suspended ceiling, etc.

### **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 or 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.

### **3.4 CONCEALED CONDUITS**

- .1 Run parallel or perpendicular to building lines.
  - .2 Do not install horizontal runs in masonry walls.
  - .3 Do not install conduits in terrazzo or concrete toppings.
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### **3.5 CONDUITS IN CAST-IN-PLACE CONCRETE**

- .1 Locate to suit reinforcing steel.
  - .1 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.
  - .1 Use cold mastic between sleeve and conduit.
- .5 Conduits in slabs: minimum slab thickness 4 times conduit diameter.
- .6 Encase conduits completely in concrete with minimum 25 mm concrete cover, unless noted otherwise.
- .7 Organize conduits in slab to minimize cross-overs.

### **3.6 CONDUITS IN CAST-IN-PLACE SLABS ON GRADE**

- .1 Run conduits 27 mm and larger below slab and encase in 75 mm concrete envelope.
  - .1 Provide 50 mm of sand over concrete envelope below floor slab.

### **3.7 CONDUITS UNDERGROUND**

- .1 Slope conduits to provide drainage.
- .2 Waterproof joints (pvc excepted) with heavy coat of bituminous paint.

### **3.8 CONDUITS TO WET WELL**

- .1 Rigid steel conduit threads shall have at least five fully engaged threads and as required to draw conduits up tight. Running threads are not acceptable.
  - .2 Use coated rigid steel conduit for circuits to/from wet well.
  - .3 Use approved for application and recommended by coated conduit manufacturer touch up compound to repair minor damage to conduit coating and on exposed threads.
  - .4 Install conduit sealing fittings in accordance with CSA C22.1 Section 18 and as indicated. Fill with approved compound.
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### **3.9 CLEANING**

- .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.