Part 1 General

1.1 REFERENCES

.1 Canadian Standards Association (CSA)

.1 CAN/CSA C22.2 No. 18, Outlet Boxes, Conduit Boxes, and Fittings and Associated Hardware.

.2 CAN/CSA C22.2 No. 45.1, Electrical Rigid Metal Conduit – Steel.

.3 CSA C22.2 No. 56, Flexible Metal Conduit and Liquid-Tight Flexible Metal Conduit.

.4 CSA C22.2 No. 211.2, Rigid PVC (Unplasticized) Conduit.

.5 CAN/CSA C22.2 No. 227.3, Nonmetallic Mechanical Protection Tubing (NMPT) and Fittings (Binational Standard, with UL 1696).

1.2 SUBMITTALS

.1 Provide submittals in accordance with Contract Document.

.2 Product Data:

.1 Provide manufacturer's printed product literature, specifications and datasheet and include product characteristics, performance criteria, physical size, finish and limitations.

Part 2 Products

2.1 CONDUITS

.1 Minimum conduit size: 19 mm, unless specifically indicated on the drawings or approved by the Contract Administrator.

.2 Rigid metal conduit: to CSA C22.2 No. 45.1, aluminum, threaded,

.3 Electrical Metallic Tubing CAN/CSA C22.2 No. 83, aluminum threaded.

.4 Flexible metal conduit: to CSA C22.2 No. 56, liquid-tight flexible metal.

.5 Rigid PVC conduit: to CSA C22.2 No. 211.2.

.6 PVC coated Rigid Aluminum: to CSA C22.2 No. 45.1

.7 PVC coated Rigid Aluminum: to CSA C22.2 No. 45.1

2.2 CONDUIT FASTENINGS

.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.

.3 Channel type supports for two or more conduits at 1.5 m oc.

.4 Threaded rods, 6 mm dia., to support suspended channels.

2.3 CONDUIT SPACERS

.1 PVC coated malleable iron spacers, CSA approved for the purpose.

.2 Aluminum channel may be utilized where conduits are grouped, however a non-metallic spacer must be provided between the aluminum channel and concrete.

2.4 CONDUIT FITTINGS

.1 Fittings: manufactured for use with conduit specified. Coating: same as conduit.

.2 Factory "ells" where 90° bends are required for 25 mm and larger conduits.

.3 Utilize insulated grounding bushings at all enclosure entries.

.4 Watertight connectors and couplings for EMT. Set-screws are not acceptable.

2.5 EXPANSION FITTINGS FOR RIGID CONDUIT

.1 Weatherproof expansion fittings with internal bonding assembly suitable for 100 mm linear expansion.

.2 Watertight expansion fittings with integral bonding jumper suitable for linear expansion and 19 mm deflection in all directions.

.3 Weatherproof expansion fittings for linear expansion at entry to panel.

2.6 FISH CORD

.1 Polypropylene

Part 3 Execution

3.1 ROUTING

.1 Locate conduits containing communication and low voltage conductors away from conduits containing power wiring.

.2 Avoid routes that would interfere with any potential maintenance activities such as but not limited to:

.1 Roof hatches.

.2 Mechanical Dampers.

.3 Building/Equipment door openings.

.4 Equipment Monorails.

.3 Where not specifically shown in detail on the drawings, review proposed conduit routing with Contract Administrator prior to installation. Comply with all routing changes requested by the Contract Administrator.

3.2 INSTALLATION

.1 Minimum conduit size for instrumentation to be 21Ø.

.2 Install conduits to conserve headroom in exposed locations and cause minimum interference in spaces through which they pass.

.3 Conceal conduits in finished areas.

.4 Surface mount conduits in mechanical and electrical service rooms and in unfinished areas.

.5 Use rigid aluminum threaded conduit except where specified otherwise.

.6 Minimum conduit size for lighting and power circuits: 19 mm.

.7 Mechanically bend steel conduit over 19 mm dia.

.8 Field threads on rigid conduit must be of sufficient length to draw conduits up tight.

.9 Remove and replace blocked conduit sections. Do not use liquids to clean out conduits.

.10 Dry conduits out before installing wire.

.11 Do not include more than the equivalent of four (4) quarter bends. Provide pull boxes as required.

.12 Ensure electrical continuity in all conduit systems.

.13 All conduit shown exposed in finished areas is to be free of unnecessary labels and trade marks.

.14 Seal conduits with duct seal where conduits are run between heated and unheated areas. Where conduits, cables, or cable trays pierce fire separations, seal openings with Dow Corning 3-6548 sealant. Seal all conduits entering or leaving hazardous classified areas with approved seals.

.15 EYS seal conduits after explosion-proof boxes towards unclassified areas. Add Chico compound to stop migration of hazardous gases only after all tests and commission is successfully done.

.16 Where conduits pass through walls, group and install through openings. After all conduits shown on the Drawings are installed, close wall openings with material compatible with the wall construction.

.17 Install fish cord in empty conduits.

.18 Install ground wire in all conduits. Size ground wire as per CEC Table 17.

.19 Underground conduits: Slope conduits to provide drainage, use waterproof joints (PVC excepted) with heavy coat of bituminous paint.

3.3 SURFACE CONDUITS

1 Run parallel or perpendicular to building lines.

2 Group conduits wherever possible on suspended or surface channels.

3 Provide a minimum space of 12 mm between conduits.

4 Do not pass conduits through structural members except as indicated.

5 Do not locate conduits less than 75 mm parallel to steam or hot water lines with minimum of 25 mm at crossovers.

6 Provide a separate ground wire within rigid conduit, bonded to motor frames and system ground.

7 Install spacers as required to provide a space between the conduits and the supporting surface, with a minimum space as follows:

.1 Above grade spaces not classified as CEC Category 1 or 2:

.1 Drywall / Wood surfaces: no space required

.2 Masonry / concrete surfaces: 6 mm

.2 Below grade spaces: 12 mm

3.4 Colour Coding

.1 Apply plastic tape or paint colour coded bands to conduits at points where conduit or cable enters wall, ceiling, or floor, and at 5 m intervals.

.2 Bands: 38 mm wide prime colour and 19 mm wide auxiliary colours.

.3 Band colours as per below, table 4-5 of the CoW Electrical Design Guide.

Table 4-5 : Conduit Colour Bands

System	Prime Band	Aux. Band
Medium Voltage (> 750 V)	Orange	
347/600 V	Yellow	
208/120/240 V Power	Black	
UPS 208/120/240 V Power	Black	Green
Control Wiring (120 V)	Black	Orange
Fire Alarm	Red	
Low Voltage Communication/General	Blue	
Low Voltage Control Wiring (< 50 V)	Blue	Orange
Intrinsically Safe	Blue	White
Grounding	Green	
Fibre Optic Cable	Purple	

3.5 PVC CONDUIT

.1 Concrete Penetrations:

.1 Seal and fire stop penetration around conduit with CSA approved assembly for the installation conditions.

.2 Maximum spacing between supports for rigid PVC conduit:

.1 27mm conduit 0.75 m

.2 35mm conduit 0.75 m

.3 41mm conduit 1.2 m

.4 53mm conduit 1.5 m

.5 63mm conduit 1.5 m

.6 78mm conduit 1.5 m

.7 91mm conduit and larger 2.0 m

3.6 METAL CONDUIT

.1 Bend conduit cold. Replace conduit if kinked or flattened more than 1/10th of its original diameter.

.2 Mechanically bend conduits over 19 mm in diameter.

.3 Concrete Penetrations:

.1 Sleeves for Aluminum Conduit

.1 Install schedule 40 galvanized steel pipe, sized for free passage of conduit.

.2 Seal and fire stop penetration around conduit with CSA approved assembly for the installation conditions.

3.7 LIQUID-TIGHT AND EXPLOSION-PROOF FLEXIBLE CONDUIT

.1 Use as LT raceways at all motors, pipe-mounted control devices, and other devices subject to movement or water when located in non-classified areas.

2 Use as XP raceways at all motors, pipe-mounted control devices, and other devices subject to movement when located in classified areas.

.3 At all motors provide a short length before connecting to the motor terminal box. Minimum length shall be 450 mm plus four times the conduit diameter.

.4 Provide a separate ground wire within flexible conduit, bonded to motor frames and system ground.

3.8 CONCEALED CONDUIT

.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.

3.9 CONDUIT 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 is 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.

3.10 CONDUIT IN CAST-IN-PLACE SLABS ON GRADE

.1 Run conduits 25 mm and larger below slab and encased in 75 mm concrete envelope. Provide 50 mm of sand over concrete envelope below floor slab.

3.11 INSTALLATIONS IN CATEGORY 1 AND 2 LOCATIONS

.1 As per CEC section 22.

.2 Arrange to provide drainage at frequent intervals to suitable locations.

.3 Equip with approved fittings to permit the moisture to drain out of the system.

.4 Install the conduit with a minimum of 12 mm space from the supporting surface.

.5 Install every joint to be water-tight.

.6 Where conduit leaves a warm room and enters a cooler atmosphere, seal the conduit and arrange the conduit in a manner to avoid condensation accumulation at the seal.

3.12 INSTALLATIONS IN HAZARDOUS ZONE 1 AND 2 LOCATIONS

.1 Explosion proof conduit sealing fittings:

.1 Install sealing fittings as indicated and on all new conduit installations to meet CEC requirements.

.2 Add sealing compound following manufacturer's instructions.

END OF SECTION