PART 1 - GENERAL

1.1 DESCRIPTION OR WORK

.1 Electrical work includes but is not restricted to:
.1 Replacement of High Pressure Test Cell Control System.

1.2 REFERENCES

.1 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.

.2 Reference Standards:
.1 CSA Group
.1 CSA C22.1-15, Canadian Electrical Code, Part 1 (23rd Edition), Safety Standard for Electrical Installations.
.2 IEEE SP1122-2000, The Authoritative Dictionary of IEEE Standards Terms, 7th Edition.

1.3 DESIGN REQUIREMENTS

.1 Motors, electric heating, control and distribution devices and equipment to operate satisfactorily at 60 Hz within normal operating limits established by above standard.

.2 Language operating requirements: provide identification nameplates and labels for control items in English.

.3 Use one nameplate or label.

1.4 ACTION AND INFORMATIONAL SUBMITTALS

.1 Submit as instructed by Departmental Representative.

.2 Quality Control: as instructed by Departmental Representative.

.3 Separate wate materils for reuse and recycling. Clean site each day at the end of the work day.

1.5 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.

.5 Ensure operating instructions will not fade when exposed to sunlight and are secured to prevent easy removal or peeling.

PART 2 - PRODUCTS

2.1 MATERIALS AND EQUIPMENT

.1 Material and equipment to be CSA certified.

.2 Factory assemble control panels and component assemblies.

2.2 WARNING SIGNS

.1 Warning Signs: in accordance with requirements of Departmental Representative.

.2 Decal signs, minimum size 175 x 250 mm.

2.3 WIRING TERMINATIONS

.1 Ensure lugs, terminals, screws used for termination of wiring are suitable for either copper or aluminum conductors.

2.4 EQUIPMENT IDENTIFICATION

.1 Identify electrical equipment with nameplates and labels as follows:
.1 Nameplates: plastic laminate lamicoid 3 mm thick plastic engraving sheet melamine, black matt white finish face, black, 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 Allow for minimum of twenty-five (25) letters per nameplate and label.

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

.5 Identify equipment with Size 3 labels engraved "ASSET INVENTORY NO. " as directed by Departmental Representative.

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

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

2.5 WIRING IDENTIFICATION

.1 Identify wiring with permanent indelible identifying markings, numbered and coloured plastic tapes, on both ends of phase conductors of feeders and branch circuit wiring.

.2 Maintain phase sequence and colour coding throughout.

2.5 WIRING IDENTIFICATION (Cont'd)

.3 Colour coding: to CSA C22.1.

2.6 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.

.4 Match site existing colour code.

Prime	Auxiliary
up to 250 V	Yellow

2.7 FINISHES

.1 Shop finish metal enclosure surfaces by application of rust resistant primer inside and outside, and at least two coats of finish enamel.

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 cables, conduits and fittings embedded or plastered over, close to building structure so furring can be kept to minimum.

3.4 MOUNTING HEIGHTS

.1 Install electrical equipment at following heights unless indicated otherwise.
.1 Local switches: 1400 mm.

3.4 MOUNTING HEIGHTS (Cont'd)

.1 (Cont'd)

.2 Wall receptacles:

.1 General: 300 mm.

.3 Panelboards: as required by Code or as indicated.

3.5 CO-ORDINATION OF PROTECTIVE DEVICES

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

3.6 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.

END OF SECTION

PART 1 - GENERAL

1.1 RELATED REQUIREMENTS

.1 Section 26 05 00 - Common Work Results For Electrical.

1.2 REFERENCES

.1 CSA International
.1 CAN/CSA-C22.2 No.18-98(R2003), Outlet Boxes, Conduit Boxes and Fittings.
.2 CAN/CSA-C22.2 No.65-13, Wire Connectors (Tri-National Standard with UL 486A-486B and NMX-J-543-ANCE-03).

.2 Electrical and Electronic Manufacturers' Association of Canada (EEMAC)

.3 National Electrical Manufacturers Association (NEMA)

PART 2 - PRODUCTS

2.1 MATERIALS

.1 Pressure type wire connectors to: CAN/CSA-C22.2 No.65, sized to fit copper or aluminum conductors as required.

.2 Clamps or connectors for as required to: CAN/CSA-C22.2 No.18.

2.2 TERMINAL BLOCKS

.1 Tin-plated terminals and stainless steel spring clamps for resistance to corrosion and vibration.

.2 Screw type design.

.3 Top wire entry for ease of installation.

.4 Circuit testing with standard 2 mm diameter test probe or stackable test plugs on most spring-clamp blocks.

.5 Insulation stops to ensure electrical connection when using smaller gauge wires.

.6 Markers that are visible after terminal blocks are wired.

2.2 TERMINAL BLOCKS (Cont'd)

.7 Common profiles to minimize stocking of accessories.

.8 Self-extinguishing, polymide 6.6 housing materials with a flammability rating UL 94-V0 (1492-R terminal blocks have a UL 94-V2 flammability rating).

.9 DIN Rail mounting.

PART 3 - EXECUTION

3.1 EXAMINATION

.1 Verification of Conditions: verify that conditions of substrate previously installed under other Sections or Contracts are acceptable for wire and box connectors installation in accordance with manufacturer's written instructions.
.1 Visually inspect substrate in presence of Departmental Representative.
.2 Inform Departmental Representative of unacceptable conditions immediately upon discovery.
.3 Proceed with installation only after unacceptable conditions have been remedied and after receipt of written approval to proceed from Departmental Representative.

3.2 INSTALLATION

.1 Remove insulation carefully from ends of conductors and cables 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 CAN/CSA-C22.2 No.65.
.3 Install fixture type connectors and tighten to CAN/CSA-C22.2 No.65. Replace insulating cap.
.4 All wiring terminations in control cabinets shall be fixed terminal block type.

END OF SECTION

PART 1 - GENERAL

1.1 RELATED REQUIREMENTS

.1 Section 26 05 20 - Wires and Box Connectors (0-1000 V).

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 for aboveground installation and RWU90 XLPE for underground application.

2.2 TECK 90 CABLE

.1 Cable: in accordance with Section 26 05 00 - Common Work Results for Electrical.

.2 Conductors:
.1 Grounding conductor: copper, as indicated.
.2 Circuit conductors: copper, as indicated, size as indicated.

.3 Fastenings:
.1 One hole steel straps to secure surface cables 50 mm and smaller. Two hole steel straps for cables larger than 50 mm.
.2 Channel type supports for two or more cables at 1500 mm centers.
.3 Threaded rods: 6 mm diameter to support suspended channels.

.4 Connectors:
.1 Watertight, approved for TECK cable.

2.3 ARMOURED CONTROL CABLE

.1 Cable: in accordance with Section 26 05 00 Common Work Results for Electrical.

.2 Conductors:
.1 Grounding conductor: copper.
.2 Circuit conductors: copper, size as required.

2.3 ARMOURED CONTROL CABLE (Cont'd)

.2 (Cont'd)
.3 Insulation:
.1 Cross-linked polyethylene XLPE.
.2 Rating: 600 V.
.4 Overall covering: thermoplastic polyvinyl chloride, compliant to applicable Building Code classification for this project.
.5 Fastenings:
.1 One-hole steel straps to secure surface cables 50 mm and smaller. Two-hole steel straps for cables largerthan 50 mm.
.2 Channel type supports for two or more cables at 1500 mm centers.
.3 Threaded rodsw: 6 mm diameter to support suspended channels.
.6 Connectors:
.1 Water-tight, approved for TECK cable.
.7 Contractor is responsible for the routing of the control cables, and the selection of size, number of conductors and ratings.
.8 Conductor size #18 AWG to #16 AWG.

2.4 CONTROL CABLES

.1 Type: LVT: soft annealed copper conductors, sized as required.
.1 Contractor is responsible for the routing of the control cables, and the selection of size, number of conductors and ratings.
.1 Control wiring/cables shall be run in rigid galvanized or EMT conduits if not of the armoured type.
.2 AC-90 is not allowed.
.3 Cable insulation 600 V.
.2 Shield as required.
.3 Drain wire as required.
.4 Number of conductors as required.
.5 Wire size #18 to #16.

PART 3 - EXECUTION

3.1 FIELD QUALITY CONTROL

.1 Perform tests in accordance with Section 26 05 00 - Common Work Results for Electrical.

3.1 FIELD QUALITY CONTROL (Cont'd)

.2 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 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.

.5 Provide numbered wire collars for control wiring. Numbers to correspond to control shop drawing legend. Obtain wiring diagram for control wiring.

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.

3.4 INSTALLATION OF TECK90 CABLE (0 -1000 V)

.1 Group cables wherever possible on channels.

.2 Install cable exposed, securely supported by straps.

3.5 INSTALLATION OF ARMOURED CABLES

.1 Group cables wherever possible on channels.

3.6 INSTALLATION OF CONTROL CABLES

.1 Install control cables in conduit.

.2 Ground control cable shield.

END OF SECTION

PART 1 - GENERAL

1.1 REFERENCES

.1 American National Standards Institute /Institute of Electrical and Electronics Engineers (ANSI/IEEE)
.1 ANSI/IEEE 837-14, IEEE Standard for Qualifying Permanent Connections Used in Substation Grounding.

.2 CSA International
.1 CSA Z32-15, Electrical Safety and Essential Electrical Systems in Health Care Facilities.

PART 2 - PRODUCTS

2.1 EQUIPMENT

.1 Conductors: bare stranded copper, size as indicated.

.2 Insulated grounding conductors: green, copper conductors, size as indicated.

PART 3 - EXECUTION

3.1 EXAMINATION

.1 Verification of Conditions: verify that conditions of substrate previously installed under other Sections or Contracts are acceptable for grounding equipment installation in accordance with manufacturer's written instructions.
.1 Visually inspect substrate in presence of Departmental Representative.
.2 Inform Departmental Representative of unacceptable conditions immediately upon discovery.
.3 Proceed with installation only after unacceptable conditions have been remedied and after receipt of written approval to proceed from Departmental Representative.

3.2 INSTALLATION GENERAL

.1 Install connectors in accordance with manufacturer's instructions.

3.2 INSTALLATION GENERAL (Cont'd)

.2 Protect exposed conductors from mechanical injury.

.3 Use mechanical connectors for connections to equipment provided with lugs.

.4 Soldered joints not permitted.

.5 Install bonding wire for flexible conduit, connected at one end to grounding bushing, solderless lug, clamp or cup washer and screw. Neatly cleat bonding wire to exterior of conduit.

.6 Bond single conductor, metallic armoured cables to cabinet at supply end.

3.3 EQUIPMENT BONDING

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

3.4 FIELD QUALITY CONTROL

.1 Perform tests in accordance with Section 26 05 00 - Common Work Results for 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.

END OF SECTION

PART 1 - GENERAL

1.1 RELATED REQUIREMENTS

.1 Section 26 05 21 - Wires and Cables (0-1000 V).

PART 2 - PRODUCTS

2.1 SUPPORT CHANNELS

.1 U shape, size 41 x 41 mm, 2.5 mm thick, surface mounted or suspended as indicated, suspended, set in poured concrete walls and ceilings.

.2 ASTM A500 tubing hot dip galvanized, size as indicated.

PART 3 - EXECUTION

3.1 EXAMINATION

.1 Verification of Conditions: verify that conditions of substrate previously installed under other Sections or Contracts are acceptable for hangers and supports installation in accordance with manufacturer's written instructions.
.1 Visually inspect substrate in presence of Departmental Representative.
.2 Inform Departmental Representative of unacceptable conditions immediately upon discovery.
.3 Proceed with installation only after unacceptable conditions have been remedied and after receipt of written approval to proceed from Departmental Representative.

3.2 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.

3.2 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 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.

.8 For surface mounting of two or more conduits use channels at 1500 mm on centre spacing.

.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 Departmental

3.2 INSTALLATION (Cont'd)

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

END OF SECTION

PART 1 - GENERAL

1.1 RELATED REQUIREMENTS

.1 Section 26 05 34 - Conduits, Conduit Fastenings and conduit Fittings.

1.2 REFERENCES

.1 Canadian Standards Association (CSA International)
.1 CSA C22.1-15, Canadian Electrical Code, Part 1, 23rd Edition.

1.3 ACTION AND INFORMATIONAL SUBMITTALS

.1 Submit shop drawings for cabinets. Include material, dimensions and approvals.

PART 2 - PRODUCTS

2.1 SPLITTERS

.1 Construction: sheet metal enclosure, welded corners and formed hinged cover suitable for locking in closed position.

.2 Terminations: connection blocks to match required size and number of incoming and outgoing conductors as indicated.

.3 Spare Terminals: minimum three spare terminals or lugs on each connection or lug block sized less than 400 A.

2.2 JUNCTION AND PULL BOXES

.1 Construction: welded steel enclosure.

.2 Covers Flush Mounted: 25 mm minimum extension all around.

.3 Covers Surface Mounted: hinged, screw-on turned edge covers.

2.3 CABINETS

.1 Construction: CSA Type 3R welded sheet steel hinged door, handle, lock 2 keys and catch

2.3 CABINETS (Cont'd)

.2 Type T Terminal: mounting as indicated. With din rail mounted terminals, all connections to be terminated on terminals.

PART 3 - EXECUTION

3.1 SPLITTER INSTALLATION

.1 Mount plumb, true and square to building lines.

.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 Mount cabinets with top not higher than 2 m above finished floor except where indicated otherwise.

.3 Install terminal block in cabinets.

.4 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.

END OF SECTION

PART 1 - GENERAL

1.1 RELATED REQUIREMENTS

.1 Section 26 05 34 - Conduits, Conduit Fastenings and Conduit Fittings.

1.2 REFERENCES

.1 Canadian Standards Association (CSA International)
.1 CSA C22.1-15, Canadian Electrical Code, Part 1, 23rd Edition.

PART 2 - PRODUCTS

2.1 OUTLET AND CONDUIT BOXES GENERAL

.1 Size boxes in accordance with CSA C22.1.

.2 102 mm square or larger outlet boxes as required.

.3 Blank cover plates for boxes without wiring devices.

2.2 CONDUIT BOXES

.1 Cast FS or FD copper-free aluminum boxes with factory -threaded hubs and mounting feet for surface wiring of devices.

2.3 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 35 mm and pull boxes for larger conduits.

.4 Double locknuts and insulated bushings on sheet metal boxes.

PART 3 - EXECUTION

3.1 INSTALLATION

.1 Support boxes independently of connecting conduits.

.2 Fill boxes with paper, sponges or foam or similar approved material to prevent entry of debris during construction. Remove upon completion of work.

.3 Provide correct size of openings in boxes for conduit, mineral insulated and armoured cable connections. Do not install reducing washers.

.4 Vacuum clean interior of outlet boxes before installation of wiring devices.

.5 Identify systems for outlet boxes as required.

.6 Use FS or FD boxes.

.7 Conduit fittings (condulets) shall be accessible (not concealed).

.8 Each receptacle to have its panel and circuit number identified on lamicoid nameplate above device.

.9 Dedicated neutrals required for all circuits.

END OF SECTION

PART 1 - GENERAL ÿ

1.1 REFERENCES

.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. 56-13, 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 C22.2 No. 227.3-15, Nonmetallic Mechanical Protection Tubing (NMPT), A National Standard of Canada (February 2006).

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.

.2 Each coil or reel of cable to contain only one continuous cable without splices.

2.2 CONDUITS

.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 with expanded ends.

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

2.3 CONDUIT FASTENINGS

.1 One hole steel straps to secure surface conduits 50 mm and smaller.

2.3 CONDUIT FASTENINGS (Cont'd)

.1 (Cont'd)
.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 1.5 m on centre.

.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" where 90 degrees bends for NPS 1 25 mm and larger conduits.

.3 Watertight connectors and couplings for EMT.
.1 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.

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

2.6 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 and in unfinished areas.

.3 Use rigid hot dipped galvanized steel except where specified otherwise.

.4 Use liquid tight flexible metal conduit for connection to motors or vibrating equipment.

.5 Minimum conduit size for lighting and power circuits: 27 mm.

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

.9 Install fish cord in empty 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.

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.

END OF SECTION

PART 1 - GENERAL

1.1 RELATED REQUIREMENTS

.1 Section 26 05 00 - Common Work Results For Electrical.

1.2 REFERENCES

.1 Canadian Standards Association (CSA International)
.1 CAN/CSA-C22.2 No.4-04(R2009), Enclosed and Dead-Front Switches.
.2 CSA C22.2 No.39-13, Fuseholder Assemblies.

PART 2 - PRODUCTS

2.1 DISCONNECT SWITCHES

.1 Fusible, horsepower rated disconnect switch in CSA enclosure,Type 2, to CAN/CSA-C22.2 No.4, size as required.

.2 Provision for padlocking in on-off switch position.

.3 Mechanically interlocked door to prevent opening when handle in ON position.

.4 Fuses: size as indicated.

.5 Fuseholders: to CSA C22.2 No.39 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.

2.2 EQUIPMENT IDENTIFICATION

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

.2 Indicate name of load controlled on size 4 nameplate.

PART 3 - EXECUTION ÿ

3.1 INSTALLATION .1 Install disconnect switches complete with fuses if applicable.

END OF SECTION

PART 1 - GENERAL

1.1 RELATED REQUIREMENTS

.1 Section 26 05 00 - Common Work Results for Electrical.

1.2 SHOP DRAWINGS

.1 Submit shop drawings in accordance with Section 26 05 00 - Common work Results For Electrical.

.2 Include data sheets, schematic, wiring, interconnection diagrams.

1.3 REFERENCES

.1 CSA C23.2 No. 14-13, Industrial Control Equipment.

1.4 INSPECTION OF INSTALLATION

.1 The Contractor is to provide and pay all associated fees for a controls systems integrator to be present to do start-up, check, adjust, balance and calibrate all field instrumentation devices, specified herein as indicated on drawings along with all "equipment packages" specified under Division 26, and other construction divisions.

.2 Equipment will only be accepted after receipt of the manufacturer's representative's report.

.3 Modify or replace equipment or materials failing required tests.

.4 Perform additional testing required due to changes of materials requested by equipment supplier or due to failure of materials or construction to meet the requirements of the specification.

.5 Contractor to provide technical personnel during this phase of the work for instrument recalibration, re-wiring, reprogramming, etc. as required until the integrated waste-water treatment plant control system is deemed ready for operation.

1.4 INSPECTION OF INSTALLATION (Cont'd)

.6 The existing waste-water treatment plant shall remain in operation until the new waste-water treatment plant is successfully tested, commissioned and in full operation.

PART 2 - PRODUCTS

2.1 PUSHBUTTONS

.1 Pushbuttons shall be 30.5 mm heavy duty, corrosion resistant/watertight/oil tight, booted, flush momentary contact (unless indicated otherwise), complete with one normally closed and one normally open contact, refer to control schematic for required contacts configuration.

.2 Acceptable Manufacturers:
.1 Any that meet the above listed specifications.

.3 Suggested Manufacturers:
.1 Schneider Electric, Allen Bradley, Crouse-Hinds, etc.

2.2 EMERGENCY STOP BUTTONS

.1 Twist to release.

.2 NC contacts to IEC 60947-5-1.

.3 30.5 mm oil tight.

.4 Red mushroom type operator.

.5 With black lettering on yellow circular label "E-STOP".

2.3 INDICATING LIGHTS

.1 All panel mounted indicating light shall be heavy duty, corrosion resistant/water tight/oil tight and rated for the applicable hazardous area classification, CSA 4X, 120 VAC rated, and coloured as per controls schematic diagrams.

.2 Acceptable Manufacturers:
.1 Any that meet the above listed specification.

.3 Suggested Manufacturers:

2.3 INDICATING LIGHTS (Cont'd)

.3 (Cont'd)
.1 Schneider Electric, Allen Bradley, Crouse-Hinds, etc.

2.4 SELECTOR SWITCH

.1 All field mounted selector switches shall be heavy duty, corrosion resistant/water tight/oil tight, "dead-front" mounted, two (2) or three (3) position (refer to control schematic diagrams), either maintained or spring return contact (as indicated on the drawings) minimum CSA 4X and complete with one normally open and one normally closed contact per position.
.1 Acceptable Manufacturers:
.1 Any that meet the above listed specification.
.2 Suggested Manufacturers:
.1 Schneider Electric, Allen Bradley, Crouse-Hinds, etc.

2.5 CONTROL TRANSFORMER

.1 Single phase dry type.

.2 Primary: 600 VAC, 60 Hz.

.3 Secondary: as indicated.

.4 Primary and secondary HRC fusing, size as required.

.5 Rating: sized for control circuit load plus 30% spare capacity.

.6 Close voltage regulation as required by magnet coils.

2.6 CONTROL RELAYS

.1 Universal pole type: electrically held with poles as indicated, convertible from NO to NC by changing wiring connections. Coil rating: as indicated. Contact rating: as indicated and as required.

2.7 SAFETY RELAYS

.1 To CAN/CSA Z-462-15 Safety-Cat.III.

.2 Field configurable for auto or manual reset.

2.7 SAFETY RELAYS (Cont'd)

.3 Suggested product: AB440R series.

.4 Positively guided contacts.

.5 Monitoring loops pulse train signal type.

2.8 RELAY ACCESSORIES

.1 Standard contact cartridges: normally-open -convertible to normally-closed in field.

PART 3 - EXECUTION

3.1 INSTALLATION

.1 Install all units to manufacturers' specifications and requirements.

.2 Install alarm indicating light where indicated on the drawings.

.3 Complete power and control wiring/cabling termination on terminal strips.

END OF SECTION