

Part 1 General

1.1 SCOPE OF WORK (ELECTRICAL)

Note: All references to 'DDC' and 'DDC System' refer to EMSC. See Division 26.

.1 DDC System Upgrades (Connection of Unit 6 and Works Buildings)

.1 Existing Systems:

Delta Controls systems are currently installed in Unit 6, the Works Building, and in several other buildings at Stony Mountain Institution. The Unit 6 DDC system is not connected to the central DDC system, which is controlled from a operating station in the Powerhouse. The DDC panel for Unit 6 is located in the second floor mechanical room. The Works Building is connected to the central DDC system via an MSTP cable. There are two DDC panels in the Works Building, one in a main floor mechanical room and one in a second floor mechanical room. The 'Works building DDC panel' referred to in this project is the one on the main floor.

.2 Install three new continuous sections of fibre optic cable, one each between the following locations:

- .1 Powerhouse DDC Panel and Works Building DDC Panel
- .2 Works Building DDC Panel and Unit 6 DDC Panel
- .3 Unit 6 DDC Panel and Powerhouse DDC Panel

.3 Install new conduit, junction boxes, and enclosures as shown on the drawings. Pull the new fibre optic cables through the new and existing conduits and junction boxes as shown on the drawings.

.2 Fan Coil Installation (8 Locations)

.1 Existing Systems:

Delta controllers are currently installed in two locations in the Unit 6 gallery hallways. The first location is half way down the gallery hallway between Ranges I and J, in a 610 x 610 enclosure. The second location is half way down the gallery hallway between Ranges G and H, also in a 610 x 610 enclosure.

.2 Install one new 610 x 610 metal enclosure next to each of the two existing enclosures described above.

.3 Install two new 120V circuits on an existing panel located in the gallery hallway. Install new 120V power supply wiring in new conduit to each new 610 x 610 enclosure.

.4 Install low voltage control wiring (0-10 V and 24 V) and low voltage power supply wiring (24 VDC) for the fan coil and related sensors. Install wiring from each new fan coil to the new DDC controllers. All wiring shall be concealed in new conduits and enclosures as shown on the drawings. Note: Access hatches to mechanical chases above each range hallway are welded shut. The contractor is responsible for opening and re-welding closed the access hatch doors. The

contractor is also responsible for repairing all surfaces and enclosures damaged during the execution of work.

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 CSA Group
 - .1 CSA C22.1-15, Canadian Electrical Code, Part 1 (23rd Edition), Safety Standard for Electrical Installations.
 - .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.

1.3 ACTION AND INFORMATIONAL SUBMITTALS

- .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 and include product characteristics, performance criteria, physical size, finish and limitations.

1.4 CLOSEOUT SUBMITTALS

- .1 Submit in accordance with Section 01 78 00 - Closeout Submittals.

1.5 DELIVERY, STORAGE AND HANDLING

- .1 Delivery and Acceptance Requirements: deliver materials to site in original factory packaging, labelled with manufacturer's name and address.
- .2 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 from nicks, scratches, and blemishes.
 - .3 Replace defective or damaged materials with new.

Part 2 Products

2.1 MATERIALS AND EQUIPMENT

- .1 Provide material and equipment in accordance with drawings.

- .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
- .3 Factory assemble control panels and component assemblies.

2.2 WIRING TERMINATIONS

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

2.3 EQUIPMENT IDENTIFICATION

- .1 Identify electrical equipment with labels as follows:
 - .2 Labels: embossed plastic labels with 6 mm high letters unless specified otherwise.
 - .3 Wording on labels to be approved by Departmental Representative prior to manufacture.

2.4 WIRING IDENTIFICATION

- .1 Identify wiring with permanent indelible identifying markings, coloured plastic tapes, 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.

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 installation in accordance with manufacturer's written instructions.
 - .1 Inform Departmental Representative of unacceptable conditions immediately upon discovery.
 - .2 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 Do complete installation in accordance with CSA C22.1 except where specified otherwise.

3.3 CONDUIT AND CABLE INSTALLATION

- .1 Install cables, conduits and fittings as indicated on drawings.

3.4 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 As required by code or indicated on plans

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 Progress Cleaning: clean in accordance with Section 01 74 11 - Cleaning.
 - .1 Leave Work area clean at end of each day.
- .2 Final Cleaning: upon completion remove surplus materials, rubbish, tools and equipment in accordance with Section 01 74 11 - Cleaning

END OF SECTION

Part 1 General

1.1 NOT USED

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.65-03(R2008), Wire Connectors (Tri-National Standard with UL 486A-486B and NMX-J-543-ANCE-03).
- .2 National Electrical Manufacturers Association (NEMA)

1.3 ACTION AND INFORMATIONAL SUBMITTALS

- .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 wire and box connectors and include product characteristics, performance criteria, physical size, finish and limitations.

1.4 CLOSEOUT SUBMITTALS

- .1 Submit in accordance with Section 01 78 00 - Closeout Submittals.
- .2 Operation and Maintenance Data: submit operation and maintenance data for wire and box connectors for incorporation into manual.

1.5 DELIVERY, STORAGE AND HANDLING

- .1 Deliver, store and handle materials in accordance with manufacturer's written instructions
- .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 wire and box connectors from nicks, scratches, and blemishes
 - .3 Replace defective or damaged materials with new.

Part 2 Products

2.1 NOT USED

Part 3 Execution

3.1 INSTALLATION

- .1 Fibre optic cable shall be installed according to the more stringent of the following two requirements: the fibre optic cable manufacturer's recommendations or to allow minimum fibre optic bend radius as follows:
 - .1 Installation – 90 mm
 - .2 Long Term – 60 mm
- .2 Fibre Optic Cables are to be continuous, with no splices

3.2 CLEANING

- .1 Progress Cleaning: clean in accordance with Section 01 74 11 - Cleaning.
 - .1 Leave Work area clean at end of each day.
- .2 Final Cleaning: upon completion remove surplus materials, rubbish, tools and equipment in accordance with Section 01 74 11 - Cleaning.

END OF SECTION

Part 1 General

1.1 RELATED REQUIREMENTS

- .1 Not Used

1.2 REFERENCE STANDARDS

- .1 CAN/CSA C22.1-15 Canadian Electrical Code, Part 1.

1.3 PRODUCT DATA

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

1.4 DELIVERY, STORAGE AND HANDLING

- .1 Packaging Waste Management: in accordance with Section 01 74 21 - Construction/Demolition Waste Management and Disposal.

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.

2.2 CONTROL CABLES

- .1 Type: LVT: 2 soft annealed copper conductors, sized as indicated:
 - .1 Insulation: thermoplastic.
 - .2 Sheath: thermoplastic jacket.

2.3 FIBRE OPTIC CABLES

- .1 Minimum 6 strands, indoor/outdoor, riser rated type, with the following performance characteristics:
 - .1 Mode: Single mode
 - .2 Core/Clad: 8.3/125
 - .3 N/A: .14
 - .4 Type. Atten. (dB/km): 0.5/0.4
 - .5 Max. Atten. (dB/km): 1.0/0.75
 - .6 Bandwidth (Mhz*km) Corning# SMF28e
 - .7 Max Diameter (mm) 5.3
 - .8 Pull Load (N) Install/Operate: 1000/300
 - .9 Bend Radius (mm) Install/Operate: 90/60
 - .10 Buffer Size (um): 900
 - .11 Storage Temp. (°C): -40 / +85
 - .12 Operating Temp. (°C): -20 / +85
 - .13 Colour: Yellow

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.
- .4 Test fibre optic cables for end to end loss exceeds total allowable loss according OFSTP-7 standard. The source should be of the same type and wavelength as the transmitters used in the network being tested.

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 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.

- .6 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 CONTROL CABLES

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

3.5 INSTALLATION OF NON-METALLIC SHEATHED CABLE

- .1 Install cables.
- .2 Install straps and box connectors to cables as required.

3.6 INSTALLATION OF FIBRE OPTIC CABLES

- .1 Install cables per manufacturer's recommendations.
- .2 Install pull tape in all conduits to enable future cable pulling.

END OF SECTION

Part 1 General

1.1 NOT USED

1.2 REFERENCES

- .1 Canadian Standards Association (CSA International)
 - .1 CSA C22.1-2015, Canadian Electrical Code, Part 1, 23rd Edition.

1.3 ACTION AND INFORMATIONAL 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.

1.4 DELIVERY, STORAGE AND HANDLING

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

Part 2 Products

2.1 JUNCTION AND PULL BOXES FOR FIBRE OPTIC CABLE

- .1 Construction: welded steel enclosure, 914 x 200 x 127 mm.
- .2 Covers surface mounted, top hinged flat covers.

2.2 JUNCTION AND PULL BOXES FOR LOW VOLTAGE CONTROL AND POWER SUPPLY CABLES

- .1 Construction: steel enclosure, 119 x 119 x 54 mm.
- .2 Covers surface mounted.

2.3 CABINETS/ENCLOSURES FOR DDC NETWORK EQUIPMENT

- .1 Construction: welded steel enclosure, 305 x 305 x 152 mm or 610 x 610 x 152 mm as indicated on drawings.
- .2 Covers surface mounted: side hinged flat covers with key lock

Part 3 Execution

3.1 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 Only main junction and pull boxes are indicated. Install additional pull boxes as required by CSA C22.1.

3.2 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 NOT USED

1.2 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. 83 Electrical Metallic Tubing.

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.

1.4 WASTE MANAGEMENT AND DISPOSAL

- .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.

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 Cloth pull tape
- .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. 83, EMT

2.3 CONDUIT FASTENINGS

- .1 Use existing conduit hangers where available and install new galvanized metal mounting channels and conduit hangers as needed.

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 and larger conduits.
- .3 Watertight connectors and couplings for EMT:
 - .1 Rugged all steel construction,
 - .2 Die cast fittings are not acceptable,
 - .3 Set-screws are not acceptable.
 - .4 LB type conduit fittings are not acceptable.

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 tunnels, mechanical and electrical service rooms.
- .3 Use EMT threaded conduit in tunnels.
- .4 Cloth pull tape is to be installed in all conduits to allow easier future installations.

3.3 CONDUITS UNDERGROUND

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

3.4 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.

END OF SECTION