PART 1 - GENERAL

1.1 Product Data

.1 Submit product data in accordance with Section 01340.

.2 Include time-current characteristic curves for breakers with ampacity of 200A and over or with interrupting capacity of 22,000 A symmetrical (rms) and over at system voltage.

PART 2 - PRODUCTS

2.1 Breakers General

.1 Bolt-on moulded case circuit breaker: quick- make, quick-break type, for manual and automatic operation with temperature compensation for 40 C ambient.

.2 Common-trip breakers: with single handle for multi-pole applications. Tie-bars are not acceptable.

.3 Magnetic instantaneous trip elements in circuit breakers to operate only when value of current reaches setting. Trip settings on breakers with adjustable trips to range from [3-8] times current rating.

.4 Breakers used for unswitched lighting circuits to be rated SWD (switching duty).

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.

2.3 Motor Circuit Protector

.1 Moulded case circuit breaker to operate automatically by means of magnetic tripping devices to provide instantaneous tripping for short circuit protection of combination motor starters.

2.4 Optional Features

.1 Include:

- .1 auxiliary switch.
- .2 on-off locking device.

.3 handle mechanism.

2.5 Enclosure

.1 Section 16225 - Motor control centres
.2 Section 16441 - Panelboards Breaker Type

PART 3 - EXECUTION

3.1 Installation

.1 Install circuit breakers as indicated in:

.1 Lighting panels
.2 Motor control centre.

1.0 General

.1 Supply and installation of all disconnect switches at location indicated on drawings, as specified herein and as required by CEC.

1.1 PRODUCT DATA

.1 Submit product data in accordance with Section 01340 - Shop Drawings, Samples and Mock-ups.

1.2 QUALITY ASSURANCE

.1 Disconnect switches and installation to conform to requirements of CEC and CSA.

2.0 Products

2.1 DISCONNECT SWITCHES

.1 For motors, use disconnect switches with HP ratings at least equal to motor HP.

.2 Enclosures: EEMAC type 12, code gauge galvanized steel, hinged doors, external operating handles. Disconnect switches in intake junction box or outdoors to have EEMAC type 4 enclosures.

.3 Finish: One (1) primer coat and one (1) finish coat on all metal surfaces, colour as described in Section 16010.

.4 Switch mechanisms: Quick make and quick break action with self-wiping contacts, solderless pressure lug connectors. All switch poles to operate together from a common operating bar. Provision for padlocking disconnect switches in "Off" position. Doors to be interlocked and complete with "defeat" mechanism. Provide auxiliary interlock on motor disconnects to disconnect control circuit from motor starter with early break, late make action.

.5 Neutral bars: Where distribution system has grounded neutral conductor, provide neutral bar where required, with ampere rating equal to switch rating in enclosure. Provide ground bar for terminating ground conductors.

.6 Fuses for service entrance switch to be HRC Form 1, Class J.

2.2 MANUFACTURER

.1 Acceptable manufacturers: Square D, or approved equal.

3.0 Execution

3.1 INSTALLATION

.1 Install motor and circuit disconnect switches where located and specified, and as required by the Canadian Electrical Code.

.2 Mounting: Provide supports independent of conduits. Wall mount where possible, otherwise provide HSS and Unistrut frame supports. Where switches are grouped, mount in uniform arrangement.

.3 Wiring: Connect line and load cable to all switches.

.4 Identification: Provide lamicoid plate on each switch showing voltage, source of supply and load being fed.

END OF SECTION

PART 1 - GENERAL

1.1 Shop Drawings

.1 Submit Shop Drawings in accordance with Section 01340.

1.2 Plant Assembly

.1 Install circuit breakers in panelboards before shipment.

.2 In addition to CSA requirements manufacturer's nameplate must show fault current that panel including breakers has been built to withstand.

PART 2 - PRODUCTS

2.1 Panelboards

.1 Panelboards: product of one manufacturer.

.2 208V panelboards: bus and breakers rated as per short circuit study minimum 10,000 A symmetrical interrupting capacity or as indicated.

.3 Sequence phase bussing with odd numbered breakers on left and even on right, with each breaker identified by permanent number identification as to circuit number and phase.

.4 Panelboards: mains, number of circuits, and number and size of branch circuit breakers as indicated on panel schedules.

.5 Two keys for each panelboard and key panelboards alike.

.6 Copper bus with neutral of same ampere rating as mains.

.7 Mains: suitable for bolt-on breakers.

.8 Trim with concealed front bolt and hinges.

.9 Trim and door finish: baked grey enamel.

.10 Standard of acceptable manufacturers:
- .1 Square D NQOB (208 volt panel boards) NY1B I-Line (208 volt panelboards)
- .2 Cutler Hammer/Westinghouse Pow-R-Line.

2.2 Breakers

.1 Breakers: to Section 16412.

.2 Breakers with thermal and magnetic tripping in panelboards except as indicated otherwise.

.3 Main breaker: separately mounted on top or bottom of panel to suit cable entry. When mounted vertically, down position should open breaker.

.4 Lock-on devices for emergency, and exit light circuits, and as indicated on Panel Schedule.

2.3 Equipment Identification

.1 Provide equipment identification indicating:
- .1 Panel Name
- .2 Voltage

.2 Type written panel directory.

PART 3 - EXECUTION

3.1 Installation

.1 Locate panelboards as indicated and mount securely, plumb, true and square, to adjoining surfaces.

.2 Install surface mounted panelboards in accordance with Nunavut Electrical safety code.

.3 Mount panelboards to height specified in Section 16010 or as indicated.

.4 Connect loads to circuits.

.5 Connect neutral conductors to common neutral bus with respective neutral identified.

1.0 General

.1 Provide a complete system of wiring to motors and controls as specified herein and as shown on the drawings,

1.1 GENERAL REQUIREMENTS

.1 Unless specifically noted otherwise, wire and leave in operation all electrically operated equipment supplied under this project.

.2 All control wiring diagrams shown on the drawings illustrate typical control circuits applicable to the equipment. Control circuits may vary with different manufacturers of equipment. Verify all control circuits with the suppliers of the equipment and make any corrections that may be required.

.3 Unless specifically noted otherwise, supply all pushbuttons, relays, starters, etc., necessary for the operation of equipment. Check all starters, relay coils and thermal elements to ensure that they provide the necessary protection for motors.

.4 Do not operate motors and controls until approval is obtained from the appropriate Subcontractor providing the equipment.

.5 Examine drawings and shop drawings of other Trades to obtain exact location of motors and equipment shown on drawings. Obtain conduit locations from other Trades' drawings and shop drawings.

.6 Assist in placing in operation all process and mechanical equipment having electrical connections.

.7 Provide all power and control wiring for all motors unless otherwise indicated.

2.0 Products

2.1 208 VOLT, 3 PHASE DISCONNECT SWITCHES

.1 Manual starter with overload relay. Standard of Acceptance: Square "D".

3.0 EXECUTION

.1 For all motors, provide disconnect means adjacent to the motors, as indicated on the drawings and as required by Code.

.2 Wall mount disconnects at equipment or channel mount at motor locations. Disconnects to be mounted 1350 mm above the floor to centre of unit.

END OF SECTION

PART 1 - GENERAL

1.1 Related Sections

.1 Section 16010.

1.2 References

.1 Canadian Standards Association (CSA)

.1 CSA C22.2 No. 248.12-94, Low Voltage Fuses Part 12: Class R (Bi-National Standard With, UL 248-12 (1st Edition).

1.3 Shop Drawings and Product Data

.1 Submit Shop Drawings and product data in accordance with Section 01340.

1.4 Maintenance Materials

.1 Provide maintenance materials in accordance with Section 01730.

.2 Three spare fuses of each type and size installed above 100 A.

.3 Six spare fuses of each type and size installed up to and including 100 A.

1.5 Delivery and Storage

.1 Ship fuses in original containers.

.2 Do not ship fuses installed in switchboard.

.3 Store fuses in original containers in moisture free location.

PART 2 - PRODUCTS

2.1 Fuses General

.1 Fuses: product of one manufacturer for entire project.

2.2 Fuse Types

.1 Class J fuses (formerly HRCI-J).

.1 Type J1, time delay, capable of carrying 500% of its rated current for 10 s minimum.

.2 Type J2, fast acting.

PART 3 - EXECUTION

3.1 Installation

.1 Install fuses in mounting devices immediately before energizing circuit.

.2 Ensure correct fuses fitted to physically matched mounting devices.

.3 Ensure correct fuses fitted to assigned electrical circuit.

END OF SECTION

PART 1 - GENERAL

1.1 Shop Drawings and Product Data

.1 Submit Shop Drawings and product data in accordance with Section 01340.

PART 2 - PRODUCTS

2.1 Materials

.1 Components comprising ground fault protective system to be of same manufacturer.

2.2 Breaker Type Ground Fault Interrupter

.1 Single pole ground fault circuit interrupter for 15 A, 120 V, 1 phase circuit c/w test and reset facilities.

PART 3 - EXECUTION

3.1 Installation

.1 Do not ground neutral on load side of ground fault relay.

.2 Pass phase conductors including neutral through zero sequence transformers.

.3 Connect supply and load wiring to equipment in accordance with manufacturer's recommendations.

3.2 Field Quality Control

.1 Perform tests in accordance with Section 16010.

.2 Arrange and pay for field testing of ground fault equipment by contractor before commissioning service.

.3 Submit report of tests to Engineer and a certificate that system as installed meets criteria specified herein.

.4 Demonstrate simulated ground fault tests.

1.0 General

.1 Supply and install all controls indicated on the drawings and specified herein. Some control items are integral to the new systems being installed, and as such the individual components are not individually identified.

1.1 SHOP DRAWINGS

.1 Submit shop drawings and/or manufacturer's printed literature of all control components in accordance with Section 01340 - Shop Drawings, Samples and Mock-Ups.

2.0 Products

.1 AC control relays: fixed contact plug in type, heavy duty, electrically held, 120 V coil, contact rating, 120V, 10A minimum. Standard of acceptance: Allen Bradley.

.2 Selector switches: maintained 3 position labelled "Auto-Off - Manual" heavy duty, oil tight operators knob, contact arrangement as indicated, rated 120V, 10 amps. Standard of acceptance: Allen Bradley 800 T series.

.3 Indicating lights: heavy duty oil tight, full voltage, LED type push to test, colour "red" "green" as indicated 120V, labels as indicated. Standard of acceptance: Allen Bradley 800 T series.

.4 Control Panel: CSA type 12 sheet metal enclosure with hinged padlockable access door, size to accommodating relays, timers, control transformers, disconnect switch, starters, fuses, labels, as indicated, and factory installed wires to identified terminals.

2.1 TERMINAL BLOCKS

.1 Terminal blocks shall be of a high density design rated not less than 15A at 120 VAC. All terminal blocks shall be rail mount type. All terminal block groupings to be complete with sequential printed numbers (black on white). Earth terminals shall be green in colour and lock securely to rail. Neutral terminals shall be blue in colour with bus bar connection system. Low voltage (24 VDC, 4-20 ma and 1-5 VDC) wiring to terminate in double level terminals complete with separation plates. All low voltage and 120 VAC terminals to be separated with isolating partition plates. All terminal block strips to be identified and secured with end plates and end clamps. All terminal blocks and rail shall be of the same manufacturer equal to Phoenix Contact, Eldelec, or Weidmuller.

2.2 CONTROL RELAYS

.1 Fixed contact type: heavy-duty 3 poles. Coil rating 24 VDC, contact rating 3A.

.2 Standard of acceptance: Potter & Brumfield, KUP Series or Allen-Bradley equivalent with sockets and status indicator.

2.3 SEALED CONTACT OILTIGHT LIMIT SWITCHES

.1 Lever type switches: roller operated, double pole, double throw. Contact rating: EEMAC B-600.

.2 Standard of acceptance: Allen-Bradley 800T.

2.4 SOLID STATE TIMING RELAYS

.1 Construction: AC operated electronic timing relay with solid-state timing circuit to operate output contact. Timing circuit and output contact completely encapsulated to protect against vibration, humidity and atmospheric contaminants.

.2 Operation: on-delay, off-delay, interval, latching interval.

.3 Potentiometer: self contained to provide time interval adjustment.

.4 Supply voltage: 120 V, AC, 60 Hz.

.5 Temperature range: minus 20°C to 60°C.

.6 Output contact rating: maximum voltage 300 V AC or DC. Current: EEMAC B300.

.7 Timing ranges: .1-3 sec, 4-120 sec, 2-60 min, .33-10 sec
.1 -10 min, .33-10 hrs, 1-30 sec, 1-30 min

.8 Accuracy: ±3%.

.9 Standard of acceptance: Agastat SSF series.

2.5 PUSHBUTTONS

.1 Standard Heavy duty Oil tight. Operator type, as indicated. With contacts rated at 10 A, AC, labels as indicated. Stop pushbuttons coloured red, labelled "stop".

.2 Emergency stop pushbuttons shall be maintained contact type, push-to-open contacts, pull-to-close contacts. These units shall be complete with a jumbo mushroom head, red in colour and shall be installed to provide ample and clear access.

.3 Standard of acceptance: Allen-Bradley 800T Series.

2.6 CONTROL AND RELAY PANELS

.1 CSA Type 4 sheet steel enclosure with hinged padlockable access door, accommodating relays timers, labels, as indicated, factory installed and wired to identified terminals.

2.7 CONTROL CABLE

.1 Control cables shall be of low energy type, 300 volt, 7 strand tinned copper conductors, 14 AWG or sized as indicated. Primary insulation shall be 300 Volt PVC type min. 0.60 mm. Each conductor shall be numbered, drain wire shall be a minimum 14 AWG, 7 strand tinned copper conductor, and overall shield shall be aluminum/mylar/aluminum. Control cables shall meet CSA Standard C21.2-M86.

.2 Standard of acceptance: Shawflex Control Cable.

2.8 INSTRUMENT CABLE

.1 Instrument cables shall be power limited low energy type, 600 volt, multi-pair individually shielded cable with an overall shield. Conductors shall be tinned copper, 18 AWG or sized as indicated. Conductors shall be soft annealed. Class B, concentric per ASTM B-3 and ASTM B-8. Primary insulation shall be 105°C rated PVC flame retardant in accordance with UL Subject 13. Each pair shall include one white conductor, one black conductor, one bare drain wire and a shield. Conductor pairs in multi-pair cable are to be numbered at 25 mm intervals. Jacketing shall be flame retardant PVC and be moisture and sunlight resistant with a minimum thickness of 1.25 mm. Cable shall be CSA approved.

.2 Standard of acceptance: Belden Process Control Cabling.

2.10 SCADA LAN COAXIAL CABLE

.1 Coaxial cables shall be RG-58/U. Conductor shall be 20AWG minimum stranded tinned copper with a resistance not greater than 31.2 ohms per kilometre. Core insulation shall be a minimum 2.41 mm FEP Teflon. Nominal impedance shall be 50 phms with a nominal capacitance of 83.3 pF per metre. Shield shall be bare copper with a resistance of not greater than 31.2 ohms/km with 95% coverage. Outer jacket shall be gray FCP. Velocity of propagation shall not be less than 80%. Cable shall be CSA approved.

.2 Standard of acceptance: Belden Coaxial Broadcast Cable.

3.0 Execution

3.1 INSTALLATION

.1 Installation to be to manufacturer's latest instructions and to the drawings.

END OF SECTION

Contents

1.0 General

.1 Supply the spare parts and equipment listed herein.

2.0 Products

2.1 GENERAL

.1 All spare parts are to be of identical make and model as the components supplied in other parts of this project.

2.2 SPARE PARTS

.1 Supply the following spare parts:

	COMPONENT		PARTS
.1	Intake Pump	(15451)	- 1 Complete submersible pump and motor with power cable attached for each type. A total of two (2), one for fire flow and one for process water flow.
.2	Heat Trace Cables		- 1 length of cable for each intake pipeline. - 4 Termination boots
.3	Motor Starters		- 2 Pilot lights and overload heaters - 1 Each of coil and contact

3.0 Execution

3.1 GENERAL

.1 Supply spare parts and store in shelf units. Parts to be neatly labelled with product information including:

.1 Manufacturer's name

.2 Type of component

.3 Catalogue number

.4 Component rating (amps, volts, etc)

END OF SECTION