

1. GENERAL

1.1 Related Work

- .1 Cast-in-Place Concrete: Division 03
- .2 Installation of anchor devices, setting templates: Division 03

1.2 References

- .1 CAN/CSA-G40.21, Structural Quality Steels.
- .2 EEMAC G1-1, Indoor and Outdoor Switch and Bus Insulators.
- .3 NEMA 210, Secondary Unit Substations.

1.3 Description of System

- .1 Indoor unit substation with:
 - .1 Primary switchgear.
 - .2 Remote mounted transformer (roof of pump station).
 - .3 Secondary switchgear.

1.4 Source Quality Control

- .1 Submit 6 copies of production test results to Contract Administrator. Do not ship equipment until test results have been accepted by Contract Administrator.
- .2 Substation manufactured and/or factory assembled by one supplier.

1.5 Shop Drawings

- .1 Submit shop drawings in accordance with Section 16010 - Electrical General Requirements.
- .2 Indicate:
 - .1 Single line diagram.
 - .2 Equipment layout.
 - .3 Equipment dimensions including door openings, draw-out equipment positions and workspace requirements.
 - .4 Dimensioned foundation template.
 - .5 Dimensioned bus entrance and exit locations.
 - .6 Dimensioned bus termination heights.

- .3 Submit preliminary coordination study to Contract Administrator and include shop drawings. Study to show coordination curves for protective devices from circuit breaker and main secondary breaker. Recommend breaker settings and main secondary breaker setting. Shop drawings will not be accepted or reviewed without this co-ordination study.

1.6 Maintenance Data

- .1 Provide maintenance data for unit substation for incorporation into manual specified in Section 16010 - Electrical General Requirements.
- .2 Three copies maintenance data for complete substation assembly, including components, in one combined manual.

1.7 Maintenance Materials

- .1 Provide maintenance materials in accordance with Section 16010 - Electrical General Requirements.
- .2 Include:
 - .1 Fuses:
 - .1 6 fuse refills for each Type up to and including 600 A.

2. PRODUCTS

2.1 Materials

- .1 Unit substation: To NEMA 210.
- .2 Steel for cubicles: To CAN/CSA-G40.21.
- .3 Insulators: To EEMAC G1-1.

2.2 Primary Switchgear

- .1 Primary Switchgear: 4.16 kV, 1200 A, 3 phase, 3 wire, interrupting capacity 41 kA, BIL 60 kV to suit coordination study requirements.
- .2 Unit substation to consist of the following equipment:
 - .1 Non-fused tie switch with bus connection to existing equipment-1200 A rated.
 - .2 Facility for 2nd source power supply main vacuum breaker – breaker not included.
 - .3 Two (2) 600 A Fusible interrupter switches for future pumps – fuses not included.
 - .4 Vacuum breaker, 1200 A bus rated with digital overcurrent protection and system analyzer – 2000 kVA transformer.

.5 One (1) 600 A fusible interrupter switch for miscellaneous equipment transformer LT-4.

.3 Acceptable Manufacturers: Cutler-Hammer, Schneider, Seimens.

2.3 Enclosure

.1 Enclosure: Metal enclosed free standing, floor mounted, dead front, indoor non walk in CSA Enclosure 1 for 4160 V and 600 V cubicle units.. Construction from rolled flat steel sheets, maximum enclosure dimensions:

	Height	Width	Depth
Tie Switch (4.16 KV)	2295 mm	1295 mm	1778 mm
2 nd Main Source Breaker (4.16 KV) (Breaker NIC)	2295 mm	914 mm	1778 mm
Load Interrupter Switches (4.16 KV)	2295 mm	914 mm	1405 mm
Breaker for 4160 V-600V Transformer LT-3	2295 mm	914 mm	1778 mm
Main 600V Breaker Section	2515 mm	560 mm	1828 mm
600V Distribution	2286 mm	914 mm	460 mm

.2 Ventilating louvres: Vermin proof.

.3 Use non-corrodible bolts and hardware.

.4 Access from front and back.

.5 100 mm steel channel sills for base mounting in single length common to multi-cubicle switch board.

.6 Full height outer door reinforced with stiffeners, gasketed, hinges on left side, provision for multiple padlocking. Three point latch, stops, to open at least 135°.

.7 Inner doors to open at least 90°.

.8 Hinge doors of multi-cubicle switchboard on same side.

.9 Gaskets on removable covers.

.10 Removable cover bolts not accessible from outside of cubicle.

.11 Interior hinged and bolted mesh steel screens to prevent inadvertent contact with exposed live parts.

.12 Metal pocket on inside surface of door to accommodate drawing and diagram prints.

2.4 Primary Bus Bars and Connections

- .1 Three phase and full capacity neutral insulated bus bars, continuous current rating 1200 A extending full width of multi-cubicle switchboard suitably supported on insulators.
- .2 Main connections between bus bars, major switching components of continuous current rating to match major switching components.
- .3 Copper for bus bars and main connections.
- .4 Brace bus-bar system to withstand stresses resulting from short circuit currents specified.
- .5 Silver surfaces joints, secured with non-corrosive bolts and washers, tightened with torque wrench in accordance with manufacturer's recommended load.
- .6 Identify phases of bus bars by suitable marking [and/or coloured paint].
- .7 Busbar connectors when switchgear shipped in more than one section.

2.5 Grounding

- .1 Copper ground bus not smaller than 50 x 6 mm extending full width of multi-cubicle switchboard section and situated at bottom. Lugs at each end for size of grounding cable.
- .2 Bond non current carrying metal parts, including switchgear framework, enclosure and bases to ground bus.

2.6 Circuit Breaker

- .1 Cubical section for 2nd source breaker to be set for a future vacuum circuit breaker to be installed at a later date. Provide all hardware required to accept vacuum circuit breaker.
- .2 Provide provision for microprocessor based three-phase protective relay to be installed with breaker.
- .3 Cubical section for 4160 V-600 V transformer vacuum circuit breaker. Refer to Section 16350 – Circuit Breakers.

2.7 Load Interrupting Switch

- .1 Refer to Section 16360 Load Interrupting Switches.

2.8 Isolating Switches

- .1 Refer to Section 16362 – Isolating Switches to 15kV.

2.9 Interlocks

- .1 Refer to Section 16359 – Interlock Systems.

2.10 Instrument Transformers

- .1 Refer To Section 16432 – Instrument Transformers.

2.11 Transformers (remote from unit substation)

- .1 Refer to Section 16322 – Dry Type Transformers.

2.12 Shop Fabrication

- .1 Shop assemble and test components of substation.
- .2 After completion of factory assembly and high potential test, prepare for shipment to site in sections, complete with hardware for re-assembly and re-connecting.

2.13 Finishes

- .1 Apply finishes in accordance with Section 16010 - Electrical General Requirements.
- .2 Cubicle exteriors: To Match Substation.
- .3 Cubicle interiors: White.
- .4 Supply 2 spray cans touch up paint.

2.14 Equipment Identification

- .1 Provide equipment identification in accordance with Section 16010 - Electrical General Requirements.
- .2 Nameplates:
 - .1 Primary switchgear: Black plate, white letters, size 7:
 - .1 Engraved: “Primary Cubicle”.
 - .2 Engraved: “Substation 2 - Main Breaker.”

2.15 Warning Signs

- .1 Provide warning signs in accordance with Section 16010 - Electrical General Requirements.

3. EXECUTION

3.1 Installation

- .1 Set and secure cubicles and transformers in place, rigid, plumb and square, on channel bases.
- .2 Interconnect cubicles and transformer with bus bar connections supplied by manufacturer.

- .3 Check factory-made connections for mechanical security and electrical continuity.
- .4 After finishing work, remove foreign material, including dust, before energizing substation.
- .5 Check relay settings against shop drawings to ensure proper working of components and that coordinated sequence of action is established.

3.2 Field Quality Control

- .1 Perform tests in accordance with Section 16980 - Testing, Adjusting and Balancing of Electrical Equipment and Systems.
- .2 Test for 24 consecutive hours, to include:
 - .1 Primary and secondary voltage at no load.
 - .2 Primary and secondary voltages at normal load once per hour.
 - .3 Primary and secondary current in each phase once per hour.
 - .4 kW and kVA once per hour.

END OF SECTION