.1 General

.1 Site services to buildings require underground services installed in trenches, manholes, reinforced concrete encasement of ducts, etc.

.2 This section covers the supply and installation of underground civil work required for electrical installations. The civil work shall include but not be limited to:

- .1 Trenching and excavation
- .2 Concrete encasement rebarring, etc. of underground raceways
- .3 Manholes and pull boxes
- .4 Concrete luminaire bases
- .5 Sand bedding and back filling
- .6 Repairing existing grade finish
- .7 Pull pits beneath main switchgear, secondary distribution centres, and in Communications Rooms.

.2 Protection of Existing Features

.1 Contractors are to be made aware of existing features, trees, sidewalks, walkways, roadways, and other items which must be protected from damage.

.3 Clearances and Depth of Raceways

.1 Unless specifically stated on plans, the following clearances are to be maintained for all underground raceways, to be used for power cables and communications.

- .1 Between communication and power raceways:
  - .1 in concrete encasement - 75mm
  - .2 direct buried raceway - 300mm
- .2 From all gas, water (except landscape sprinkler lines) and sewer utilities:
  - .1 1000mm running parallel
  - .2 500mm at crossings
  - .3 150mm at crossings is allowed if electrical raceway is concrete encased for length of crossing, plus 1000mm to either side of crossing.
- .3 From landscape sprinkler lines
  - .1 1000mm running parallel
  - .2 150mm at crossings if sprinkler lines are run over electrical lines.

.2 Unless specifically stated on plans, the following clearances are to be maintained for all underground direct buried cables for power and communications:

- .1 Between communications and power - 600mm.
- .2 From all gas, water (except landscape sprinkler lines) and sewer utilities:
  - .1 1500mm running parallel
  - .2 1000mm at crossings.
  - .3 150mm at crossings is allowed if cable is sleeved with duct and concrete encased for 1000mm to either side of crossing.

.3 Unless specifically stated on the plans, the following depth of raceways shall be a minimum from top of duct:

- .1 Roadways and private property except rock excavation:
  - .1 Communications - 600mm
  - .2 Secondary power to 750 volts - 600mm

.3 Power above 750 volts - 900mm

.2 Rock excavation:

.1 All systems - 150mm from the top of concrete encasement. All raceways to be concrete encased with a minimum of 50mm concrete all round.

.4 Unless specifically stated on the plans all cables shall be buried to a minimum of 1000mm.

.4 Backfill

.1 Sand shall mean screened pit material, free of all organic material. Screen shall eliminate all stones over 5mm in diameter and any sharp debris.

.2 Selective granular material shall mean material found in excavation or obtained from a gravel pit, that excludes rubble, hard packed clays, sharp objects or rock that could cut duct or cable, and be free of all stones over 50mm in diameter.

.3 Native material, shall mean material found on site, excluding material that would deteriorate over time, for example wood scraps or rubble, and stones over 300mm in diameter.

.4 Crushed rock and drain rock shall be as obtained from reputable gravel pit, clean of rubble and fines.

.5 Concrete Mix

.1 Type 10 Portland cement, min. compressive strength 20 Mpa at 28 days, slump 50-75mm at point of discharge, nominal coarse aggregate.

.6 Drainage

.1 Floor drain in each manhole to consist of floor drain, backwater valve trap and pipe connection to provide positive drainage to storm drain system.

.2 Sump pit 300 x 300 x 125mm with rock drainage only allowed if specifically noted for each location.

.3 Provide power connections to sump pumps indicated on mechanical or civil drawings.

.7 Manhole

.1 Concrete manhole neck to bring cover flush with finished grade or 40mm above grade in unpaved areas.

.2 Build up neck with brick and mortar to achieve above.

.3 Precast concrete manholes, for primary power and communications services where indicated on plans.

.4 Concrete manhole neck to bring cover flush with finished grade or 40mm above grade in unpaved areas.

.5 Build up neck with brick and mortar to achieve above.

.6 Size 4.3 metres long x 2.5 metres wide x 1.8 metres inside depth. AE Precast Products Ltd. #4212-'C' Series Manhole Type.

.7 Manhole to be complete with knockout windows, steel reinforcement, unistrut channel supports (all sides), pulling irons, circular sump complete with metal cover, grounding sleeve, and #C-23/23A cast iron frame and traffic rated cover marked "Electrical" for power services, and "Communications" for communications service manholes.

.8 Manholes to be complete with minimum 610mm deep concrete sump complete with concrete base, cast iron grate, and suitable for 100mm mechanical drainage service entry.

.9 Seal all penetrations.

.8 Manhole Frames

.1 Cast iron manhole frames and covers road rated.

.2 Hinged checker plate standard covers for pre-cast manholes or pullboxes.

.9 Ground Rods

.1 Ground rods - 3 metre copperweld. Provide ground rod to each manhole.

.10 Cable Racks

.1 Cantruss preset inserts for rack mounting, hot dip galvanized cable racks and supports on all faces of manholes and pullboxes - two if side exceeds 1.2m long.

.11 Luminaire Bases

Supply and install luminaire bases consisting of round concrete reinforced bases. In landscape areas, bases are to be 100mm above finish grade and flush with grade at concrete surfaces.

.12 Cable Pulling Equipment

Pulling irons of galvanized steel rods, size, shape and location as indicated.

Standard polypropylene pull rope with tensile strength 5kN continuous in each duct run.