1. GENERAL

1.01 SECTION INCLUDES

.1 Cables installed in ducts.

.2 Direct buried cables.

.3 Handholes.

1.02 RELATED REQUIREMENTS

.1 Section 31 23 00 – Excavation and Fill.

1.03 REFERENCES

.1 CSA Group:

.1 CSA C22.3 No. 7-15, Underground systems.

.2 Institute of Electrical and Electronics Engineers:

.1 IEEE 835-1994, Standard Power Cable Ampacity Tables.

.3 Insulated Cable Engineers Association, Inc. (ICEA).

1.04 SUBMITTALS

.1 Submit records of underground utility locates, indicating location plan of existing utilities as found in field and clearance record from utility authority and location plan of relocated and abandoned services, as required.

.2 Feeder ampacity calculations from cable manufacturer for any duct banks or direct buried feeders not constructed in accordance with OESC to demonstrate compliance with IEEE 835.

1.05 CLOSEOUT SUBMITTALS

.1 Record documentation:

.1 Records of underground utility locates.

.2 Record as-constructed location of all underground conduits and feeders on as-built drawings regardless of conduit size.

2. PRODUCTS

2.01 FILL MATERIALS

.1 Sand fill: clean, natural sand and gravel material, free from silt, clay, loam, friable or soluble materials and vegetable matter.

.2 Backfill material: Selected material from excavation or other sources, reviewed by the Consultant, unfrozen and free from rocks larger than 75 mm (3 inch), rock with sharp angular surfaces, cinders, ashes, sods, refuse, or other deleterious materials.

2.02 DIRECT BURIED AND CONCRETE ENCASED CONDUITS

.1 Rigid Type DB2/ES2 PVC conduit to Section 26 05 33.13.

2.03 CONDUCTORS

.1 RWU90, in accordance with Section 26 05 19 for use in direct buried applications, and in below grade conduits and duct banks.

2.04 TRACER WIRE

.1 Direct burial rated tracer wire: single, solid copper, 12 AWG minimum size with 30 mm PVC jacket.

.1 Provide red jacket for circuits 120 V and higher.

.2 Provide orange jacket for communications conduits and services lower than 120 V.

2.05 HANDHOLES

.1 460 mm (18") round handhole.

.2 Precast concrete, to OPSD 2112.02 standard, suitable for use in vehicular traffic areas.

.3 Manufacturers:

.1 Armtec-Brooklin Concrete.

.2 Hy-Grade Precast Concrete.

.3 Utilicon.

3. EXECUTION

3.01 EXAMINATION

.1 Perform locates prior to start of work.

3.02 EXCAVATION AND FILL

.1 In accordance with Section 31 23 00.

.2 Trenching:

.1 Excavate to dimensions indicated. Ensure trench width is sufficient to accommodate mechanical vibratory compactor.

.2 Do not leave open trench at end of day's operation.

.3 Backfilling:

.1 Do not proceed with backfilling operations until Electrical Inspection Authority has inspected and approved installation.

.4 Restoration:

.1 Restore surface of work area to conditions existing prior to execution of work.

.2 After backfilling trench, provide new topsoil as required to follow minimum depths after settlement of 100 mm (4 in) for grass seeded areas.

.3 Restore surface of paved areas to match existing.

3.03 CABLE INSTALLATION IN DUCTS

.1 Install cables as indicated in ducts.

.2 Do not pull spliced cables inside ducts.

.3 Install multiple cables in duct simultaneously.

.4 Use CSA approved lubricants of type compatible with cable jacket to reduce pulling tension.

.5 To facilitate matching of colour coded multiconductor control cables reel off in same direction during installation.

.6 Before pulling cable into ducts and until cables are properly terminated, seal ends of lead covered cables with wiping solder; seal ends of non-leaded cables with moisture seal tape.

.7 After installation of cables, seal duct ends with duct sealing compound.

3.04 DIRECT BURIAL OF CABLE

.1 Provide sand bed as indicated.

.2 Lay cables maintaining 75 mm (3 in) clearance from each side of trench to nearest cable. Do not pull cable into trench.

.3 Provide offsets for thermal action and minor earth movements. Offset cable 150 mm for each 60 m run, maintaining minimum cable separation and bending radius requirements.

.4 Install treated planks on cables for mechanical protection. Install above cables and below markers.

.5 Cable separation:

.1 Maintain 75 mm (3 in) minimum separation between cables of different circuits.

.2 Maintain 300 mm (12 in) horizontal separation between low and high voltage cables.

.3 When low voltage cables cross high voltage cables maintain 300 mm (12 in) vertical separation with low voltage cables in upper position.

.4 At crossover, maintain 75 mm (3 in) minimum vertical separation between low voltage cables and 150 mm between high voltage cables.

.5 Maintain minimum 300 mm (12 in) horizontal separation between cables or conduits and gas service where installed in the same trench.

3.05 MARKERS

.1 Mark cable every 150 m along duct runs and changes in direction.

.2 Mark underground splices.

.3 Where markers are removed to permit installation of additional cables, reinstall existing markers.

.4 Install cedar post type markers.

.5 Lay concrete markers flat and centred over cable with top flush with finish grade.

.6 Where warning tape is used to comply with 2021 OESC Rule 12-012(11) or latest edition, bury the tape approximately halfway between the installation and grade level, covering the width of the raceways or cables installed, in accordance with OESC Bulletin 12-2-(latest version).

.7 Tracer wires:

.1 Provide direct burial rated tracer wire above all underground raceways and duct banks for power, control/monitoring, lighting and branch circuits, and communications raceways.

.2 Install tracer wire above the warning tape.

3.06 FIELD QUALITY CONTROL

.1 Perform tests in accordance with Section 26 05 00.

.2 Perform tests using qualified personnel. Provide necessary instruments and equipment.

.3 Check phase rotation and identify each phase conductor of each feeder.

.4 Check each feeder for continuity, short circuits and grounds. Ensure resistance to ground of circuits is not less than 50 megohms.

.5 Pre-acceptance tests:

.1 After installing cable but before splicing and terminating, perform insulation resistance test with 1000 V megger on each phase conductor.

.2 Check insulation resistance after each splice and/or termination to ensure that cable system is ready for acceptance testing.

.6 Acceptance Tests:

.1 Ensure that terminations and accessory equipment are disconnected.

.2 Ground shields, ground wires, metallic armour, and conductors not under test.

.3 High Potential (Hipot) Testing.

.1 Conduct hipot testing in accordance with manufacturer's ICEA recommendations.

.7 Provide Owner with list of test results showing location at which each test was made, circuit tested and result of each test.

.8 Non-Conforming Work: Remove and replace entire length of cable if cable fails to meet any of test criteria.

3.07 WASTE MANAGEMENT

.1 Remove from site and dispose of all packaging materials at appropriate recycling facilities.

.2 Collect and separate for disposal paper, plastic, polystyrene, corrugated cardboard, packaging material in appropriate on-site bins for recycling in accordance with Waste Management Plan.

.3 Do not dispose of unused sealant material into sewer system, into streams, lakes, onto ground or in other location where it will pose health or environmental hazard.

.4 Divert unused metal and wiring materials from landfill to metal recycling facility as approved by Departmental Representative.

.5 Do not dispose of preservative treated wood through incineration.

.6 Do not dispose of preservative treated wood with other materials destined for recycling or reuse.

.7 Dispose of treated wood, end pieces, wood scraps and sawdust at sanitary landfill approved by Departmental Representative.

.8 Fold up metal banding, flatten and place in designated area for recycling.

End of Section