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**R.086180.001 EMERSON RFID INFRASTRUCTURE  
EMERSON, MANITOBA**

December 2016

Section 31 23 33.01 – Excavating, Trenching, and Backfilling

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**PART 1      GENERAL**

**1.1            RELATED SECTIONS**

- .1      Section 01 33 00 - Submittal Procedures.
- .2      Section 01 35 33 - Health and Safety.
- .3      Section 01 35 43 - Environmental Procedures.
- .4      Section 01 56 00 - Temporary Barriers.

**1.2            REFERENCES**

- .1      American Society for Testing and Materials (ASTM).
  - .1      ASTM C117, Standard Test Method for Material Finer Than 0.075 mm (No. 200) Sieve in Mineral Aggregates by Washing.
  - .2      ASTM C136, Standard Test Method for Sieve Analysis of Fine and Coarse Aggregates.
  - .3      ASTM D422, Standard Test Method for Particle-Size Analysis of Soils.
  - .4      ASTM D698, Standard Test Method for Laboratory Compaction Characteristics of Soil Using Standard Effort (12,400 ft-lbf/ft<sup>3</sup>) (600 kN-m/m<sup>3</sup>).
  - .5      ASTM D1557, Test Method for Laboratory Compaction Characteristics of Soil Using Modified Effort (56,000 ft-lbf/ft<sup>3</sup>) (2,700 kN-m/m<sup>3</sup>).
  - .6      ASTM D4318, Standard Test Methods for Liquid Limit, Plastic Limit, and Plasticity Index of Soils.
- .2      Canadian General Standards Board (CGSB).
  - .1      CAN/CGSB-8.1, Sieves, Testing, Woven Wire, Inch Series.
  - .2      CA/CGSB-8.2, Sieves, Testing, Woven Wire, Metric
- .3      Canadian Standards Association (CSA)
  - .1      CAN/CSA-A3000, Cementitious Materials Compendium (Consists of A3001, A3002, A3003, A3004 and A3005).
  - .2      CSA-A3001, Cementitious Materials for Use in Concrete.
  - .3      CSA-A23.1/A23.2, Concrete Materials and Methods of Concrete Construction/ Methods of Test and Standard Practices for Concrete.

**1.3            DEFINITIONS**

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- .1 Excavation classes: two classes of excavation will be recognized; common excavation and rock excavation.
  - .1 Rock excavation: excavation of material from solid masses of igneous, sedimentary or metamorphic rock which, prior to its removal, was integral with its parent mass, and boulders or rock fragments having individual volume in excess of 1 m<sup>3</sup>. Frozen material not classified as rock.
  - .2 Common excavation: excavation of materials of whatever nature, which are not included under definitions of rock excavation.
- .2 Unclassified excavation: excavation of deposits of whatever character encountered in work.
- .3 Topsoil: material capable of supporting good vegetative growth and suitable for use in top dressing, landscaping and seeding.
- .4 Waste material: excavated material unsuitable for use in work or surplus to requirements.
- .5 Borrow material: material obtained from locations outside area to be graded, and required for construction of fill areas or for other portions of work.
- .6 Unsuitable materials:
  - .1 Weak and compressible materials under excavated areas.
  - .2 Frost susceptible materials under excavated areas.
  - .3 Frost susceptible materials:
- .7 Fine grained soils with plasticity index less than 10 when tested to ASTM D4318, and gradation within limits specified when tested to ASTM D422 and ASTM C136: Sieve sizes to CAN/CGSB-8.1.

<u>Sieve Designation</u>	<u>%Passing</u>
2.00 mm	100
0.10 mm	45-100
0.02 mm	10-80
0.005 mm	0-45

- .8 Coarse grained soils containing more than 20% by mass passing 0.075 mm sieve.

**1.4 SUBMITTALS**

- .1 Inform Departmental Representative at least 2 weeks prior to commencing work, of proposed source of fill materials.

- .2 Provide a condition survey of existing buildings, trees and other plants, lawns, fencing, service poles, wires, rail tracks, pavement, survey bench marks and monuments which may be affected by work.

## **1.5 EXISTING CONDITIONS**

- .1 Buried services:
  - .1 Before commencing work verify location of buried services on and adjacent to site.
  - .2 Arrange with appropriate authority for relocation of buried services that interfere with execution of work: pay costs of relocating services.
  - .3 Remove obsolete buried services within 2 m of foundations: cap cut-offs.
  - .4 Size, depth and location of existing utilities and structures as indicated are for guidance only. Completeness and accuracy are not guaranteed.
  - .5 Prior to commencing excavation work, notify Departmental Representative or authorities having jurisdiction, establish location and state of use of buried utilities and structures. Owners or authorities having jurisdiction to clearly mark such locations to prevent disturbance during work.
  - .6 Confirm locations of buried utilities by careful test excavations.
  - .7 Maintain and protect from damage, water, sewer, gas, electric, telephone and other utilities and structures encountered as indicated.
  - .8 Where utility lines or structures exist in area of excavation, obtain direction of Departmental Representative before removing or re-routing.
  - .9 Record location of maintained, re-routed and abandoned underground lines.
  - .10 Confirm locations of recent excavations adjacent to area of excavation.
- .2 Existing buildings and surface features:
  - .1 Protect existing buildings and surface features from damage while work is in progress. In event of damage, immediately make repair to approval of Departmental Representative.
  - .1 Where required for excavation, cut roots or branches as approved by Departmental Representative.

## **PART 2 PRODUCTS**

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**2.1 MATERIALS**

- .1 Crushed, pit run or screened stone, gravel or sand.
- .2 Gradations to be within limits specified when tested to ASTM C136 and ASTM C117. Sieve sizes to CAN/CGSB-8.1.

Sieve Designation	%Passing	
	<u>Type1</u>	<u>Type2</u>
75 mm	-	100
50 mm	-	-
37.5 mm	-	-
25 mm	100	-
19 mm	75-100	-
12.5 mm	-	-
9.5 mm	50-100	-
4.75 mm	30-70	22-85
2.00 mm	20-45	-
0.425 mm	10-25	5-30
0.180 mm	-	-
<u>0.075 mm</u>	<u>3-8</u>	<u>0-10</u>

- .3 Type 3 fill: selected material from excavation or other sources, approved by Departmental Representative for use intended, unfrozen and free from rocks larger than 75 mm, cinders, ashes, sods, refuse or other deleterious materials.

**PART 3 EXECUTION**

**3.1 SITE PREPARATION**

- .1 Remove obstructions, ice and snow, from surfaces to be excavated.

**3.2 PREPARATION/PROTECTION**

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- .1 Protect existing features in accordance with Section 01 56 00 - Temporary Barriers and Enclosures and applicable local regulations.
- .2 Keep excavations clean, free of standing water, and loose soil.
- .3 Where soil is subject to significant volume change due to change in moisture content, cover and protect to Departmental Representative's approval.
- .4 Protect natural and man-made features required to remain undisturbed. Unless otherwise indicated or located in an area to be occupied by new construction, protect existing trees from damage. Protect buried services that are required to remain undisturbed.

**3.3 STRIPPING OF TOPSOIL**

- .1 Commence topsoil stripping after area has been cleared of brush, weeds and grasses and removed from site.
- .2 Strip topsoil to appropriate depth. Do not mix topsoil with subsoil.
- .3 Dispose of unused topsoil.

**3.4 STOCKPILING**

- .1 Stockpile fill materials in a manner to prevent segregation.
- .2 Protect fill materials from contamination.

**3.5 SHORING, BRACING AND UNDERPINNING**

- .1 Maintain sides and slopes of excavations in safe condition by appropriate methods and in accordance with Section 01 35 33 - Health and Safety Requirements .
- .2 Construct temporary works to depths, heights and locations as required.
- .3 During backfill operation:
  - .1 Unless otherwise as indicated, remove sheeting and shoring from excavations.
  - .2 Do not remove bracing until backfilling has reached respective levels of such bracing.
  - .3 Pull sheeting in increments that will ensure compacted backfill is maintained at an elevation at least 500 mm above toe of sheeting.
- .4 When sheeting is required to remain in place, cut off tops at elevations as indicated.
- .5 Upon completion of substructure construction:
  - .1 Remove shoring and bracing.

Remove excess materials from site.

**3.6 DEWATERING AND HEAVE PREVENTION**

- .1 Keep excavations free of water while work is in progress.
- .2 Avoid excavation below groundwater table if quick condition or heave is likely to occur. Prevent piping or bottom heave of excavations by groundwater lowering, sheet pile cut-offs, or other means.
- .3 Protect open excavations against flooding and damage due to surface run-off.
- .4 Dispose of water in accordance with Section 01 35 43 - Environmental Procedures and in manner not detrimental to public and private property, or any portion of work completed or under construction.
- .5 Provide flocculation tanks, settling basins, or other treatment facilities to remove suspended solids or other materials before discharging to storm sewers, water courses or drainage areas.

**3.7 EXCAVATION**

- .1 Excavate as required complete work as indicated on drawings.
- .2 Remove concrete, masonry, paving, walks, demolished foundations and rubble and other obstructions encountered during excavation in accordance with Section 02 41 16 - Structure Demolition.
- .3 Excavation must not interfere with bearing capacity of adjacent foundations.
- .4 Do not disturb soil within branch spread of trees or shrubs that are to remain. If excavating through roots, excavate by hand and cut roots with sharp axe or saw.
- .5 For trench excavation, do not excavate more than 30 m of trench in advance of installation operations and do not leave open more than 15 m at end of day's operation.
- .6 Keep excavated and stockpiled materials a safe distance away from edge of trench.
- .7 Restrict vehicle operations directly adjacent to open trenches.
- .8 Dispose of surplus and unsuitable excavated material off site.
- .9 Do not obstruct flow of surface drainage or natural watercourses.
- .10 Earth bottoms of excavations to be undisturbed soil, level, free from loose, soft or organic matter.
- .11 Remove unsuitable material from trench bottom.
- .12 Correct unauthorized over-excavation as follows:

- .1 Fill under bearing surfaces and footings with concrete specified for footings.
- .2 Fill under other areas with Type 2 fill compacted to not less than 95% of corrected maximum dry density.
- .13 Hand trim, make firm and remove loose material and debris from excavations. Where material at bottom of excavation is disturbed, compact foundation soil to density at least equal to undisturbed soil. Clean out rock seams and fill with concrete mortar or grout.

### **3.8 FILL TYPES AND COMPACTION**

- .1 Use fill of types as indicated or specified below. Compaction densities are percentages of maximum densities obtained from ASTM D698 corrected maximum dry density.
  - .1 Exterior side of perimeter walls: use Type 3 fill to subgrade level. Compact to 95%.
  - .2 Within building area: use Type 2 to underside of base course for floor slabs. Compact to 98%.
  - .3 Under concrete slabs: provide 150 mm compacted thickness base course of Type 1 fill to underside of slab. Compact base course to 100%.
  - .4 To correct over excavation in trenches: use Type 2 fill to underside of sand bedding compacted to 95%.

### **3.9 BEDDING AND SURROUND OF UNDERGROUND SERVICES**

- .1 Place and compact granular material for bedding and surround of underground services as indicated.
- .2 Place bedding and surround material in unfrozen condition.

### **3.10 BACKFILLING**

- .1 Do not proceed with backfilling operations until Mechanical Consultant has inspected and approved piping installations.
- .2 Areas to be backfilled to be free from debris, snow, ice, water and frozen ground.
- .3 Do not use backfill material which is frozen or contains ice, snow or debris.
- .4 Place backfill material in uniform layers not exceeding 150 mm compacted thickness up to grades indicated. Compact each layer before placing succeeding layer.

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- .5 Backfill around installations.
  - .1 Place bedding and surround material as specified.
  - .2 Do not backfill around or over cast-in-place concrete within 24 hours after placing of concrete.
  - .3 Place layers simultaneously on both sides of installed work to equalize loading. Difference not to exceed 600 mm.

**3.11 RESTORATION**

- .1 Upon completion of work, remove waste materials and debris, trim slopes, and correct defects.
- .2 Replace topsoil.
- .3 Reinstate lawns to elevation which existed before excavation.
- .4 Reinstate pavement and sidewalks distributed by excavation to thickness, structure, and elevation which existed before excavation.
- .5 Clean and reinstate areas affected by work.
- .6 Use temporary plating to support traffic loads over unshrinkable fill for initial 24 h.

**END OF SECTION**