

PART 1 - GENERAL

1.1 RELATED  
SECTIONS

- .1 Section 31 22 13: Rough Grading.
- .2 Section 33 44 01: Storm Sewers.
- .3 Section 33 34 02: Sanitary Sewers and Force Mains.

1.2 REFERENCES

- .1 ASTM C117-04, Standard Test Method for Materials Finer Than 0.075 mm (No. 200) Sieve in Mineral Aggregates by Washing.
- .2 ASTM C136-06, Standard Test Method for Sieve Analysis of Fine and Coarse Aggregates.
- .3 ASTM D422-63(2007), Standard Test Method for Particle-Size Analysis of Soils.
- .4 ASTM D698-07e1, Standard Test Methods 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 D1557-09, Standard Test Methods 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 D4318-10, Standard Test Methods for Liquid Limit, Plastic Limit, and Plasticity Index of Soils.
- .7 CAN/CGSB-8.1-88, Sieves, Testing, Woven Wire, Inch Series.
- .8 CAN/CGSB-8.2-M88, Sieves, Testing, Woven Wire, Metric.
- .9 CSA-A23.1-09/A23.2-09, Concrete materials and methods of concrete construction/Test methods and standard practices for concrete.
- .10 OPSS1010 - Specification for Aggregares - Base Subbase, Select Subgrade and Backfill Material.
- .10 Typ. for all references to OPSS 514, Ontario Provincial Standard Specification, Construction Specification for Trenching, Backfilling, and Compacting.

1.3 DEFINITIONS

- .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>.
- .2 Common excavation: excavation of materials of whatever nature, which are not included under definitions of rock excavation.
- .2 Topsoil: material capable of supporting good vegetative growth and suitable for use in top dressing, landscaping and seeding.
- .3 Waste material: excavated material unsuitable for use in work or surplus to requirements.
- .4 Borrow material: material obtained from locations outside area to be graded, and required for construction of fill areas or for other portions of work.
- .5 Unsuitable materials:
- .1 Weak and compressible materials under excavated areas.
- .2 Frost susceptible materials under excavated areas.
- .3 Frost susceptible materials:
- .1 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             |
| .2 Coarse grained soils containing more than 20% by mass passing 0.075 mm sieve. |                  |
- .6 Unshrinkable fill: very weak mixture of Portland cement, concrete aggregates and water that resists settlement when placed in utility trenches, and capable of being readily excavated.

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- 1.4 SAMPLES .1 Inform Departmental Representative at least 4 weeks prior to commencing work, of proposed source of fill materials and provide access for sampling.
- 1.5 PAYMENT .1 Payment for common excavation is included in the balance of the contract.
- .2 Payment for rock excavation will be paid per cubic meter of insitue material removed.
- 1.6 PROTECTION OF EXISTING FEATURES .1 Existing buried utilities and structures:
- .1 Size, depth and location of existing utilities and structures as indicated are for guidance only. Completeness and accuracy are not guaranteed.
- .2 Prior to commencing excavation work, notify applicable owner 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.
- .3 Confirm locations of buried utilities by careful test excavations.
- .4 Maintain and protect from damage, water, steam, sewer, gas, electric, telephone and other utilities and structures encountered as indicated.
- .5 Where utility lines or structures exist in area of excavation, obtain direction of Departmental Representative before re-routing. Costs for such work to be paid by Departmental Representative.
- .6 Record location of maintained, re-routed and abandoned underground lines.
- .2 Existing buildings and surface features:
- .1 Conduct, with Departmental Representative, 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.
- .2 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.
- .3 Where required for excavation, cut roots or branches as approved by Departmental Representative.
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1.7 TEST  
EXACAVATION

- .1 Test excavations shall be completed at all utility crossings and tie-ins to existing utilities. Inverts and horizontal layout shall be provided to the Departmental Representative if the feild condition varies from the contract documents. This information is to be provided 7 days in advance of subsurface work being completed at the location of crossing or tie-in. If this information is not provided as outlined, no compensation will be provided.

1.8 SHORING,  
BRACING AND  
UNDERPINNING

- .1 Protect existing features in accordance with applicable local regulations and to the satisfaction of the departmental representative.
- .2 Engage services of qualified professional engineer who is registered or licensed in province of Ontario, Canada in which work is to be carried out to design and inspect cofferdams, shoring, bracing and underpinning required for work.
- .3 Submit design and supporting data at least 2 weeks prior to commencing work.
- .4 Design and supporting data submitted to bear stamp and signature of qualified professional engineer registered or licensed in province of Ontario, Canada.

1.9 EXCAVATION AND  
BACKFILLING  
REQUIRED BY  
OTHER SECTIONS

- .1 Excavation and backfilling for site services, mechanical and electrical work is included in this Section and shall be carried out in accordance with provisions specified herein and as indicated on drawings. This work to be laid out and supervised by trade concerned.

PART 2 - PRODUCTS

2.1 MATERIALS

- .1 Type 1 fill: to Ontario Provincial Standard Specification OPSS 1010, April 2004 for Granular A aggregate. Maximum size 19.0mm
- .2 Type 2 fill: to Ontario Provincial Standard Specification OPSS 1010, April 2004 for Granular B Type 2 aggregate. Maximum size 26.5mm.

2.1 MATERIALS  
(Cont'd)

- .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.
- .4 Unshrinkable fill: proportioned and mixed to provide:
  - .1 Maximum compressive strength of 0.4 MPa at 28 days.
  - .2 Maximum Portland cement content of 25 kg/m<sup>3</sup>.
  - .3 Minimum strength of 0.07 MPa at 24 h.
  - .4 Concrete aggregates: to CAN/CSA-A23.1/A23.2.
  - .5 Portland cement: Type GU.
  - .6 Slump: 160 to 200 mm.
- .5 Shearmat: honeycomb type bio-degradable cardboard 100 mm thick, treated to provide sufficient structural support for poured concrete until concrete cured.

PART 3 - EXECUTION

3.1 SITE  
PREPARATION

- .1 Remove obstructions, ice and snow, from surfaces to be excavated within limits indicated.
- .2 Cut pavement or sidewalk neatly along limits of proposed excavation in order that surface may break evenly and cleanly.

3.2 STRIPPING OF  
TOPSOIL

- .1 Commence topsoil stripping of areas as indicated after area has been cleared of brush, weeds, and grasses and removed from site.
- .2 Strip topsoil to depths as indicated. Do not mix topsoil with subsoil.
- .3 Stockpile in locations as directed by Departmental Representative. Stockpile height not to exceed 2 m.
- .4 Dispose of unused topsoil off site.

3.3 STOCKPILING

- .1 Stockpile fill materials in areas designated by Departmental Representative. Stockpile granular materials in manner to prevent segregation.
- .2 Protect fill materials from contamination.

3.4 COFFERDAMS,  
SHORING, BRACING  
AND UNDERPINNING

- .1 Construct temporary works to depths, heights and locations as indicated or directed by Departmental Representative.
- .2 During backfill operation:
  - .1 Unless otherwise as indicated or as directed by Departmental Representative, 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.
- .3 When sheeting is required to remain in place, cut off tops at elevations as indicated.

3.5 DEWATERING AND  
HEAVE PREVENTION

- .1 Keep excavations free of water while work is in progress.
  - .2 Submit for Departmental Representative's approval details of proposed dewatering or heave prevention methods, such as dikes, well points, and sheet pile cut-offs.
  - .3 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.
  - .4 Protect open excavations against flooding and damage due to surface run-off.
  - .5 Dispose of water in accordance with applicable local regulations and in manner not detrimental to public and private property, or any portion of work completed or under construction.
  - .6 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.
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3.6 EXCAVATION

- .1 Excavate to lines, grades, elevations and dimensions as indicated as directed by Departmental Representative.
- .2 Remove concrete masonry paving walks demolished foundations and rubble and other obstructions encountered during excavation in accordance with Section 01 74 20.
- .3 Excavation must not interfere with normal 45 splay of bearing from bottom of any footing.
- .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, unless otherwise authorized by Departmental Representative in writing, 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 Dispose of surplus and unsuitable excavated material off site.
- .7 Do not obstruct flow of surface drainage or natural watercourses.
- .8 Earth bottoms of excavations to be undisturbed soil, level, free from loose, soft or organic matter.
- .9 Notify Departmental Representative when bottom of excavation is reached.
- .10 Obtain Departmental Representative's approval of completed excavation.
- .11 Remove unsuitable material from trench bottom to extent and depth as directed by Departmental Representative.
- .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 Standard Proctor Density to ASTM D698.

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- 3.6 EXCAVATION  
(Cont'd)
- .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 to approval of Departmental Representative.
- 3.7 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 ASTM D1557 Standard Proctor 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 Retaining walls: use Type 2 fill to subgrade level on high side for minimum 500 mm from wall and compact to 95%. For remaining portion, use Type 3 fill compacted to 95%.
- .5 Place unshrinkable fill in areas as indicated.
- 3.8 BEDDING AND UNDERGROUND SERVICES
- .1 Place and compact granular material for bedding and surround of underground services as indicated in Section 32 11 20.
- .2 Place bedding and surround material in unfrozen condition.
- 3.9 BACKFILLING
- .1 Do not proceed with backfilling operations until Departmental Representative has inspected and approved 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.
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3.9 BACKFILLING  
(Cont'd)

- .4 Place backfill material in uniform layers not exceeding 150 mm compacted thickness up to grades indicated. Compact each layer before placing succeeding layer.
- .5 Backfill around installations.
- .6 Place unshrinkable fill in areas as indicated. Consolidate and level unshrinkable fill with internal vibrators.
  - .1 Place bedding and surround material as specified elsewhere.
  - .2 Do not backfill around or over cast-in-place concrete within 24 h after placing of concrete.
  - .3 Place layers simultaneously on both sides of installed work to equalize loading. Difference not to exceed 0.6m.
  - .4 Where temporary unbalanced earth pressures are liable to develop on walls or other structures:
    - .1 Permit concrete to cure for minimum 14 days or until it has sufficient strength to withstand earth and compaction pressure and approval obtained from Departmental Representative or:
    - .2 If approved by Departmental Representative, erect bracing or shoring to counteract unbalance, and leave in place until removal is approved by Departmental Representative.
- .7 Install drainage system in backfill as indicated.

3.10 RESTORATION

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