

**PART 1 – GENERAL**

- 1.1 REFERENCES .1 Ontario Provincial Standard Specifications (OPSS)
- .1 OPSS 206 (November 2013) - Construction Specification For Grading.
  - .2 OPSS 801 (November 2010) - Construction Specification For The Protection Of Trees.
  - .3 OPSS 802 (November 2010) - Construction Specification For Topsoil.
  - .4 OPSS 805 (November 2010) - Construction Specification For Temporary Erosion And Sediment Control Measures

**PART 2 – PRODUCTS**

- 2.1 NOT USED .1 Not Used.

**PART 3 – EXECUTION**

- 3.1 TEMPORARY EROSION AND SEDIMENTATION CONTROL .1 Provide temporary erosion and sedimentation control measures to prevent soil erosion and discharge of soil-bearing water runoff or airborne dust to adjacent properties walkways, according to sediment and erosion control drawings.
- .2 Inspect, repair, and maintain erosion and sedimentation control measures during construction until permanent vegetation has been established.
- 3.2 STRIPPING OF TOPSOIL .1 Ensure that procedures are conducted in accordance with applicable Provincial requirements.
- .2 Remove topsoil before construction procedures commence to avoid compaction of topsoil.
- .3 Handle topsoil only when it is dry and warm.
- .4 Remove vegetation from targeted areas by non-chemical means and dispose of stripped vegetation by alternative disposal.
- .5 Remove brush from targeted area by non-chemical means and dispose of through alternative disposal.
- .6 Strip topsoil to depths as directed by Departmental Representative.
- .1 Avoid mixing topsoil with subsoil.
- .7 Pile topsoil in berms in locations as directed by Departmental Representative.
- .1 Stockpile height not to exceed 2.5 - 3 m.
- .8 Spread unused topsoil in location as indicated by Departmental Representative.
- .9 Protect stockpiles from contamination and compaction.
- .10 Cover topsoil that has been piled for long term storage, with trefoil or grass to maintain agricultural potential of soil.
- 3.3 PREPARATION OF GRADE .1 Verify that grades are correct and notify Departmental Representative if discrepancies occur, do not begin work until instructed by Departmental Representative.
- .1 Grade area only when soil is dry to lessen soil compaction.
- .2 Grade soil establishing natural contours and eliminating uneven areas and low spots, ensuring positive drainage.
- 3.4 PLACING OF TOPSOIL .1 Place topsoil only after Departmental Representative has accepted subgrade.
- .2 Spread topsoil during dry conditions in uniform layers not exceeding 150mm, over unfrozen subgrade free of standing water.

- .3 Establish traffic patterns for equipment to prevent driving on topsoil after it has been spread to avoid compaction.
- .4 Cultivate soil following spreading procedures.

3.5 CLEANING

- .1 Proceed in accordance with Section 01 74 11 – Cleaning.
- .2 On completion and verification of performance of installation, remove surplus materials, excess materials, rubbish, tools and equipment.

- END OF  
SECTION -

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**PART 1 – GENERAL**

- 1.1 RELATED REQUIREMENTS .1 Section 31 14 13 – Soil Stripping and Stockpiling.
- 1.2 REFERENCES .1 ASTM International  
.1 ASTM D6938-10, Standard Test Method for In-Place Density and Water Content of Soil and Soil-Aggregate by Nuclear Methods (Shallow Depth).  
.2 Ontario Provincial Standard Specifications (OPSS)  
.1 OPSS 206 (November 2013) - Construction Specification For Grading.  
.2 OPSS 501 (November 2014) - Construction Specification For Compacting
- 1.3 ACTION AND INFORMATION SUBMITTALS .1 Submit in accordance with Section 01 33 00 – Submittal Procedures.
- 1.4 EXISTING CONDITIONS .1 Examine subsurface investigation report which is available for inspection from the Departmental Representative.  
plan. .2 Known underground and surface utility lines and buried objects are as indicated on site  
.3 Refer to dewatering in Section 31 23 33.02 – Excavating, Trenching and Backfilling for Site Servicing.

**PART 2 – PRODUCTS**

- 2.1 MATERIALS .1 Fill material in accordance with Section 31 23 33.02 – Excavating, Trenching and Backfilling for Site Servicing.  
.2 Excavated or graded material existing on site suitable to use as fill for grading work if approved by Departmental Representative.

**PART 3 – EXECUTION**

- 3.1 EXAMINATION .1 Verification of Conditions: verify that conditions of substrate previously installed under other Sections or Contracts are acceptable for rough grading installation in accordance with manufacturer's written instructions.  
.1 Visually inspect substrate in presence of Departmental Representative.  
.2 Inform Departmental Representative of unacceptable conditions immediately upon discovery.  
.3 Proceed with installation only after unacceptable conditions have been remedied.
- 3.2 GRADING .1 Rough grade to levels, profiles, and contours allowing for surface treatment as indicated  
.2 Rough grade to following depths below finish grades:  
.1 100 mm for grassed areas.  
.2 400 mm for flowerbeds.  
.3 100 mm for shrub beds.

- .4 See Drawing C1 for temporary roadway patching materials and thickness.
  - .3 Slope rough grade away from building.
  - .4 Grade ditches to depth as indicated on grading plan.
  - .5 Prior to placing fill over existing ground, scarify surface to depth of 150 mm minimum before placing fill over existing ground. Maintain fill and existing surface at approximately same moisture content to facilitate bonding.
  - .6 Subgrade surface shall be heavily proof rolled with a large vibratory roller (minimum 8 tonnes).
  - .7 Do not disturb soil within branch spread of trees or shrubs to remain.
- 3.3 TESTING .1 Inspection and testing of soil compaction will be carried out by qualified professional at the cost of the Contractor. No measurement for payment will be made for the work of this section. All costs associated with the work of this section shall be deemed to be included in the Balance of Project.
- .2 Submit testing procedure, frequency of tests to Departmental Representative for approval.
- 3.4 CLEANING .1 Progress Cleaning: clean in accordance with Section 01 74 11 – Cleaning.
- .1 Leave Work area clean at end of each day.
- 3.5 PROTECTION .1 Maintain access roads to prevent accumulation of construction related debris on roads.

- END OF SECTION -

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**PART 1 – GENERAL**

- 1.1 **RELATED REQUIREMENTS** .1 Section 33 07 16 – Factory Pre-Insulated Piping Systems for Utility Applications
- 1.2 **MEASUREMENT PROCEDURES** .1 [intentionally left blank]
- 1.3 **REFERENCES** .1 American Society for Testing and Materials International (ASTM)
- .1 ASTM C117-04, Standard Test Method for Material Finer than 0.075 mm (No.200) Sieve in Mineral Aggregates by Washing.
  - .2 ASTM C136-05, Standard Test Method for Sieve Analysis of Fine and Coarse Aggregates.
  - .3 ASTM D422-632002, Standard Test Method for Particle-Size Analysis of Soils.
  - .4 ASTM D698-00ae1, 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 D1557-02e1, 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 D4318-05, Standard Test Methods for Liquid Limit, Plastic Limit, and Plasticity Index of Soils.
  - .7 ASTM D6938-10, Standard Test Method for In-Place Density and Water Content of Soil and Soil-Aggregate by Nuclear Methods (Shallow Depth).
- .2 Canadian General Standards Board (CGSB)
- .1 CAN/CGSB-8.1-88, Sieves, Testing, Woven Wire, Inch Series.
  - .2 CAN/CGSB-8.2-M88, Sieves, Testing, Woven Wire, Metric.
- .3 Canadian Standards Association (CSA International)
- .1 CAN/CSA-A3000-03, Cementitious Materials Compendium (Consists of A3001, A3002, A3003, A3004 and A3005).
    - .1 CSA-A3001-03, Cementitious Materials for Use in Concrete.
  - .2 CSA-A23.1/A23.2-04, Concrete Materials and Methods of Concrete Construction/Methods of Test and Standard Practices for Concrete
- .4 Ontario Provincial Standard Specifications (OPSS)
- .1 OPSS 206 (November 2013) - Construction Specification For Grading.
  - .2 OPSS 401 (November 2013) - Construction Specification For Trenching, Backfilling, And Compacting.
  - .3 OPSS 1010 (November 2013) - Material Specification For Aggregates - Base, Subbase, Select Subgrade, And Backfill Material.
- 1.4 **DEFINITIONS** .1 Excavation classes: two classes of excavation will be recognized; common excavation and rock excavation.
- .1 Rock: solid material in excess of 1.00 m<sup>3</sup> and which cannot be removed by means of heavy duty mechanical excavating equipment with 0.95 to 1.15 m<sup>3</sup> bucket. Frozen material will be 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:
- .1 Material capable of supporting good vegetative growth and suitable for use in top dressing, landscaping and seeding.

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- .2 Material reasonably free from subsoil, clay lumps, brush, objectionable weeds, and other litter, and free from cobbles, stumps, roots, and other objectionable material larger than 25 millimeters in any dimension.
  - .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 Recycled fill material: material, considered inert, obtained from alternate sources and engineered to meet requirements of fill areas.
  - .7 Unsuitable materials:
    - .1 Weak, chemically unstable, and compressible materials.
    - .2 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
      - .2 Coarse grained soils containing more than 20 % by mass passing 0.075 mm sieve.
  - .8 Unshrinkable fill: very weak mixture of cement, concrete aggregates and water that resists settlement when placed in utility trenches, and capable of being readily excavated.
- 1.5 ACTION AND INFORMATIONAL SUBMITTALS
- .1 Make submittals in accordance with Section 01 33 00 - Submittal Procedures.
  - .2 Quality Control:
    - .1 Submit condition survey of existing conditions.
    - .2 Submit for review by Departmental Representative proposed dewatering and heave prevention methods.
    - .3 Submit to Departmental Representative written notice at least 5 days prior to excavation work, to ensure cross sections are taken.
    - .4 Submit to Departmental Representative written notice when bottom of excavation is reached.
    - .5 Submit to Departmental Representative testing results and report.
- 1.6 QUALITY ASSURANCE
- .1 Submit design and supporting data at least 2 weeks prior to beginning Work.
  - .2 Design and supporting data submitted to bear stamp and signature of qualified professional engineer registered or licensed in Province of Ontario, Canada.
  - .3 Keep design and supporting data on site.
  - .4 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.
  - .5 Do not use soil material until written report of soil test results are reviewed and approved by Departmental Representative.
  - .6 Health and Safety Requirements:
    - .1 Do construction occupational health and safety in accordance with Section 01 35 29.06 - Health and Safety Requirements.
- 1.7 WASTE MANAGEMENT AND DISPOSAL
- .1 Separate waste materials for reuse in accordance with Section 01 74 11 - Cleaning.
  - .2 Divert excess materials from landfill to local quarry for reuse.
- 1.8 EXISTING CONDITIONS
- .1 Buried services:
    - .1 Before commencing work establish location of buried services on and adjacent to site.
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- .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 beginning excavation Work, notify authorities, including Departmental Representative, and state of use of buried utilities and structures. Clearly mark such locations to prevent disturbance during Work.
- .6 Confirm locations of buried utilities by careful soil hydrovac methods.
- .7 Maintain and protect from damage, water, sewer, gas, electric, telephone and other utilities and structures encountered.
- .8 Where utility lines or structures exist in area of excavation, obtain direction of Departmental Representative before removing. Costs for such Work to be paid by Contractor.
- .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 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 as directed by Departmental Representative.

**PART 2 – PRODUCTS**

- 2.1 MATERIALS .1 Backfill material shall be one of the following, as specified in the Contract Documents:
  - .1 Granular A.
  - .2 Granular B, Type I, II, or III.
  - .3 Unshrinkable fill.
  - .4 Native material, if approved the Departmental Representative.

**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 PREPARATION/  
PROTECTION .1 Protect existing features in accordance with 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 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.
- .5 Protect buried services that are required to remain undisturbed.

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- 3.3 STOCKPILING .1 Stockpile fill materials in areas designated by Departmental Representative.  
.1 Stockpile granular materials in manner to prevent segregation.  
.2 Protect fill materials from contamination.  
.3 Implement sufficient erosion and sediment control measures to prevent sediment release off construction boundaries and into water bodies.
- 3.4 DEWATERING AND HEAVE PREVENTION .1 Keep excavations free of water while Work is in progress.  
.2 Provide for Departmental Representative's approval details of proposed dewatering or heave prevention methods, including dikes, well points, and sheet pile cut-offs.  
.3 Avoid excavation below groundwater table if quick condition or heave is likely to occur.  
.1 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 to approved manner not detrimental to public and private property, or portion of Work completed or under construction as directed by Departmental Representative.  
.1 Provide and maintain temporary drainage ditches and other diversions outside of excavation limits.
- 3.5 EXCAVATION operations for .1 Advise Departmental Representative at least 7 days in advance of excavation initial cross sections to be taken.  
.2 Excavate to lines, grades, elevations and dimensions as indicated.  
.3 Remove concrete, paving, walks, curbs and other obstructions encountered during excavation as indicated.  
.4 Excavation must not interfere with bearing capacity of adjacent foundations.  
.5 Do not disturb soil within branch spread of trees or shrubs that are to remain.  
.1 If excavating through roots, excavate by hand and cut roots with sharp axe or saw.  
.6 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.  
.7 Keep excavated and stockpiled materials safe distance away from edge of trench as directed by Departmental Representative.  
.8 Restrict vehicle operations directly adjacent to open trenches.  
.9 Dispose of surplus and unsuitable excavated material off site.  
.10 Do not obstruct flow of surface drainage or natural watercourses.  
.11 Earth bottoms of excavations to be undisturbed soil, level, free from loose, soft or organic matter.  
.12 Notify Departmental Representative when bottom of excavation is reached.  
.13 Obtain Departmental Representative approval of completed excavation.  
.14 Remove unsuitable material from trench bottom including those that extend below required elevations to extent and depth as directed by Departmental Representative.  
.15 Correct unauthorized over-excavation as follows:  
.1 Fill under bearing surfaces and footings with Type 2 fill compacted to not less than 100% of corrected Standard Proctor maximum dry density.  
.2 Fill under other areas with Type 2 fill compacted to not less than 95 % of corrected Standard Proctor maximum dry density.  
.16 Hand trim, make firm and remove loose material and debris from excavations.  
.1 Where material at bottom of excavation is disturbed, compact foundation soil to density at least equal to undisturbed soil.  
.2 Clean out rock seams and fill with concrete mortar or grout to approval of Departmental Representative.
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- .17 The sides of the excavation shall be sloped in accordance with the requirements in Ontario Regulation 213/91 under the Occupational health and Safety Act. According to the act, the soils at this site can be classified as Type 3. Open cut excavations within the overburden deposits shall be carried out with side slopes of 1 horizontal to 1 vertical, or flatter, extending from the base of the excavation.
- .18 No unusual problems are anticipated in excavating the fill material, silty clay and glacial till above the groundwater level. Alternatively, excavation below the groundwater in the sandy fill material will present some constraints. If groundwater is encountered during excavation, notify Departmental Representative immediately.
- .19 Boulders should be expected in the glacial till deposits, and may require special handling and disposal.
- .20 If services are installed below the water level, a Permit to Take Water (PTTW) may be required for pumping from within the excavations, in accordance with Ministry of the Environment and Climate Change (MOECC) requirements.

### 3.6 BEDDING

- .1 The bedding for the services shall consist of at least 150 mm of well graded crushed stone meeting OPSS requirements for Granular A. Granular materials used in the service trenches shall be composed of virgin (i.e. not recycled) material only.
- .2 Allowance shall be made for sub excavation of any existing fill, organic deposits, or disturbed material encountered at subgrade level. Any sub excavations shall be filled with granular material meeting OPSS requirements for Granular B Type II.
- .3 Cover material, from pipe spring line to at least 300 mm above the top of the pipe, shall consist of granular material meeting OPSS requirements for Granular A.
- .4 The use of clear crushed stone shall not be permitted as pipe bedding, subbedding or cover material.
- .5 Compact sub using hand tampers as insulation is susceptible to damage from mechanical compactors. Mechanical compactors or wheeled or tracked vehicles are not to be used for trench bed until after at least 300 mm compacted thickness is provided on top of the insulation jacket. Compact to 95% corrected Standard Proctor maximum dry density.

### 3.7 BACKFILLING

- .1 In areas where the service trench will be located below or in close proximity to existing or future roadway areas, acceptable native materials (as deemed by the Departmental Representative) shall be used as backfill between the roadway subgrade level and the depth of seasonal frost penetration in order to reduce the potential for differential frost heaving between the area over the trench and the adjacent section of the roadway.
- .3 When native backfill is used, it shall match the native materials exposed on the trench walls. Backfill below the zone of seasonal frost penetration shall consist of either acceptable native material (as deemed by the Departmental Representative) or imported granular material conforming to OPSS Granular B Type I. The depth of frost penetration in areas that are kept clear of snow and where trench backfill consists of earth fill is expected to be about 1.8 metres.
- .4 It is anticipated that most of the inorganic overburden materials encountered during the completion of Borehole 15-9 (As shown on Drawing C1) will be acceptable for reuse as trench backfill. Topsoil or other organic material shall be wasted from the trench.
- .5 The specified density for compaction of the backfill materials may be reduced where the trench backfill is not located below or in close proximity to existing or future areas of hard surfacing and/or structures (as deemed appropriate by the Departmental Representative).
- .6 The native deposits of sandy silt and glacial till have moisture contents above optimum for compaction. The overburden deposits at this site are sensitive to changes in moisture content. Unless these materials are allowed to dry, the specified densities will not likely be possible to achieve and, as a consequence, some settlement of these backfill materials could occur. The Contractor shall implement the following measures to reduce

post construction settlement above the trenches, depending on the weather conditions encountered during the construction:

1. allow the overburden materials to dry prior to compaction.
2. reuse any wet materials outside hard surfaced areas and where post construction settlement is less of a concern (such as landscaped areas).
- .7 Do not proceed with backfilling operations until completion of following:
  - .2 Departmental Representative has inspected and approved installations.
  - .3 Departmental Representative has inspected and approved of construction below finish grade.
  - .4 Inspection, testing, approval, and recording location of underground utilities.
- .8 Areas to be backfilled to be free from debris, snow, ice, water and frozen ground.
- .9 Do not use backfill material which is frozen or contains ice, snow or debris.
- .10 Backfilling around installations:
  - .1 Place bedding and surround material as specified elsewhere.
  - .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.
- .11 Factory pre-insulated piping system trench bedding and backfill: provide initial backfill around the pipe of Granular A meeting OPSS requirements. Ensure backfill is well graded with no sharp edges and compacted to 95% placed at a maximum compacted thickness of 150 mm layers. Compact backfill using hand tampers as insulation is susceptible to damage from mechanical compactors. Mechanical compactors or wheeled or tracked vehicles are not to be used for trench bed until after at least 300 mm compacted thickness is provided on top of the insulation jacket Compact to 95% corrected Standard Proctor maximum dry density.

- 3.9 RESTORATION
- .1 Upon completion of Work, remove waste materials and debris in accordance to Section 01 74 11 - Cleaning, trim slopes, and correct defects as directed by Departmental Representative.
  - .2 Replace topsoil as indicated.
  - .3 Reinstall lawns to elevation which existed before excavation.
  - .4 Reinstall pavements and sidewalks disturbed by excavation to thickness, structure and elevation which existed before excavation up to 1.0m beyond the excavation limits.
  - .5 Clean and reinstall areas affected by Work as directed by Departmental Representative.
  - .6 Use temporary plating to support traffic loads over unshrinkable fill for initial 24 hours.
  - .7 Protect newly graded areas from traffic and erosion and maintain free of trash or debris.

- END OF SECTION -