

Part 1 General**1.1 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 C136-06. 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 D698-00a.1. Standard Test Methods for Laboratory Compaction Characteristics of Soil Using Standard Effort (600 kN-m/m³).
 - .5 ASTM D4318-05. Standard Test Methods for Liquid Limit, Plastic Limit, and Plasticity Index of Soils.
- .2 Canadian General Standards Board (CGSB).
 - .1 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).
 - .2 CSA-A23.1-04/A23.2-04. Concrete Materials and Methods of Concrete Construction/Methods of Test and Standard Practices for Concrete.

1.2 DEFINITIONS

- .1 Excavation classes: two classes of excavation will be recognized; common excavation and rock excavation.
 - .1 Rock: any solid material in excess of 1.00 m³ and which cannot be removed by means of heavy duty mechanical excavating equipment with 0.95 to 1.15 m³ bucket. Frozen material is 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:
 - .1 Material capable of supporting good vegetative growth and suitable for use in top dressing, landscaping and seeding.
 - .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 mm 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 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-8.2.

- .2 Table:

Sieve Designation	% Passing
2.00 mm	100
0.10 mm	45 - 100
0.02 mm	10 - 80
0.005 mm	0 - 45

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

1.3 ACTION AND INFORMATIONAL SUBMITTALS

- .1 Make submittals in accordance with Section 01 33 00 - Submittal Procedures.
- .2 Preconstruction Submittals:
 - .1 Submit list of construction equipment for major equipment to be used prior to start of Work.
 - .2 Submit records of underground utility locates. Indicate: location plan of existing utilities as found in field, clearance record from utility authority, location plan of relocated and abandoned services, as required.
- .3 Samples:
 - .1 Submit samples in accordance with Section 01 33 00 - Submittal Procedures.
 - .2 Inform Departmental Representative at least 4 weeks prior to beginning Work, of proposed source of fill materials and provide access for sampling.
 - .3 If requested, submit 70 kg samples of type of fill specified including representative samples of excavated material.
 - .4 Ship samples prepaid to in tightly closed containers to prevent contamination and exposure to elements.

1.4 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.
- .3 Keep design and supporting data on site.
- .4 Engage services of qualified professional Engineer who is registered or licensed in Province of Ontario 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 Do construction occupational health and safety in accordance with Section 01 35 29.06 - Health and Safety Requirements.

1.5 REGULATIONS

- .1 Shore and brace excavations, protect slopes and banks and perform all work in accordance with Provincial and Municipal regulations whichever is more stringent.

1.6 TESTS AND INSPECTIONS

- .1 Testing of materials and compaction of backfill and fill will be carried out by testing laboratory designated by Departmental Representative.
- .2 Costs of tests will be paid as per Section 01 45 00 – Quality Control.
- .3 Not later than one week before backfilling or filling, provide to designated testing agency, 23 kg sample of backfill for fill material proposed for use.
- .4 Do not begin backfilling or filling operations until material has been approved for use by Departmental Representative.
- .5 Not later than 48 hours before backfilling or filling with approved material, notify Departmental Representative so that compaction tests can be carried out by designated testing agency.
- .6 Before commencing work, conduct, with Departmental Representative, condition survey of existing structures, trees and other plants, lawns, fencing, service poles, wires, rail tracks and paving, survey bench marks and monuments which may be affected by work.

1.7 EXISTING SITE CONDITIONS

- .1 Protect existing features in accordance with applicable local regulations.
- .2 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 beginning excavation Work, notify applicable Engineer and authorities having jurisdiction to establish location and state of use of buried utilities and structures. Contractor 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, sewer, gas, electric, telephone and other utilities and structures encountered and as indicated.
 - .5 Where utility lines or structures exist in area of excavation, obtain direction of Departmental Representative before removing or re-routing.
 - .6 Record location of maintained, re-routed and abandoned underground lines.
 - .7 Confirm locations of recent excavations adjacent to area of excavation.
- .3 Existing buildings and surface features:
 - .1 Conduct, with Departmental Representative, 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.
 - .2 Protect existing buildings and surface features from damage while Work is in progress. In event of damage, immediately make repair.
 - .3 Where required for excavation, cut roots or branches as directed by Departmental Representative.
- .4 Separate waste materials for reuse and recycling in accordance with Section 01 10 00 _ general Instructions.
 - .1 Handle and dispose of hazardous materials in accordance with CEPA, TDGA and Regional and Municipal regulations.
 - .2 Divert excess aggregate materials from landfill to local quarry or recycling facility for reuse.

1.8 PROTECTION

- .1 Protect excavations from freezing.
- .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.
- .5 Protect buried services that are required to remain undisturbed.

Part 2 Products**2.1 MATERIALS**

- .1 Granular A/Granular B(Type 1 and 2)/ Select Subgrade Material:
 - .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-8.2.
 - .3 Table: Gradation Requirements – Percent Passing

Sieve	Granular (Walkways and Parking Areas)			Select Subgrade Material (Softscape)
	A	B		
		Type 1	Type 2	
150 mm	N/A	100	N/A	100
106 mm	N/A	N/A	100	N/A
25 mm	100	50-100	50-100	50-100
19.0 mm	85-100	N/A	N/A	N/A
9.5 mm	50-73	N/A	N/A	N/A
4.75 mm	35-55	20-100	20-55	20-100
2 mm	15-40	10-100	10-40	10-100
400 μm	5-22	2-65	5-22	5-95
74 μm	2-8	0-8	0-10	0-25

Part 3 Execution**3.1 STOCKPILING**

- .1 All debris from concrete slab removal from inside the building shall be removed from site and shall not be stockpiled and shall not be reused as fill.
- .2 Stockpile fill materials in areas designated by Departmental Representative. Stockpile granular materials in manner to prevent segregation. Protect fill materials from contamination.
- .3 See Figure 1 showing stockpile location for granular fill removed for trenching inside the building. This stockpiling location is accessible from the South Loading Dock.
- .4 For trenching/excavation work within the building, Contractor to provide a detailed plan and schedule for sequence of excavation, stockpiling and backfilling.

- .5 Implement sufficient erosion and sediment control measures to prevent sediment release off construction boundaries and into water bodies.
- .6 Figure 1: Stockpile area circled in red. See 3.1.4.



3.2 SHORING, BRACING AND UNDERPINNING

- .1 Maintain sides and slopes of excavations in safe condition by appropriate methods and in accordance with Section 01 35 29.06 - Health and Safety Requirements.
- .2 Construct temporary Works to depths, heights and locations as indicated or directed by Departmental Representative.
- .3 During backfill operation:
 - .1 Unless otherwise indicated or directed by Contractors Shoring Engineer, 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 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 remove shoring and bracing. Remove excess materials from site and restore watercourses as indicated and as directed by Departmental Representative.

3.3 DEWATERING AND HEAVE PREVENTION

- .1 Keep excavations free of water while Work is in progress.
- .2 Submit for Departmental Representative's review and approval all 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.
- .4 Prevent piping or bottom heave of excavations by groundwater lowering, sheet pile cut-offs, or other means.
- .5 Protect open excavations against flooding and damage due to surface run-off.
- .6 Dispose of water to approved collection runoff areas and in manner not detrimental to public and private property, or portion of Work completed or under construction.
- .7 Provide and maintain temporary drainage ditches and other diversions outside of excavation limits.
- .8 Provide flocculation tanks, settling basins, or other treatment facilities to remove suspended solids or other materials before discharging to storm sewers, watercourses or drainage areas.

3.4 EXCAVATION

- .1 Strip topsoil over areas required to suit new site services installations and so that excavated material may be stockpiled without covering topsoil. Stockpile topsoil on site for later use.
- .2 Excavate as required to carry out work, in all materials met. Do not disturb soil or rock below bearing surfaces. Notify Departmental Representative when excavations are complete. If bearings are unsatisfactory, additional excavation will be authorized in writing and paid for as additional work. Excavation taken below depths shown without Departmental Representative's written authorization to be filled with concrete of same strength as for footings.
- .3 Excavate trenches to provide uniform continuous bearing and support for 150 mm thickness of pipe bedding material on solid and undisturbed ground. Trench widths below point 150 mm above pipe not to exceed diameter of pipe plus 600 mm.
- .4 Excavate for slabs and paving to subgrade levels. In addition, remove all topsoil, organic matter, debris and other loose and harmful matter encountered at subgrade level.
- .5 Excavate to lines, grades, elevations and dimensions as indicated and as directed by Departmental Representative.
- .6 Remove concrete, masonry, paving, walks, demolished foundations and rubble and other obstructions encountered during excavation.
- .7 Excavation must not interfere with bearing capacity of adjacent foundations.
- .8 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.
- .9 For trench excavation, unless otherwise authorized by Contractors Shoring Engineer 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.
- .10 Keep excavated and stockpiled materials safe distance away from edge of trench as directed by Contractors Shoring Engineer.
- .11 Restrict vehicle operations directly adjacent to open trenches.

- .12 Dispose of surplus and unsuitable excavated material off site.
- .13 Do not obstruct flow of surface drainage or natural watercourses.
- .14 Earth bottoms of excavations to be undisturbed soil, level, free from loose, soft or organic matter.
- .15 Notify Departmental Representative when bottom of excavation is reached. Obtain Departmental Representative approval of completed excavation.
- .16 Remove unsuitable material from trench bottom including those that extend below required elevations to extent and depth as directed by Departmental Representative.
- .17 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.

3.5 BACKFILLING PLACEMENT AND COMPACTION

- .1 Do not backfill until installations have been reviewed by the Departmental Representative.
- .2 Re-use excavated material where material is acceptable for re-use and approved by Departmental Representative. Except that new OPSS Granular 'A' material shall be used for pipe bedding under pipes and services per 3.5.2.5 and new OPSS Granular B and A and sand material shall be used under interior slab on grade per 3.5.2.8. Where native material is not suitable for backfill, use types of fill as indicated or specified below.
 - .1 Backfill within building perimeter: OPSS 1010, Granular B Type II.
 - .2 Backfill for exterior paved areas: OPSS 1010, Granular B Type II.
 - .3 Backfill against the exterior of foundation walls: OPSS 1010, Granular B Type II.
 - .4 Bulk backfill for exterior sodded or landscaped areas: Approved native soil or OPSS 1010, Granular B Type I or II.
 - .5 Bedding for site services (new material): OPSS 1010, Granular A.
 - .6 Backfilling for site services: As specified above.
 - .7 Granular sub-base (where required) for paved areas: OPSS 1010, Granular B Type II.
 - .8 Granular base under interior slab-on-grade (new material): 300mm of OPSS 1010, Granular B (sub-base), 150mm of OPSS 1010 Granular A blinded with a 40mm layer of sand.
 - .9 Granular base under exterior paved areas: OPSS 1010, Granular A.
 - .10 Bedding for foundation and underslab drainage (where required): 19 mm clear crushed stone.
- .3 Except where otherwise indicated, compact each layer of backfill to the following percentages of maximum dry densities obtained from ASTM D698 (Standard Proctor Maximum Dry Density (SPMDD)).
 - .1 Under structures, slabs-on-grade and pavements:
 - .1 Interior of building: 100%.
 - .2 Exterior of building: 98%.
 - .2 Under walkways: 95%.
 - .3 Under lawn, planted areas, or other unpaved areas: 90%
 - .4 Place and compact backfill materials in maximum 300 mm loose lifts except in maximum 150mm lifts under slab on grade and paving and as further specified in this section.

- .5 Place and compact backfill materials equally on both sides of walls to minimize unequal earth pressure.
- .6 Backfilling for site services and pipes:
 - .1 Pipe bedding and cover where not otherwise specified: Minimum 150 mm OPSS 1010, Granular "A" compacted to 95% standard proctor density. Extend the bedding material to the spring line of the pipe.
 - .2 If the soil at the subgrade level becomes disturbed, increase bedding to 300 mm in thickness. Place and compact in two 150 mm lifts.
 - .3 Cover material where not otherwise specified: From the spring line of the pipe to at least 300 mm above the top of the pipe, place OPSS 1010, Granular 'A' and compact to at least 95% SPMDD.
 - .4 Trench backfill: Native material to the Departmental Representative's approval, may be used for trench backfill. Under paved areas, the soil used for backfill to a depth of 2 m shall match the soil at the trench walls for frost heave compatibility.
 - .5 If the moisture content of the native material makes it difficult to handle, use it in the lower portions of the trench only or waste the material.
- .4 Use vibratory type compaction equipment:
- .5 Do not proceed with backfilling operations until completion of following:
 - .1 Departmental Representative has inspected and approved installations.
 - .2 Departmental Representative has inspected and approved of construction below finish grade.
 - .3 Inspection, testing, approval, and recording location of underground utilities.
 - .4 Removal of concrete formwork.
 - .5 Removal of shoring and bracing; backfilling of voids with satisfactory soil material.
- .6 Areas to be backfilled to be free from debris, snow, ice, water and frozen ground. Do not use backfill material which is frozen or contains ice, snow or debris.

3.6 GRADING

- .1 Grade so that water will drain away from buildings, walls and paved areas, to catch basins and other disposal areas approved by the Departmental Representative. Grade to be gradual between finished spot elevations shown on drawings.

3.7 RESTORATION

- .1 Upon completion of Work, remove waste materials and debris in accordance to Section 01 10 00 – General Instructions, trim slopes, and correct defects as directed by Departmental Representative.
- .2 Replace topsoil as indicated as directed by Departmental Representative.
- .3 Reinstall lawns to elevation which existed before excavation. Reinstall pavements and sidewalks disturbed by excavation to thickness, structure and elevation which existed before excavation.
- .4 Clean and reinstall areas affected by Work as directed by Departmental Representative.
- .5 Use temporary plating to support traffic loads over unshrinkable fill for initial 24 hours.
- .6 Protect newly graded areas from traffic and erosion and maintain free of trash or debris.

3.8 SHORTAGE AND SURPLUS

- .1 Supply all necessary fill to meet backfilling and grading requirements and with minimum and maximum rough grade variance.
- .2 Dispose of surplus material off site.

END OF SECTION

