

PART 1 GENERAL**1.1 RELATED SECTIONS**

- .1 Section 31 23 13 – Rough Grading.
- .2 Section 31 23 33.01 – Excavating, Trenching and Backfilling.
- .3 Section 32 91 21 – Topsoil Placement and Grading.

1.2 REFERENCES

- .1 Canadian Standard Association (CSA)
 - .1 CAN/CSA A23.1-14/A23.2-14 - Concrete materials and methods of concrete construction / Test methods and standard practices for concrete.
- .2 American Society for Testing and Materials (ASTM)
 - .1 ASTM D 698-12e2, Standard Test Methods for Laboratory Compaction Characteristics of Soil Using Standard Effort (12 400 ft-lbf/ft³ (600 kN-m/m³))

1.3 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.

1.4 TEST AND INSPECTIONS

- .1 Testing of materials and compaction of backfill and fill will be carried out by testing laboratory designated by Department Representative.
- .2 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.
- .3 Do not begin backfilling or filling operations until material has been approved for use by Department Representative.
- .4 Not later than 48 hours before backfilling or filling with approved material, notify Department Representative so that compaction tests can be carried out by designated testing agency.
- .5 Before commencing work, conduct, with Department 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.

1.5 BURIED SERVICES

- .1 Before commencing work, verify the location of all buried services on and adjacent to the 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. Cap cut-offs.

EARTHWORK AND RELATED WORK – SHORT FORM**1.6 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 Department 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, B Type II, Select Subgrade to OPSS1010. Sand to OPSS1004.

PART 3 EXECUTION**3.1 CLEARING AND GRUBBING**

- .1 Remove trees, stumps, shrubs, bushes, and debris within limits of excavation area.
- .2 Remove stumps and tree roots to 900mm below finished grade.
- .3 Dispose of cleared and grubbed material off site daily to disposal areas acceptable to Departmental Representative.

3.2 TOPSOIL STRIPPING AND STOCKPILING

- .1 Begin topsoil stripping of areas as directed by Departmental Representative after area has been cleared of brush, weeds and grasses and removed from site.
- .2 Strip topsoil to depths as directed by Departmental Representative. Do not mix topsoil with subsoil.
- .3 Stockpile in locations as directed by Departmental Representative. Stockpile height not to exceed 2 m and should be protected from erosion.
- .4 All excavated material to be stockpiled and reused for backfilling as indicated in Section 31 23 33.01 - Excavating, Trenching and Backfilling.

EARTHWORK AND RELATED WORK – SHORT FORM**3.3 EXCAVATION**

- .1 Strip topsoil over areas shown in drawings, and over areas where grade changes are required. Stockpile topsoil on site for later use.
- .2 Excavate, as required to carry out work, 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 structural fill or concrete of same strength as for footings at Contractor's expense.
- .3 Excavate to a level required for all new installations and stockpile for later use. In addition, remove all topsoil, organic matter, debris and other loose and harmful matter encountered at that level.

3.4 BACKFILLING

- .1 Inspection: do not commence backfilling until material and spaces to be filled have been inspected and approved by Departmental Representative.
- .2 Remove construction debris, organic soil and standing water from spaces to be filled.
- .3 Lateral support: maintain even levels of backfill around structures as work progresses, to equalize earth pressures.
- .4 Under slabs and paving:
 - .1 Use Granular 'A', and Granular 'B' Type II for base courses under paving areas to depths as indicated in Section 31 23 33.01 Excavating, Trenching and Backfilling.
- .5 In service trenches:
 - .1 Up to 300 mm above pipe or conduit: sand placed by hand.
 - .2 Over 300 mm above pipe or conduit: backfill as indicated in Section 31 23 33.01 Excavating, Trenching and Backfilling.
- .6 Under sodded areas: place topsoil to depth indicated in Section 32 91 21 Topsoil Placement and Grading.

3.5 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 Department Representative. Grade to be gradual between finished spot elevations shown on drawings.

3.6 SHORTAGE AND SURPLUS

- .1 Supply all necessary fill to meet backfilling and grading requirements and with minimum and maximum rough grade variance.
- .2 The on-site soil is not suitable for re-use as clean fill off-site. Soil excavated during on-site activities is to be reused on site. If soil is to be removed off-site, it must be disposed of at an Ontario Ministry of the Environment and Climate Change (MOECC) approved non-hazardous solid waste landfill.

END OF SECTION

PART 1 GENERAL**1.1 RELATED SECTIONS**

- .1 Section 31 23 33.01 - Excavation, Trenching and Backfilling.
- .2 Section 32 01 90.33 - Tree and Shrub Preservation.

1.2 REFERENCES

- .1 American Society for Testing and Materials (ASTM)
 - .1 ASTM D 698-91(1998), Test Method for Laboratory Compaction Characteristics of Soil Using Standard Effort (600 kN-m/m³).

1.3 EXISTING CONDITIONS

- .1 Examine subsurface logs, and test results which are bound into specification in Appendices Section.
- .2 Known underground and surface utility lines and buried objects are as indicated on site plan.
- .3 Refer to dewatering in Section 31 23 33.01 - Excavating Trenching and Backfilling.

1.4 PROTECTION

- .1 Protect existing landscaping, bench marks, buildings, surface or underground utility lines which are to remain as directed by Departmental Representative. If damaged, restore to original or better condition unless directed otherwise.
- .2 Maintain access roads to prevent accumulation of construction related debris on roads.

PART 2 PRODUCTS**2.1 MATERIALS**

- .1 Approved on-site excavated material in accordance with Section 31 23 33.01 – Excavating, Trenching and Backfilling is suitable for use only below vegetated landscaped areas.
- .2 Approved engineered fill in accordance with Section 31 23 33.01 - Excavating, Trenching and Backfilling is suitable for areas below all walkways, patios, and asphalt paving.

PART 3 EXECUTION**3.1 STRIPPING OF TOPSOIL**

- .1 Strip and stockpile topsoil in accordance with Section 31 14 11 – Earthwork and

ROUGH GRADING

Related Work – Short Form.

3.2 GRADING

- .1 Rough grade to levels, profiles, and contours allowing for surface structures as indicated.
- .2 Rough grade approved fill to following depths below finish grades:
 - .1 150 mm for grassed areas.
 - .2 350mm for perennial and ground cover planting beds
 - .3 350mm for shrub plantings.
 - .4 335mm for walkways and light duty patio areas.
- .3 Slope rough grade away from building as indicated.
- .4 Grade ditches to depth as indicated.
- .5 Prior to placing fill over existing ground, scarify surface to depth of 150 mm. Maintain fill and existing surface at approximately same moisture content to facilitate bonding.
- .6 Compact filled and disturbed areas to corrected maximum dry density to ASTM D 698, as follows:
 - .1 95% SPMDD under landscaped areas.
 - .2 95% SPMDD under light duty patio and walk areas.
 - .3 100% SPMDD under asphalt paving areas
- .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 testing laboratory designated by ULC. Costs of tests will be paid for by the Departmental Representative.

3.4 SURPLUS MATERIAL

- .1 Remove surplus material and material unsuitable for fill, grading or landscaping off site.

END OF SECTION

**EXCAVATING, TRENCHING
AND BACKFILLING****Part 1 General****1.1 RELATED REQUIREMENTS**

- .1 Section 02 41 16 – Structure Demolition.
- .2 Section 32 11 19 – Granular Sub-base.
- .3 Section 32 12 17 - Asphalt Paving – Short Form

1.2 REFERENCES

- .1 American Society for Testing and Materials International (ASTM).
 - .1 ASTM C117-17. Standard Test Method for Material Finer Than 0.075 mm (No.200) Sieve in Mineral Aggregates by Washing.
 - .2 ASTM C136/C136M-14 Standard Test Method for Sieve Analysis of Fine and Coarse Aggregates.
 - .3 ASTM D698-12e2 Standard Test Methods for Laboratory Compaction Characteristics of Soil Using Standard Effort (12,400 ft-lbf/ft³ (600 kN-m/m³)).
 - .4 ASTM D4318-17e1. 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-A3000-13. Cementitious Materials Compendium (Consists of A3001, A3002, A3003, A3004 and A3005).
 - .2 CSA-A23.1-14/A23.2-14 - Concrete materials and methods of concrete construction / Test methods and standard practices for concrete.

1.3 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.

EXCAVATING, TRENCHING AND BACKFILLING

- .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.

1.4 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 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.

1.5 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.

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- .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.

1.6 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.

1.7 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 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.
- .3 Do not begin backfilling or filling operations until material has been approved for use by Departmental Representative.
- .4 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.
- .5 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.

1.8 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:

EXCAVATING, TRENCHING AND BACKFILLING

- .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 as directed by Departmental Representative.
- .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 74 21 - Construction / Demolition Waste Management.
 - .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 as directed by Departmental Representative.

1.9 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

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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 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 Begin topsoil stripping of areas as indicated or as directed by Departmental Representative after area has been cleared of brush, weeds and grasses and removed from site.
- .2 Strip topsoil to depths as indicated or as directed by Departmental Representative. Do not mix topsoil with subsoil.
- .3 Stockpile in locations as indicated or as directed by Departmental Representative. Stockpile height not to exceed 2 m and should be protected from erosion.

3.3 STOCKPILING

- .1 Stockpile fill materials in areas designated by Departmental Representative. Stockpile granular materials in manner to prevent segregation. Protect fill materials from contamination.
- .2 Implement sufficient erosion and sediment control measures to prevent sediment release off construction boundaries and into water bodies.

3.4 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. Where conditions are unstable, Departmental Representative to verify and advise methods.
- .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 Contractor's 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.

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- .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.

3.5 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.

3.6 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, 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. Excavation taken below depths shown without Departmental Representative's written authorization to be filled with concrete of same strength as for footings at Contractor's expense.
- .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.

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- .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 Contractor's 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.

3.7 FILL TYPES AND COMPACTION

- .1 Use types of fill as indicated or specified below. Compaction densities are percentages of maximum densities obtained from ASTM D698.
 - .1 Below softscape finishes:
 - .1 Fill from undisturbed native soil up to underside of top soil with select subgrade material compacted to 100% SPMDD
 - .2 Below stone dust pathways/concrete sidewalks/asphalt pathways:
 - .1 1000 mm Granular B from undisturbed native soil to sub-base,
 - .2 300 mm OPSS Granular 'A' base compacted to 100% SPMDD
 - .3 Below heavy duty asphalt roadways:
 - .1 1220 mm Granular B from undisturbed native soil to sub-base, compacted to 100% SPMDD,
 - .2 300 mm OPSS Granular 'B' Type 2 Sub-base compacted to 100% SPMDD
 - .3 300 mm OPSS Granular 'A' Base compacted to 100% SPMDD.
 - .4 Backfill over services bedding: Granular 'A' with a minimum of 300mm vertical and side cover, compacted to 95% SPMDD.
 - .1 Service trenches in landscape areas: backfill using select subgrade material placed in 300mm thick loose lifts and compacted.
 - .2 Service trenches below paved areas: backfill with Granular A from the top of pipe to within 1200mm of the paved surface, placed in 300mm thick loose lifts and compacted to 95% SPMDD. A minimum of 150mm OPSS

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Granular A be placed below the pipe invert as bedding material. The upper 1200mm and below the subgrade line to be backfilled using Granular A, placed in 300mm thick loose lifts and compacted to 95% SPMDD.

3.8 BACKFILLING

- .1 Use vibratory type compaction equipment:
- .2 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.
- .3 Areas to be backfilled to be free from deditis, snow, ice, water and frozen ground. Donot 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 each successive layer.
- .5 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. Difference not to exceed 600 mm.
 - .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 as approved by Departmental Representative.
 - .2 If approved by Departmental Representative, erect bracing or shoring to counteract unbalance, and leave in place until removal is approved by Departmental Representative.
- .6 Compaction of subgrade: compact existing subgrade under walks, paving, and slabs on grade, to same compaction as specified for fill. Fill excavated areas with selected subgrade material compacted as specified for fill.
- .7 Placing:
 - .1 Place backfill, fill and basecourse material in 150 mm lifts. Add water as required to achieve specified density.
- .8 Compaction: compact each layer of material to following densities for material to ASTM D 698:

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- .1 To underside of basecourses: 95%.
- .2 Basecourses: 100%.
- .3 Elsewhere: 95%.

3.9 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.

3.10 RESTORATION

- .1 Upon completion of Work, remove waste materials and debris in accordance to Section 01 74 21 - Construction / Demolition Waste Management, trim slopes, and correct defects as directed by Departmental Representative.
- .2 Replace topsoil as indicated as directed by Departmental Representative.
- .3 Reinstate lawns to elevation which existed before excavation. Reinstate pavements and sidewalks disturbed by excavation to thickness, structure and 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 hours.
- .6 Protect newly graded areas from traffic and erosion and maintain free of trash or debris.

3.11 SHORTAGE AND SURPLUS

- .1 Supply all necessary fill to meet backfilling and grading requirements and with minimum and maximum rough grade variance.
- .2 The excavated material is not suitable for re-use as clean fill off-site. Soil excavated during on-site activities is to be reused on site. If soil is to be removed off-site, it must be disposed of at an Ontario Ministry of the Environment and Climate Change (MOECC) approved non-hazardous solid waste landfill.

END OF SECTION

PART 1 - GENERAL**1.1 RELATED REQUIREMENTS**

- .1 Section 31 23 33.01 - Excavation, Trenching and Backfilling.

1.2 REFERENCES

- .1 American Society for Testing and Materials International, (ASTM)
 - .1 ASTM D4491/D4491M-17 Standard Test Methods for Water Permeability of Geotextiles by Permittivity.
 - .2 ASTM D4595-17. Standard Test Method for Tensile Properties of Geotextiles by the Wide-Width Strip Method.
 - .3 ASTM D4716 / D4716M – 14. Standard Test Method for Determining the (In-plane) Flow Rate per Unit Width and Hydraulic Transmissivity of a Geosynthetic Using a Constant Head.
 - .4 ASTM D4751-16 Standard Test Methods for Determining Apparent Opening Size of a Geotextile.
- .2 Canadian Standards Association (CSA International)
 - .1 CAN/CSA-G40.20-13/G40.21-13 - General requirements for rolled or welded structural quality steel / Structural quality steel.
- .3 Ontario Provincial Standard Specifications (OPSS)
 - .1 OPSS 1860- 2012. Material Specification for Geotextiles.

1.3 ACTION AND INFORMATIONAL SUBMITTALS

- .1 Submit samples in accordance with Section 01 33 00 - Submittal Procedures.
- .2 Submit to Departmental Representative following samples at least 4 weeks prior to beginning Work.
 - .1 Minimum length of 2 m of roll width of geotextile.

1.4 DELIVERY, STORAGE AND HANDLING

- .1 During delivery and storage, protect geotextiles from direct sunlight, ultraviolet rays, excessive heat, mud, dirt, dust, debris and rodents.

1.5 WASTE MANAGEMENT AND DISPOSAL

- .1 Separate waste materials for reuse and recycling in accordance with Section 01 74 21 - Construction/Demolition Waste Management.
- .2 Remove from site and dispose of all packaging materials at appropriate recycling facilities.
- .3 Collect and separate for disposal paper, plastic, polystyrene, corrugated cardboard, packaging material in appropriate on-site bins for recycling in

GEOTEXTILES

accordance with Waste Management Plan.

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

PART 2 - PRODUCTS**2.1 MATERIAL**

- .1 Geotextile: non-woven synthetic fibre fabric, supplied in rolls.
 - .1 Width: 3.0 m minimum.
 - .2 Length: 40.0 m minimum.
 - .3 Composed of: minimum 95% by mass of polypropylene, polyethylene, polyester, or other synthetic polymers with inhibitors added to base plastic to resist deterioration by ultra-violet and heat exposure.
- .2 Physical properties:
 - .1 Thickness: to CAN/CGSB-148.1, No.3, minimum 6 mm.
 - .2 Mass per unit area: to CAN/CGSB-148.1, No.2, minimum 109 g/m².
 - .3 Tensile strength and elongation (in any principal direction): to ASTM D 4595.
 - .1 Tensile strength: minimum 355.86 N, wet condition.
 - .2 Elongation at break: maximum 50%.
 - .3 Seam strength: equal to or greater than tensile strength of fabric.
 - .4 Grab tensile strength and elongation: to CAN/CGSB-148.1, No.7.3.
 - .1 Breaking force: minimum 355.86 N, wet condition.
 - .2 Elongation at future: maximum 50%.
- .3 Hydraulic properties:
 - .1 Apparent opening size (AOS): to ASTM D 4751, 212 micrometres.
 - .2 Filtration opening size (FOS): to CAN/CGSB-148.1 No.10, OPSS 1860.
 - .3 Permittivity: to ASTM D 4491, 2.2 pers.
- .4 Securing pins and washers: to CAN/CSA-G40.21, Grade 300W, hot-dipped galvanized with minimum zinc coating of 600 g/m² to CAN/CSA G164.

PART 3 EXECUTION**3.1 INSTALLATION**

- .1 Place geotextile material by unrolling onto graded surface in orientation, manner and locations indicated and retain in position with pins.
- .2 Place geotextile material smooth and free of tension stress, folds, wrinkles and creases.
- .3 Place geotextile material on sloping surfaces in one continuous length from toe of slope to upper extent of geotextile.

GEOTEXTILES

- .4 Overlap each successive strip of geotextile 600 mm over previously laid strip.
- .5 Pin successive strips of geotextile with securing pins at 300mm interval at mid point of lap.
- .6 Protect installed geotextile material from displacement, damage or deterioration before, during and after placement of material layers.
- .7 After installation, cover with overlying layer within 1 h of placement.
- .8 Replace damaged or deteriorated geotextile to approval of Departmental Representative.
- .9 Place and compact soil layers in accordance with Section 31 23 33.01 - Excavation Trenching and Backfilling.

3.2 CLEANING

- .1 Remove construction debris from Project site and dispose of debris in an environmentally responsible and legal manner.

3.3 PROTECTION

- .1 Vehicular traffic not permitted directly on geotextile.

END OF SECTION