

PART 1 - GENERAL

- 1.1 Related Requirements
- .1 Section 32 16 15 - Concrete Curbs walks and Gutters.
 - .2 Section 32 31 13 - Chain Link Fences and Gates.
 - .3 Section 33 31 13 - Sanitary Piping.
- 1.2 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 D422-63 2002, Standard Test Method for Particle-Size Analysis of Soils.
 - .4 ASTM D698-12, Standard Test Methods for Laboratory Compaction Characteristics of Soil Using Standard Effort (600 kN-m/m³).
 - .5 ASTM D1557-02e01, Standard Test Methods for Laboratory Compaction Characteristics of Soil Using Modified Effort (2,700 kN-m/m³).
 - .6 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-8.1-88, 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).
 - .2 CSA-A3001-03, Cementitious Materials for Use in Concrete.

-
- .3 CSA-A23.1/A23.2-04, Concrete Materials and Methods of Concrete Construction/Methods of Test and Standard Practices for Concrete.
 - .4 Standard Specifications for Municipal Services, latest edition.
- 1.3 Definitions
- .1 Excavation classes: classes of excavation will be recognized; common excavation.
 - .1 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 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 Recycled fill material: material, considered inert, obtained from alternate sources and engineered to meet requirements of fill areas.
 - .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: Sieve sizes to CAN/CGSB-8.1.

.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.

.7 Rock: material which requires drilling,
ripping or breaking up with power-
operated tools for its removal, and
boulders and pieces of concrete
exceeding volume limits below. Frozen
material will not be classified as rock.
Minimum volume limits:

.1 Mass excavation: 1.0 cubic yards.

.2 Trench excavation: 0.5 cubic yards.

.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.

1.4 Action and
Informational
Submittals

.1 Make submittals in accordance with
Section 01 10 33 - Submittal Procedures.

.2 Quality Control: in accordance with
Section 01 10 33 - Submittal Procedures:
.1 Submit condition survey of existing
conditions as described in EXISTING
CONDITIONS article of this Section.
.2 Submit to Departmental
Representative written notice at
least 7 days prior to excavation
work.
.3 Submit to Departmental
Representative written notice when
bottom of excavation is reached.
.4 Submit to Departmental
Representative testing results as
described in PART 3 of this
Section.

-
- .3 Preconstruction Submittals:
 - .1 Plan of underground utility locates will be provided by Departmental Representative.

 - 1.5 Quality Assurance .1 Health and Safety Requirements:
 - .1 Do construction occupational health and safety in accordance with Section 01 35 29 - Health and Safety Requirements.

 - 1.6 Existing Conditions .1 Examine soil report available from Departmental Representative.
 - .2 Buried services:
 - .1 Before commencing work verify location of buried services on and adjacent to site.
 - .2 Size, depth and location of existing utilities and structures as indicated are for guidance only. Completeness and accuracy are not guaranteed.
 - .3 Prior to beginning excavation Work, notify applicable Departmental Representative establish location and state of use of buried utilities and structures.
 - .4 Confirm locations of buried utilities by careful test excavations.
 - .5 Maintain and protect from damage, water, sewer, gas, electric, telephone and other utilities and structures encountered as indicated.
 - .6 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.
 - .7 Record location of maintained, re-routed and abandoned underground lines.
 - .8 Confirm locations of recent excavations adjacent to area of excavation.

- .3 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 Type 1, Type 2, Pit Run and Clear stone fill: properties to the following requirements:
 - .1 Gradations to be within limits specified when tested to ASTM C136. Sieve sizes to CAN/CGSB-8.1.
 - .2 Table:

Sieve Designation	% Passing	% Passing	% Passing	% Passing
	Type 1	Type 2	Pit Run	Clear Stone
80 mm	-	-	100	-
56 mm	-	100	70-100	-
28 mm	-	60-80	50-80	100
20 mm	100	-	-	90-100
14 mm	50-85	-	35-65	-
10 mm	-	-	-	0-40
5 mm	20-50	25-45	20-50	0-10
0.16 mm	0-10	0-10	5-12	-
0.08 mm	0-7	-	3-5	-

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 and walkways, according to requirements of authorities having jurisdiction.

-
- .2 Inspect, repair, and maintain erosion and sedimentation control measures during construction until permanent vegetation has been established.
 - .3 Remove erosion and sedimentation controls and restore and stabilize areas disturbed during removal.
- 3.2 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.
- 3.3 Preparation/Protection
- .1 Protect existing features.
 - .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.
- 3.4 Excavation
- .1 Advise Departmental Representative at least 7 days in advance of excavation operations.
 - .2 Excavate to lines, grades, elevations and dimensions as indicated.
 - .3 Remove concrete, paving, walks and other obstructions encountered during excavation.
 - .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 5 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 Remove unsuitable material from trench bottom including those that extend below required elevations to extent and depth as directed by Departmental Representative.
- .14 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.

-
- .15 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.

 - 3.5 Bedding and Surround of Underground Services .1 Place and compact granular material for bedding and surround of underground services as indicated. Place bedding and surround material in unfrozen condition.

 - 3.6 Backfilling .1 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 Recording location of underground utilities.

 - .2 Areas to be backfilled to be free from debris, snow, ice, water and frozen ground.

 - .3 Do not use backfill material which is frozen or contains ice, snow or debris.

 - .4 Place backfill material in uniform layers not exceeding 150 mm compacted thickness up to grades indicated. Compact each layer before placing succeeding layer.

 - .5 Backfilling around installations:
 - .1 Place layers simultaneously on both sides of installed Work to equalize loading.

 - 3.7 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 lawns to elevation which existed before excavation.

- .4 Reinststate pavements, curbs and sidewalks disturbed by excavation to thickness, structure and elevation which existed before excavation.
- .5 Clean and reinststate areas affected by Work as directed by Departmental Representative.
- .6 Protect newly graded areas from traffic and erosion and maintain free of trash or debris.

END OF SECTION

PART 1 - GENERAL

- 1.1 RELATED REQUIREMENTS .1 Section 31 23 33 - Excavation, Trenching and Backfill.
-
- 1.2 REFERENCES .1 ASTM International
- .1 ASTM A123/A123M-09, Standard Specification for Zinc (Hot-Dip Galvanized) Coatings on Iron and Steel Products.
 - .2 ASTM D4491-99a(2009), Standard Test Methods for Water Permeability of Geotextiles by Permittivity.
 - .3 ASTM D4595-09, Standard Test Method for Tensile Properties of Geotextiles by the Wide-Width Strip Method.
 - .4 ASTM D4716-08, Standard Test Method for Determining the (In-Plane) Flow Rate Per Unit Width and Hydraulic Transmissivity of a Geosynthetic Using a Constant Head.
 - .5 ASTM D4751-04, Standard Test Method for Determining Apparent Opening Size of a Geotextile.
- .2 Canadian General Standards Board (CGSB)
- .1 CAN/CGSB-4.2 No. 11.2-2004, Textile Test Methods - Bursting Strength - Ball Burst Test (Extension of September 1989).
 - .2 CAN/CGSB-148.1, Methods of Testing Geotextiles and Complete Geomembranes.
 - .1 No. 2-M85, Methods of Testing Geosynthetics - Mass per Unit Area.
 - .2 No. 3-M85, Methods of Testing Geosynthetics - Thickness of Geotextiles.
 - .3 No. 6.1-93, Methods of Testing Geotextiles and Geomembranes - Bursting Strength of Geotextiles Under No Compressive Load.
 - .4 No. 7.3-92, Methods of Testing Geotextiles and Geomembranes - Grab Tensile Test for Geotextiles.

-
- .5 No. 10-94, Methods of Testing Geosynthetics - Geotextiles - Filtration Opening Size.
 - .3 CSA International
 - .1 CSA-G40.20/G40.21-04(R2009), General Requirements for Rolled or Welded Structural Quality Steel/Structural Quality Steel.
 - 1.3 ACTION AND INFORMATIONAL SUBMITTALS

 - .1 Submit in accordance with Section 01 33 00 - Submittal Procedures.
 - .2 Product Data:
 - .1 Submit manufacturer's instructions, printed product literature and data sheets for geotextiles and include product characteristics, performance criteria, physical size, finish and limitations.
 - .3 Samples:
 - .1 Submit copies of mill test data and certificate at least 4 weeks prior to start of Work.
 - 1.4 DELIVERY, STORAGE AND HANDLING

 - .1 Deliver, store and handle materials in accordance with manufacturer's written instructions.
 - .2 Storage and Handling Requirements:
 - .1 Store materials off ground and in accordance with manufacturer's recommendations in clean, dry, well-ventilated area.
 - .2 Store and protect geotextiles from direct sunlight and UV rays.
 - .3 Replace defective or damaged materials with new.
 - .3 Packaging Waste Management: remove for reuse.

PART 2 - PRODUCTS

2.1 MATERIAL

- .1 Geotextile fabric shall consist of polymeric filament or yarns such as polypropylene, polyethylene, polyester, or other polymers excluding polyamides, formed into a stable network such that the filaments or yarns retain their relative position to each other. The geotextile shall be inert to commonly encountered chemicals, resistant to ultraviolet light and heat exposure, and shall be indestructible by micro-organisms and insects.
- .2 Where sections of geotextile are joined, seam strength shall meet the minimum tensile strength requirements for the class of geotextile, unless otherwise specified in the Contract Documents.
- .3 Seams of the geotextile shall be sewn with thread of the material meeting the material requirements for the geotextile.
- .4 Geotextile rolls shall be supplied with an opaque protective covering by the manufacturer or supplier.
- .5 Geotextile
 - .1 Geotextile: Non-Woven needle punched synthetic fibre fabric, supplied in rolls.
 - .1 Physical properties - Minimum Average Roll Values (MARV):
 - .1 Tensile (Grab) Strength and elongation (in any principal direction) (ASTM D4632)
 - .1 Tensile strength: minimum 712 N, wet condition
 - .2 Elongation at break: 50%
 - .2 Permittivity (ASTM D4491) 1.3 sec⁻¹
 - .3 Apparent Opening Size (ASTM D4751) 0.212 mm

- .4 Mullen Burst Strength
(ASTM D3786) Minimum
1,930 kPa
- .5 Trapezoidal Tear to ASTM
D4533 267 N
- .6 Factory seams: sewn in accordance with
manufacturer's recommendations.
- .7 Thread for sewn seams: equal or better
resistance to chemical and biological
degradation than geotextile.

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 geotextile
material installation in accordance with
manufacturer's written instructions.

3.2 INSTALLATION

- .1 Where geotextile is to be placed on
natural ground, prepare surface by
removing debris which would interfere
with placement of geotextile. Remove
all boulders and sharp objects.
- .2 Place material by unrolling on to graded
surface and retain in position with
weight.
- .3 Place geotextile material by unrolling
onto graded surface in orientation,
manner and locations indicated and
retain in position with.
- .4 Place geotextile material smooth and
free of tension stress, folds, wrinkles
and creases.
- .5 When using pegged seams on sloping
surfaces, place geotextile in one
continuous length from toe of slope to
upper extent of geotextile to avoid
horizontal seams.

- .6 Join successive strips of geotextile by sewing:
 - .1 Sewing: Seam shall be a minimum of 40 mm from edges of geotextile. Seam shall be a "prayer" or "flat" seam sewn with a two-thread, double-locked chainstitch which shall develop a minimum of 85% of the specified geotextile strength. The thread shall be polyester, polypropylene or polyethylene, bonded TEX size 210 or 2000 denier.
- .7 Pin successive strips of geotextile with securing pins as indicated.
- .8 Protect installed geotextile material from displacement, damage or deterioration before, during and after placement of material layers.
- .9 Remove and replace damaged or deteriorated material. The damaged area shall be overlain with new geotextile with a minimum one metre overlap. Secure overlap.
- .10 After installation, cover with overlying layer within 4 hours of placement.
- .11 Replace damaged or deteriorated geotextile to acceptance of the Departmental Representative.
- .12 Protect geotextile from displacement or damage until and during placement of overlaid material layers.
- .13 Where structures penetrate the geotextile, ensure that the integrity of the geotextile is maintained.
- .14 Place and compact soil layers in accordance with Section 31 23 33 - Excavating Trenching and Backfilling.

3.3 PLACEMENT OF
COVER MATERIAL

- .1 Cover material shall be end dumped on the ground adjacent to the geotextile and carefully pushed or spread on to the geotextile by a dozer or other tracked machinery.

- .2 A minimum depth of 300 mm shall be maintained at all times between the geotextile and the construction equipment.
- .3 Cover material shall be spread in the direction of the geotextile overlap.
- .4 Cover material placement shall be place immediately on geotextile exposed to ultraviolet radiation. No more than 8 m of geotextile is to be left uncovered at any one time.
- .5 On unprotected geotextile, stones weighting more than 45 kg shall not be allowed to roll down slope.
- .6 For protected and unprotected geotextile, height of drop for stones less than 115 kg shall be less than 0.6 m and stones greater than 115 kg shall be placed with no free fall. If stones greater than 115 kg must be dropped, field trials shall be performed to determine the maximum height of safe drop without damaging the geotextile.

3.4 CLEANING

- .1 Progress Cleaning:
 - .1 Leave Work area clean at end of each day.
- .2 Final Cleaning: upon completion remove surplus materials, rubbish, tools and equipment.

3.5 PROTECTION

- .1 Vehicular traffic not permitted directly on geotextile.

END OF SECTION