Part 1 General

1.1 SUMMARY

.1 This Section defines correction to maximum dry density to take into account aggregate particles larger than 4.75 mm.

1.2 REFERENCES

.1 American Society for Testing and Materials (ASTM)

.1 ASTM C127-15, Standard Test Method for Specific Gravity and Absorption of Coarse Aggregate.

.2 ASTM D698-12e2, Standard Test Methods for Laboratory Compaction Characteristics of Soil Using Standard Effort (12,400 ft-lbf/ft³) (600kN-m/m³).

.3 ASTM D1557-12e1, Test Method for Laboratory Compaction Characteristics of Soil Using Modified Effort (56,000 ft-lbf/ft³).

.4 ASTM D4253-14, Standard Test Methods for Maximum Index Density and Unit Weight of Soils Using a Vibratory Table.

1.3 DEFINITIONS

.1 Corrected maximum dry density is defined as:

.1 D = (F1 x D1) + (0.9x D2 x F2)

.2 Where: D = corrected maximum dry density kg/m^3.

.1 F1 = fraction (decimal) of total field sample passing 4.75 mm sieve.

.2 F2 = fraction (decimal) of total field sample retained on 4.75 mm sieve (equal to 1.00 - F1)

.3 D1 = maximum dry density, kg/m3of material passing 4.75 mm sieve determined in accordance with Method A of ASTM D1557.

.4 D2 = bulk density, kg/m3, of material retained on 4.75 mm sieve, equal to 1000G where G is bulk specific gravity (dry basis) of material when tested to ASTM C127.

.3 For free draining aggregates, determine D1 (maximum dry density) to ASTM D4253, dry method when directed by Departmental Representative.

Part 2 Products (NOT APPLICABLE)

Part 3 Execution (NOT APPLICABLE)

END OF SECTION

Part 1 General

1.1 RELATED SECTIONS

.1 Section 01 33 00 – Submittal Procedures.

.2 Section 01 74 21 – Construction /Demolition Waste Management and Disposal.

.3 Section 32 11 16.0 – Granular Sub-base.

.4 Section 32 11 23 – Aggregate Base Courses.

.5 Section 32 12 16 – Asphalt Paving.

1.2 REFERENCES

.1 Standard Specification, Department of Transportation and Infrastructure of New Brunswick.

.2 American Society for Testing and Materials (ASTM)

.1 ASTM D4791-10, Standard Test Method for Flat Particles, Elongated Particles, or Flat and Elongated Particles in Coarse Aggregate;

.2 MTO Laboratory Testing Manual;

.3 AASHTO Standards T89 and T80.

1.3 SAMPLES

.1 Submit samples in accordance with Section 01 33 00 - Submittal Procedures.

.2 Allow continual sampling by the Departmental Representative during production.

.3 Provide the Departmental Representative with access to source and processed material for sampling.

.4 Install sampling facilities at discharge end of production conveyor, to allow Departmental Representative to obtain representative samples of items being produced. Stop conveyor belt when requested by Departmental Representative to permit full cross section sampling.

.5 Pay cost of sampling and testing of aggregates which fail to meet specified requirements.

1.4 WASTE MANAGEMENT AND DISPOSAL

.1 Divert unused granular materials from landfill to local quarry or facility as approved by Departmental Representative.

Part 2 Products

2.1 MATERIALS

.1 All materials shall be supplied by the Contractor.

.2 Aggregate quality: sound, hard, durable material free from soft, thin, elongated or laminated particles, organic material, clay lumps or minerals, or other substances that would act in deleterious manner for use intended.

.3 Fine aggregates satisfying requirements of applicable section to be one, or blend of following:

.1 Natural sand;

.2 Manufactured sand;

.3 Screenings produced in crushing of quarried rock, boulders, gravel or slag.

.4 Coarse aggregates satisfying requirements of applicable section to be one of or blend of following:

.1 Crushed rock;

.2 Gravel and crushed gravel composed of naturally formed particles of stone.

.5 Aggregate shall meet the requirements of Table 310516-1.

Table 310516-1
Properties of rock and Gravel Aggregate

Test and method	Aggregate Type	Value (Max.)
Micro Deval (MTO LS – 618)	Cover material	22%
	Aggregate Base	25%
	Aggregate Subbase and Shoulder Material	30%
Micro Deval (MTO LS – 619)	Blending Material (Aggregate Base)	25%
	Blending Material (Aggregate Subbase and Shoulder Material)	30%
Freeze Thaw (MTO LS – 614)	All Highway Aggregates	20%
Flat & Elongated Particles @ 4:1 (MTO LS – 608)	Crushed Rock Aggregates	35%
Plasticity Index (AASHTO T89 and T90)	Aggregate Base and Blending Material	3
	Aggregate Subbase and Blending Material	5

.6 Blending of Aggregates

.1 Blending of aggregates shall be permitted to meet the grading requirements, increase the percentage of crushed particles, or decrease the percentage of flat and elongated particles.

.2 Blending shall not be permitted if required solely to improve the results of material quality tests (Micro-Deval, Freeze-Thaw and Plasticity Index).

.3 Blending shall be permitted only at the crusher, and the method and location of introducing the blending material into the crushing process shall be submitted in writing to the Departmental Representative for approval, prior to production of any blended product.

.4 The blending material shall be added such that the rate of blending is controlled and measurable.

.5 Blending materials shall be granular materials having a Dust content not exceeding 20% when tested in accordance with ASTM C117.

.1 The blending materials shall individually meet the Micro-Deval and Plasticity Index requirements of Table 310516-1.

.6 Natural sand or gravel used as blending material in the production of the crushed rock aggregates shall not exceed 20% by mass of the blended aggregate produced.

.7 Blending of aggregates shall produce a consistently graded product.

.7 Aggregate Base/Subbase

.1 Crushed Rock Base/Subbase

.1 Crushed rock base/subbase shall be produced by the crushing and processing of rock to conform to the grading limits as set out in Table 310516-2, when tested in accordance with ASTM C136 and C117.

.2 Rock shall be quarried from a source that is solid in situ.

Table 310516-2
Grading Limits - Crushed Rock Base/Subbase

ASTM Sieve Size	Aggregate Base	Aggregate Subbase
	31.5 mm % passing	75 mm % passing
90.0 m		100
75.0 mm		95 – 100
63.0 mm		85 - 100
50.0 mm		73 – 95
37.5 mm	100	58 – 87
31.5 mm	95 – 100	
25.0 mm	81 – 100	
19.0 mm	66 – 90	35 – 69
12.5 mm	50 – 77	
9.5 mm	41 – 70	25 – 54
4.75 mm	27 – 54	17 – 43
2.36 mm	17 – 43	12 – 35
1.18 mm	11 - 32	8 - 28
300 µm	4 - 19	4 – 16
75 µm	0 – 8	0 – 9

.2 Crushed Gravel Base/Subbase

.1 Crushed gravel base/subbase shall be produced by the crushing and processing of gravel to conform to the grading limits as set out in Table 310516-3, when tested in accordance with ASTM C136 and C117.

.2 Gravel base shall have a minimum of 40% of the particles, by mass, having at least one fractured face, when tested in accordance with ASTM D5821.

Table 310516-3
Grading Limits - Crushed Gravel Base/Subbase

ASTM Sieve Size	Aggregate Base	Aggregate Subbase
	31.5 mm % passing	75 mm % passing
100.0		
90.0 m		100
75.0 mm		95 – 100
63.0 mm		86 - 100
50.0 mm		75 – 95
37.5 mm	100	61 – 87
31.5 mm	95 – 100	
25.0 mm	83 – 100	
19.0 mm	70 – 90	38 – 70
12.5 mm	55 – 78	
9.5 mm	45 – 72	28 – 56
4.75 mm	30 – 57	19 – 46
2.36 mm	20 – 46	13 – 37
1.18 mm	14 – 35	9 – 30
300 µm	5 - 19	4 – 16
75 µm	0 – 6	0 – 7

.3 Shoulder Material

.1 Shoulder material shall be produced using Reclaimed Asphalt Product (RAP) generated from cold milling of North Kouchibouguac Road and supplied from stockpile under Section 02 41 13.14 – Asphalt Paving Removal. RAP shall be processed to contain 100% passing the 50.0mm sieve, as determined by ASTM C136, and shall be free of all lumps or clods and soil.

2.2 SOURCE QUALITY CONTROL

.1 Inform the Departmental Representative of proposed source of aggregates and provide access for sampling at least 3 weeks prior to commencing production.

.2 If, in opinion of the Departmental Representative, materials from proposed source do not meet, or cannot reasonably be processed to meet, specified requirements, locate an alternative source or demonstrate that material from source in question can be processed to meet specified requirements.

.3 Advise the Departmental Representative 4 weeks in advance of proposed change of material source.

.4 Acceptance of material at source does not preclude future rejection if it fails to conform to requirements specified, lacks uniformity, or if its field performance is found to be unsatisfactory.

Part 3 Execution

3.1 PREPARATION

.1 Aggregate source preparation

.1 Prior to excavating materials for aggregate production, clear and grub area to be worked, and strip unsuitable surface materials. Dispose of cleared, grubbed and unsuitable materials as directed by the Departmental Representative.

.2 Where clearing is required, leave screen of trees between cleared area and roadways as directed.

.3 Clear, grub and strip area ahead of quarrying or excavating operation sufficient to prevent contamination of aggregate by deleterious materials.

.4 When excavation is completed dress sides of excavation to nominal 1.5:1 slope, and provide drains or ditches as required to prevent surface standing water.

.5 Trim off and dress slopes of waste material piles and leave site in neat condition.

.6 Install and maintain erosion and sedimentation control measures as required to protect adjacent land, wetland and watercourses from contamination.

.2 Processing

.1 Process aggregate uniformly using methods that prevent contamination, segregation and degradation.

.2 Blend aggregates, if required, to obtain gradation requirements, percentage of crushed particles, or particle shapes, as specified. Use methods and equipment approved by the Departmental Representative.

.3 Wash aggregates, if required to meet specifications. Use only equipment approved by the Departmental Representative.

.4 When operating in stratified deposits use excavation equipment and methods that produce uniform, homogeneous aggregate.

.3 Handling

.1 Handle and transport aggregates to avoid segregation, contamination and degradation.

.4 Stockpiling

.1 Stockpile aggregates on site in locations as indicated unless directed otherwise by the Departmental Representative. Do not stockpile on completed pavement surfaces.

.2 Stockpile aggregates in sufficient quantities to meet Project schedules.

.3 Stockpiling sites to be level, well drained, and of adequate bearing capacity and stability to support stockpiled materials and handling equipment.

.4 Except where stockpiled on acceptably stabilized areas, provide compacted sand base not less than 300 mm in depth to prevent contamination of aggregate. Stockpile aggregates on ground but do not incorporate bottom 300 mm of pile into Work.

.5 Separate different aggregates by strong, full depth bulkheads, or stockpile far enough apart to prevent intermixing.

.6 Do not use intermixed or contaminated materials. Remove and dispose of rejected materials as directed by the Departmental Representative within 48 hours of rejection.

.7 Stockpile materials in uniform layers of thickness as follows:

.1 Max 1.5 m for coarse aggregate and base course materials.

.2 Max 1.5 m for fine aggregate and sub-base materials.

.3 Max 1.5 m for other materials.

.8 Uniformly spot-dump aggregates delivered to stockpile in trucks and build up stockpile as specified.

.9 Do not cone piles or spill material over edges of piles.

.10 Do not use conveying stackers.

.11 During winter operations, prevent ice and snow from becoming mixed into stockpile or in material being removed from stockpile.

3.2 CLEANING

.1 Leave aggregate stockpile site in tidy, well drained condition, free of standing surface water.

.2 Unused aggregates are the property of the Contractor.

END OF SECTION

Part 1 General

1.1 RELATED SECTIONS

.1 Section 01 33 00 - Submittal Procedures.

.2 Section 01 35 29.06 – Health and Safety Requirements.

1.2 MEASUREMENT PROCEDURES

.1 Measure following items in square meters within limits as indicated:

.1 Clearing.

.2 Grubbing.

.2 Measure clearing isolated trees and grubbing isolated tree stumps as number of isolated trees cleared and number of isolated stumps grubbed.

1.3 REFERENCES

.1 U.S. Environmental Protection Agency (EPA)/Office of Water

.1 EPA 832R92005, Storm Water Management for Construction Activities: Developing Pollution Prevention Plans and Best Management Practices.

1.4 DEFINITIONS

.1 Clearing consists of cutting off trees and brush vegetative growth to not more than specified height above ground and disposing of felled trees, previously uprooted trees and stumps, and surface debris.

.2 Clearing isolated trees consists of cutting off to not more than specified height above ground of designated trees, and disposing of felled trees and debris.

.3 Grubbing consists of excavation and disposal of stumps and roots boulders and rock fragments of specified size to not less than specified depth below existing ground surface.

1.5 SUBMITTALS

.1 Provide submittals in accordance with Section 01 33 00 - Submittal Procedures.

.2 Samples:

.1 Submit one (1) sample of each material listed below for approval prior to delivery of materials to project site.

.2 Tree wound paint: one liter can with manufacturer's label.

.3 Herbicide: one liter can with manufacturer's label.

.3 Submit certificates signed by manufacturer certifying that materials comply with specified performance characteristics and physical properties.

.4 Submit manufacturer's installation instructions.

1.6 QUALITY ASSURANCE

.1 Do construction occupational health and safety in accordance with Section 01 35 29.06 - Health and Safety Requirements.

.2 Safety Requirements: worker protection.

.1 Workers must wear gloves, dust masks, eye protection, protective clothing, when applying herbicide materials.

.2 Workers must not eat, drink or smoke while applying herbicide material.

.3 Clean up spills of preservative materials immediately with absorbent material and safely discard to landfill.

1.7 STORAGE AND PROTECTION

.1 Prevent damage to trees, natural features, bench marks, utility lines, site appurtenances, water courses and root systems of trees which are to remain.

.1 Repair damaged items to approval of the Departmental Representative.

.2 Replace trees designated to remain, if damaged, as directed by the Departmental Representative.

1.8 WASTE MANAGEMENT AND DISPOSAL

.1 Separate waste materials for reuse and recycling in accordance with Section 01 74 21 - Construction/Demolition Waste Management and Disposal.

.2 Consider felled timber from which saw logs, pulpwood, posts, poles, ties, or fuel wood can be produced as saleable timber.

.1 Trim limbs and tops, and saw into saleable lengths for fuel wood.

.2 Stockpile adjacent to site.

Part 2 Products

2.1 MATERIALS

.1 Bituminous based paint of standard manufacture specially formulated for tree wounds.

.2 Soil Material for Fill:

.1 Excavated soil material: free of debris, roots, wood, scrap material, vegetable matter, refuse, soft unsound particles, deleterious, or objectionable materials.

.2 Remove and store soil material for reused.

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 erosion control drawings, specific to site, or requirements of authorities having jurisdiction, whichever is more stringent.

.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 PREPARATION

.1 The Departmental Representative shall identify clearing limits and buffer zones limits with ribbons or similar means.

.2 Inspect site and verify with the Departmental Representative, items designated to remain.

.3 Locate and protect utility lines: preserve in operating condition active utilities traversing site.

.1 Notify the Departmental Representative immediately of damage to or when unknown existing utility lines are encountered.

.4 Notify utility authorities before starting clearing and grubbing.

.5 Keep roads free of dirt and debris.

3.3 APPLICATION

.1 Manufacturer's instructions: comply with manufacturer's written recommendations or specifications, including product technical bulletins, handling, storage and installation instructions, and datasheet.

3.4 CLEARING

.1 Clearing includes felling, trimming and cutting of trees into sections and satisfactory disposal of trees and other vegetation designated for removal, including downed timber, snags, brush and rubbish occurring within cleared areas.

.2 Clear as indicated by the Departmental Representative, by cutting at height of not more than 300 mm above ground. In areas to be subsequently grubbed, height of stumps left from clearing operations to be not more than 1000 mm above ground surface.

.3 Cut off branches and cut down trees overhanging area cleared as directed by the Departmental Representative.

.4 Cut off unsound branches on trees designated to remain as directed by the Departmental Representative.

3.5 ISOLATED TREES

.1 Cut off isolated trees at height of not more than 300 mm above ground surface.

3.6 GRUBBING

.1 Remove and dispose of roots larger than 7.5 cm in diameter, matted roots, and designated stumps from indicated grubbing areas.

.2 Grub out stumps and roots to not less than 200 mm below ground surface.

.3 Grub out visible rock fragments and boulders, greater than 300 mm in greatest dimension, but less than 1.0 m^3.

.4 Fill depressions made by grubbing with suitable material and make new surface conform with existing adjacent surface of ground.

3.7 REMOVAL AND DISPOSAL

.1 Remove cleared and grubbed materials off site to disposal area approved by the Departmental Representative.

.2 Clearing shall not use heavy equipment for clearing within 30 m of stream banks and shall do cutting therein by hand or by equipment able to “reach in” to cut and yard out the timber.

.3 Cut timber greater than 125 mm diameter to 400 mm lengths and stockpile. Stockpiled timber becomes property of the Departmental Representative.

.4 Disposal of cleared and grubbed materials by burning and burying is prohibited.

.5 Chip or mulch cleared and grubbed vegetative material on site.

.6 No mulching, chipping or placement of mulched or chipped material shall occur within 30 m of a watercourse or wetland.

.7 Mulched or chipped material shall be evenly distributed over the ground within the clearing limits or disposed of off- site to approval of the Departmental Representative.

.8 Remove diseased trees identified by the Departmental Representative and dispose of this material to approval of the Departmental Representative.

3.8 FINISHED SURFACE

.1 Leave ground surface in condition suitable for immediate grading operations or stripping of topsoil to approval of the Departmental Representative.

3.9 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

Part 1 General

1.1 RELATED SECTIONS

.1 Section 01 33 00 – Submittal Procedures.

.2 Section 01 35 43 – Environmental Procedures.

.3 Section 31 05 16 – Aggregate Materials.

.4 Section 33 42 13 – Pipe Culverts.

1.2 REFERENCES

.1 Standard Specification, Department of Transportation and Infrastructure of New Brunswick.

.2 American Society for Testing and Materials International (ASTM)

.1 ASTM C117-13, Standard Test Method for Material Finer than 0.075 mm (No.200) Sieve in Mineral Aggregates by Washing.

.2 ASTM C136-14, Standard Test Method for Sieve Analysis of Fine and Coarse Aggregates.

.3 ASTM D422-63(2007)e2, Standard Test Method for Particle-Size Analysis of Soils.

.4 ASTM D698-12e2, Standard Test Methods for Laboratory Compaction Characteristics of Soil Using Standard Effort (12,400 ft-lbf/ft^3) (600 kN-m/m^3).

.5 ASTM D1557-12e1, Standard Test Methods for Laboratory Compaction Characteristics of Soil Using Modified Effort (56,000 ft-lbf/ft^3) (2,700 kN-m/m^3).

.6 ASTM D4318-10e1, Standard Test Methods for Liquid Limit, Plastic Limit, and Plasticity Index of Soils.

.3 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.

.4 Canadian Standards Association (CSA International)

.1 CAN/CSA-A3000-13, Cementitious Materials Compendium (Consists of A3001, A3002, A3003, A3004 and A3005).

.1 CSA-A3001-13, Cementitious Materials for Use in Concrete.

.2 CSA-A23.1/A23.2-09(2014), Concrete Materials and Methods of Concrete Construction/Methods of Test and Standard Practices for Concrete.

.5 U.S. Environmental Protection Agency (EPA)/Office of Water

.1 EPA 832R92005, Storm Water Management for Construction Activities: Developing Pollution Prevention Plans and Best Management Practices.

1.3 DEFINITIONS

.1 Excavation classes: two classes of excavation will be recognized; common excavation and rock excavation.

.1 Rock: solid material in excess of 1.0 m^3; and which cannot be removed by means of heavy duty mechanical excavating equipment with 0.95 to 1.15 m^3 bucket. Frozen material 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 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 / CAN/CGSB-8.2.

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

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

.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 SUBMITTALS

.1 Make submittals in accordance with Section 01 33 00 - Submittal Procedures.

.2 Quality Control: in accordance with Section 01 45 00 - Quality Control:

.1 Submit condition survey of existing conditions as described in EXISTING CONDITIONS article of this Section.

.2 Submit for review by the Departmental Representative proposed dewatering and heave prevention methods as described in PART 3 of this Section.

.3 Submit to the Departmental Representative written notice at least seven (7) days prior to excavation work, to ensure cross sections are taken.

.4 Submit to the Departmental Representative written notice when bottom of excavation is reached.

.5 Submit to the Departmental Representative testing inspection results and report as described in PART 3 of this Section.

.3 Preconstruction Submittals:

.1 Submit construction equipment list for major equipment to be used in this section prior to start of Work.

.2 Submit records of underground utility locates, indicating: location plan of existing utilities as found in field, clearance record from utility authority, location plan of relocated and abandoned services, as required.

.4 Samples:

.1 Submit samples in accordance with Section 01 33 00 - Submittal Procedures.

.2 Inform the Departmental Representative at least four (4) weeks prior to beginning Work, of proposed source of fill materials and provide access for sampling.

1.5 QUALITY ASSURANCE

.1 Qualification Statement: submit proof of insurance coverage for professional liability.

.2 Where the Engineer is employee of Contractor, submit proof that Work by the Engineer is included in Contractor's insurance coverage.

.3 Submit design and supporting data at least two (2) weeks prior to beginning Work.

.4 Design and supporting data submitted to bear stamp and signature of qualified professional engineer registered or licensed in New Brunswick, Canada.

.5 Keep design and supporting data on site.

.6 Engage services of qualified professional Engineer who is registered or licensed in New Brunswick, Canada in which Work is to be carried out to design and inspect cofferdams, shoring, bracing and underpinning required for Work.

.7 Do not use soil material until written report of soil test results are reviewed and approved by the Departmental Representative.

.8 Health and Safety Requirements:

.1 Do construction occupational health and safety in accordance with Section 01 35 29.06 - Health and Safety Requirements.

1.6 WASTE MANAGEMENT AND DISPOSAL

.1 Separate waste materials for reuse and recycling in accordance with Section 01 74 21 - Construction/Demolition Waste Management and Disposal.

.2 Divert excess aggregate materials from landfill to local quarry facility for reuse as directed by the Departmental Representative.

1.7 EXISTING CONDITIONS

.1 Examine soil report available in appendix.

.2 Buried services:

.1 Before commencing work establish location of buried services on and adjacent to 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 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 applicable authorities having jurisdiction to establish location 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 test excavations or 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 the Engineer before removing or re-routing.

.9 Record location of maintained, re-routed and abandoned underground lines.

.10 Confirm locations of recent excavations adjacent to area of excavation.

.3 Existing buildings and surface features:

.1 Conduct, with the 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 the Departmental Representative.

Part 2 Products

2.1 MATERIALS

.1 Backfill material: Class “A” or “Class “B” as per Section 140.2.7 of Standard Specifications, New Brunswick Department of Transportation and Infrastructure.

.2 Type 3 fill: selected material from excavation or other sources, approved by the Departmental Representative for use intended, unfrozen and free from rocks larger than 75 mm, cinders, ashes, sods, refuse or other deleterious materials.

.3 Geotextiles: to Section 31 32 19.01 - Geotextiles.

.4 Unshrinkable fill: proportioned and mixed to provide:

.1 Maximum compressive strength of 1.0 MPa at 28 days.

.2 Maximum cement content of 25 kg/m ; with 40% by volume fly ash replacement: to CSA-A3001, Type GU.

.3 Minimum strength of 0.07 MPa at 24 h.

.4 Concrete aggregates: to CSA-A23.1/A23.2.

.5 Cement: Type GU.

.6 Slump: 160 to 200 mm.

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 sediment and erosion control drawings and 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 neatly along limits of proposed excavation in order that surface may break evenly and cleanly.

3.3 PREPARATION/PROTECTION

.1 Protect existing features in accordance with Section 01 56 00 - Temporary Barriers and Enclosures and 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 for the 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.

.6 Provide adequate protection to all survey and layout markers, including bench marks and existing facilities, equipment, etc.

.7 Protect bottom of excavation from softening. Softened soil shall be removed and replaced with dense structural fill compacted to 95% of corrected maximum dry density.

3.4 STRIPPING OF TOPSOIL

.1 Begin topsoil stripping of areas as directed by the Departmental Representative after area has been cleared of brush, weeds and grasses, and removed from site.

.2 Strip topsoil to depths as directed by the Departmental Representative.

.1 Do not mix topsoil with subsoil.

.2 Remove topsoil before construction procedures commence to avoid compaction of topsoil.

.3 Stockpile in locations as directed by the Departmental Representative.

.1 Stockpile height not to exceed 2 m and should be protected from erosion.

.2 Handle topsoil only when it is dry and warm.

.4 Dispose of unused topsoil as directed by the Departmental Representative off site.

3.5 STOCKPILING

.1 Stockpile fill materials in areas designated by the Departmental Representative.

.1 Stockpile granular materials in manner to prevent segregation.

.2 Protect fill materials from contamination and compaction.

.3 Implement sufficient erosion and sediment control measures to prevent sediment release off construction boundaries and into water bodies.

3.6 COFFERDAMS, 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 and Safety Act for the Province of New Brunswick.

.1 Where conditions are unstable, the Departmental Representative to verify and advise methods.

.2 Obtain permit from authority having jurisdiction for temporary diversion of water course.

.3 Construct temporary Works to depths, heights and locations as required or directed by the Departmental Representative.

.4 During backfill operation:

.1 Unless otherwise indicated or directed by the Departmental Representative, remove sheeting and shoring from excavations.

.2 Do not remove bracing until backfilling has reached respective levels of such bracing.

.3 Pull sheeting in increments that will ensure compacted backfill is maintained at elevation at least 500 mm above toe of sheeting.

.5 When sheeting is required to remain in place, cut off tops at elevations as indicated.

.6 Upon completion of substructure construction:

.1 Remove cofferdams, shoring and bracing.

.2 Remove excess materials from site and restore watercourses as directed by the Departmental Representative.

3.7 DEWATERING AND HEAVE PREVENTION

.1 Keep excavations free of water while Work is in progress.

.2 Provide for the Departmental Representative's review and 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 accordance with Section 01 35 43 - Environmental Procedures to approved runoff areas and in a manner not detrimental to public and private property, or portion of Work completed or under construction.

.1 Provide and maintain temporary drainage ditches and other diversions outside of excavation limits.

.6 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.

3.8 EXCAVATION

.1 Advise the Departmental Representative at least seven (7) days in advance of excavation operations for initial cross sections to be taken.

.2 Excavate to lines, grades, elevations and dimensions as indicated.

.3 Excavation must not interfere with bearing capacity of adjacent foundations.

.4 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.

.5 For trench excavation, unless otherwise authorized by the 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 15m at end of day's operation.

.6 Keep excavated and stockpiled materials safe distance away from edge of trench as directed by the Departmental Representative.

.7 Restrict vehicle operations directly adjacent to open trenches.

.8 Dispose of surplus and unsuitable excavated material in approved location off site.

.9 Do not obstruct flow of surface drainage or natural watercourses.

.10 Earth bottoms of excavations to be undisturbed soil, level, free from loose, soft or organic matter.

.11 Notify the Departmental Representative when bottom of excavation is reached.

.12 Obtain the Departmental Representative’s approval of completed excavation.

.13 Remove unsuitable material from trench bottom including those that extend below required elevations to extent and depth as directed by the Departmental Representative.

.14 Correct unauthorized over-excavation under bearing surface and other areas as follows:

.1 Fill under areas with dense structural fill material compacted to not less than 95% of corrected Standard Proctor maximum dry density, at no extra cost.

.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.

.2 Clean out rock seams and fill with concrete mortar or grout to approval of the Departmental Representative.

.16 Install geotextiles in accordance with Section 31 32 19.01 - Geotextiles.

3.9 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 Bedding and surround of underground services: use Class “A” or Class “B” backfill materials to levels indicated. Compact to 95% of corrected maximum dry density or as indicated.

.2 Select backfill material: Compact to 95% of corrected maximum dry density.

.3 Subbase and base gravels: Compact to 100% of corrected maximum dry density.

.2 Place unshrinkable fill in areas as indicated.

3.10 BEDDING AND SURROUND OF UNDERGROUND SERVICES

.1 Place and compact granular material for bedding and surround of underground services as indicated.

.2 Place bedding and surround material in unfrozen condition.

3.11 BACKFILLING

.1 Do not proceed with backfilling operations until completion of following:

.1 The Departmental Representative has inspected and approved installations.

.2 The 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.

.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 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 0.3 m.

.6 Place unshrinkable fill in areas as indicated.

.7 Consolidate and level unshrinkable fill with internal vibrators.

.8 Install drainage system in backfill if directed by the Departmental Representative.

3.12 RESTORATION

.1 Upon completion of Work, remove waste materials and debris in accordance to Section 01 74 21 - Construction/Demolition Waste Management and Disposal, trim slopes, and correct defects as directed by the Engineer.

.2 Replace topsoil as directed by Departmental Representative.

.3 Clean and reinstate areas affected by Work as directed by the Departmental Representative.

.4 Use temporary plating to support traffic loads over unshrinkable fill for initial 24 hours.

.5 Protect newly graded areas from traffic and erosion and maintain free of trash or debris.

END OF SECTION

Part 1 General

1.1 RELATED SECTIONS

.1 Section 01 56 00 – Temporary Barriers and Enclosures.

.2 Section 01 74 21 – Construction /Demolition Waste Management And Disposal.

.3 Section 02 41 13.14 – Asphalt Pavement Removal.

.4 Section 31 05 10 – Corrected Maximum Dry Density for Fill.

.5 Section 31 11 00 – Clearing and Grubbing.

.6 Section 31 23 33.01 – Excavating, Trenching and Backfilling.

.7 Section 32 11 16.01 – Granular Sub-base.

.8 Section 32 11 23 – Aggregate Base Courses.

.9 Section 32 91 19.13 – Topsoil Placement and Grading.

1.2 REFERENCES

.1 American Society for Testing and Materials International, (ASTM).

.1 ASTM D698-12e2, Test Method for Laboratory Compaction Characteristics of Soil Using Standard Effort (12,000 ft-lbf/ft^3) (600 kN-m/m^3).

1.3 DEFINITIONS

.1 Rock Excavation: excavation of:

.1 Material from solid masses of igneous, sedimentary or metamorphic rock which, prior to removal, was integral with parent mass. Material that cannot be ripped with reasonable effort from Caterpilar D9L or equivalent to be considered integral with parent mass.

.2 Boulder or rock fragments measuring in volume one (1) cubic metre or more.

.2 Common Excavation: excavation of materials of whatever nature, which are not included in the definition of rock excavation or stripping.

.3 Unclassified Excavation: excavation of deposits of whatever character encountered in work.

.4 Stripping: excavation of organic material covering original ground.

.5 Embankment (Type 3 fill) : selected material from excavation or other sources and placed above original ground or stripped surface up to top of subgrade, approved by the Departmental Representative for use intended, unfrozen and free from rocks larger than 75 mm, cinders, ashes, sods, refuse or other deleterious materials.

.6 Waste Material: material unsuitable for embankment, embankment foundation or material surplus to requirements.

.7 Borrow Material: material obtained from areas outside right of way, and required for construction of embankments or for other portions of work.

.8 Topsoil: material capable of supporting good vegetative growth and suitable for use in top dressing, landscaping and seeding.

1.4 QUALITY ASSURANCE

.1 Regulatory Requirements:

.1 Adhere to regulations of authority having jurisdiction when blasting is required.

.2 Adhere to Provincial and National Environmental requirements when potentially toxic materials are involved.

.2 Pre-Installation Meetings: conduct pre-installation meeting to verify project requirements, installation instructions and warranty requirements.

.3 Do not use soil material until written report of soil test results are approved by Departmental Representative.

1.5 WASTE MANAGEMENT AND DISPOSAL

.1 Separate and recycle waste materials in accordance with Section 01 74 21 - Construction/Demolition Waste Management and Disposal.

.2 Divert excess materials from landfill to site approved by the Departmental Representative.

1.6 EXISTING CONDITIONS

.1 Examine soil report available in appendix.

.2 Buried services:

.1 Before commencing work establish location of buried services on and adjacent to 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 within 2 m of foundations: cap cut-offs.

Part 2 Products

2.1 MATERIALS

.1 Embankment materials require approval by the Departmental Representative.

.2 Material used for embankment not to contain more than 3% organic matter by mass, frozen lumps, weeds, sod, roots, logs, stumps or other unsuitable material.

.3 Borrow material:

.1 Obtain from borrow pit approved by the Departmental Representative.

Part 3 Execution

3.1 EXAMINATION

.1 Verification of Conditions: verify that condition of substrate is acceptable for roadway embankment Work:

.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 and after receipt of written approval to proceed from Departmental Representative.

3.2 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 sediment and erosion control drawings and 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.

3.3 PREPARATION/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 for the 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.

3.4 COMPACTION EQUIPMENT

.1 Compaction equipment: vibratory rollers or vibrating plate compactors capable of obtaining required density in materials on project.

.1 Demonstrate compaction equipment effectiveness on specified material and lift thickness by documented performance of test-strip before start of Work.

.2 Replace or supplement equipment that does not achieve specified densities.

.2 Operate compaction equipment continuously in each embankment when placing material.

3.5 WATER DISTRIBUTORS

.1 Apply water with equipment capable of uniform distribution.

3.6 STRIPPING OF TOPSOIL

.1 Place top soil and finish grading in accordance with Section 32 91 19.13 - Topsoil Placement and Grading.

.2 Commence topsoil stripping of areas as indicated after brush, weeds and grasses have been removed from these areas.

.3 Strip topsoil to depths as directed by the Departmental Representative. Do not mix topsoil with subsoil.

.4 Stockpile topsoil on site for later use. Stockpile height not to exceed 1.5 m.

.5 Remove clearing and grubbing debris from stripping.

.6 Protect stockpiles from contamination and compaction.

.7 Spread organic stripping, on completion of excavation and embankment construction, on slopes and trim or remove from site if quantity exceeds ability to grade on site.

.8 Disposal of unused topsoil (after completion of topsoil placement and grading) is to be in an environmentally responsible manner but not used as landfill.

3.7 EXCAVATING

.1 General:

.1 Notify the Departmental Representative when waste materials are encountered and remove to depth and extent directed.

.2 Compact subgrade to minimum 95% maximum dry density, ASTM D698.

.3 Treat ground slopes, where subgrade is on transition from excavation to embankment, at grade points as indicated and as directed by the Departmental Representative.

.2 Drainage:

.1 Maintain profiles, crowns and cross slopes to provide good surface drainage.

.2 Provide ditches as work progresses to provide drainage.

.3 Construct interceptor ditches as indicated or as directed before excavating or placing embankment in adjacent area.

.3 Rock excavation:

.1 Notify the Department Representative, when material appearing to conform to classification for rock is encountered, to enable measurements to be made to determine volume of rock. Provide 12 hour notification.

.2 Shatter rock to 300 mm below subgrade elevation as indicated.

.3 Explosive blasting is not permitted.

.4 Use rock removal procedures to produce uniform and stable excavation surfaces. Minimize overbreak, and to avoid damage to adjacent structures.

.5 Excavate rock to horizontal surfaces with slope not to exceed H1.5:V1.

.6 Excavate trenches to lines and grades to minimum of 200 mm below pipe invert indicated. Provide recesses for bell and spigot pipe to ensure bearing will occur uniformly along barrel of pipe.

.7 Cut trenches to widths as indicated.

.8 Remove boulders and fragments which may slide or roll into excavated areas.

.9 Correct unauthorized rock removal at no extra cost, in accordance with Section 31 23 33.01 - Excavating, Trenching and Backfilling.

.4 Borrow Excavation:

.1 Completely use in embankments, suitable materials removed from right-of-way excavations before taking material from borrow areas.

.2 Obtain embankment materials, in excess of what is available from cut areas, from designated borrow areas.

.1 The Departmental Representative to designate extent of borrow areas and allowable depth of excavation.

.2 Remove waste and stripping material from borrow pits to designated locations.

.3 Slope edges of borrow areas to minimum 2:1 and provide drainage as directed.

.4 Trim and leave borrow pits in condition to permit accurate measurement of material removed.

3.8 EMBANKMENTS

.1 Scarify or bench existing slopes in side hill or sloping sections to ensure proper bond between new materials and existing surfaces. Method used to be subject to prior approval of the Departmental Representative.

.2 Break up or scarify existing road surface prior to placing embankment material.

.3 Do not place material which is frozen nor place material on frozen surfaces except in areas authorized.

.4 Maintain crowned surface during construction to ensure ready run-off of surface water.

.5 Drain low areas before placing materials.

.1 Place and compact to full width in layers not exceeding 150 mm thickness. The Departmental Representative may authorize thicker lifts if specified compaction

can be achieved and if material contains more than 25% by volume stone and rock fragments larger than 100 mm.

.6 Where material consists of rock:

.1 Place to full width in layers of sufficient depth to contain maximum sized rocks, but in no case is layer thickness to exceed 1 m.

.2 Distribute rock material to fill voids with smaller fragments to form compact mass.

.3 Fill surface voids at subgrade level with rock spalls or selected material to form earth-tight surface.

.4 Do not place boulders and rock fragments with dimensions exceeding 150 mm within 300 mm of subgrade elevation.

.7 Deductions from excavation will be made for overbuild of embankments.

3.9 SUBGRADE COMPACTION

.1 Break material down to sizes suitable for compaction and mix for uniform moisture to full depth of layer.

.2 Deposit, spread, and level, embankment material in layers 200 mm maximum thickness before compaction.

.1 Compact each layer of embankment until compaction equipment achieves no further significant consolidation.

.2 Ensure required compaction for each layer before placing any material for next layer.

.3 Use specialized compaction equipment supplemented by routing, hauling, and leveling equipment over each layer of fill.

.4 Compact each layer to minimum 95% maximum dry density, ASTM D698 except top 150 mm of subgrade. Compact top 150 mm to 100% maximum dry density.

.5 Add water or dry as required to bring moisture content of materials to level required to achieve specified compaction.

3.10 FINISHING

.1 Shape entire roadbed to within 25 mm of design elevations.

.2 Finish slopes, ditch bottoms and borrow pits true to lines, grades and drawings where applicable.

.3 Remove rocks over 150 mm in dimension from slopes and ditch bottoms.

.4 Hand finish slopes that cannot be finished satisfactorily by machine.

.5 Round top of backslope 1.5 m both sides of top of slope.

.6 Run tractor tracks over slopes exceeding 3 m in height to leave tracks parallel to centreline of highway.

.7 Trim between constructed slopes and edge of clearing to provide drainage and free of humps, sags and ruts.

3.11 PROTECTION

.1 Maintain finished surfaces in condition conforming to this section until acceptance by the Departmental Representative.

.2 Provide silt fences and erosion protection as required to mitigate and prevent impacts to adjacent properties.

END OF SECTION

Part 1 General

1.1 SECTION INCLUDES

.1 Materials and installation of polymeric geotextiles used in revetments, breakwaters, retaining wall structures, filtration, drainage structures, roadbeds and railroad beds purpose of which is to:

.1 Separate and prevent mixing of granular materials of different grading.

.2 Act as hydraulic filters permitting passage of water while retaining soil strength of granular structure.

1.2 RELATED SECTIONS

.1 Section 01 33 00 - Submittal Procedures.

.2 Section 01 74 21 - Construction/Demolition Waste Management and Disposal.

.3 Section 31 23 33.01 - Excavating, Trenching and Backfilling.

.4 Section 31 24 13 - Roadway Embankments.

1.3 MEASUREMENT PROCEDURES

.1 Measure geotextiles in square metres of surface covered by material. No allowance will be made for seams and overlaps.

1.4 REFERENCES

.1 Standard Specification, Department of Transportation and Infrastructure of New Brunswick.

.2 American Society for Testing and Materials International, (ASTM)

.1 ASTM D4491-00a(2014)e1, Standard Test Methods for Water Permeability of Geotextiles by Permittivity.

.2 ASTM 4533-15, Standard Test Method for Trapezoid Tearing Strength of Geotextiles

.3 ASTM D4632-15a, Standard Test Method for Grab Breaking Load and Elongation of Geotextiles.

.4 ASTM D4751-12, Standard Test Method for Determining Apparent Opening Size of a Geotextile.

.3 Canadian Standards Association (CSA International)

.1 CAN/CSA-G40.20/G40.21-13, General Requirements for Rolled or Welded Structural Quality Steel/Structural Quality Steel.

.2 CAN/CSA-G164-M92(R2003), Hot Dip Galvanizing of Irregularly Shaped Articles.

1.5 SUBMITTALS

.1 Submit samples in accordance with Section 01 33 00 - Submittal Procedures.

1.6 DELIVERY, STORAGE AND HANDLING

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

1.7 WASTE MANAGEMENT AND DISPOSAL

.1 Separate waste materials for reuse and recycling in accordance with Section 01 74 21 - Construction/Demolition Waste Management and Disposal.

.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 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, conforming to Standard Specification, Department of Transportation and Infrastructure of New Brunswick, Type N2.

.1 Width: 4 m minimum.

.2 Composed of: minimum 85% by mass of polypropylene with inhibitors added to base plastic to resist deterioration by ultra-violet and heat exposure for 60 days.

.2 Physical properties:

.1 Grab tensile strength and elongation (in any principal direction): to ASTM D4632.

.1 Breaking force: minimum 600 N, wet condition.

.2 Elongation at break: 50%.

.3 Seam strength: equal to or greater than tensile strength of fabric.

.2 Tearing Strength (trapezoid Method): to ASTM D4533, minimum 250N

.3 Hydraulic properties:

.1 Apparent opening size (AOS): to ASTM D4751, 0.050 to 0.250 mm.

.2 Permittivity: to ASTM D4491, sec -1, 1.25 to 2.75.

.4 Securing pins and washers: to CAN/CSA-G40.21, Grade 300W, hot-dipped galvanized with minimum zinc coating of 600 g/$m^2$to CAN/CSA G164.

.5 Factory seams: sewn in accordance with manufacturer's recommendations.

.6 Thread for sewn seams: equal or better resistance to chemical and biological degradation than geotextile.

Part 3 Execution

3.1 INSTALLATION

.1 Place geotextile material by unrolling onto graded surface in orientation, manner and locations indicated.

.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.

.4 Overlap each successive strip of geotextile 600 mm over previously laid strip.

.5 Join successive strips of geotextile by sewing.

.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 4 h of placement.

.8 Replace damaged or deteriorated geotextile to approval of the Departmental Representative.

.9 Place and compact soil layers in accordance with Section 31 23 33.01 - Excavating Trenching and Backfilling and 31 24 13 - Roadway Embankments.

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. For roadbed construction, place minimum 300 mm of granular material between equipment and fabric.

END OF SECTION

Part 1 General

1.1 RELATED SECTIONS

.1 Section 01 74 21 – Construction /Demolition Waste Management and Disposal.

.2 Section 31 32 19.01 – Geotextiles.

1.2 WASTE MANAGEMENT AND DISPOSAL

.1 Separate and recycle waste materials in accordance with Section 01 74 21 - Construction/Demolition Waste Management and Disposal.

.2 Collect and separate plastic and paper packaging, corrugated cardboard, in accordance with Waste Management Plan.

.3 Place materials defined as hazardous or toxic in designated containers.

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

.5 Divert left over aggregate materials from landfill to local facility for reuse as approved by the Departmental Representative.

.6 Divert left over geotextiles to local plastic recycling facility as approved by the Departmental Representative.

Part 2 Products

2.1 STONE

.1 Hard, dense, with relative density (formally specific gravity) not less than 2.6 t/m^3 , durable quarry stone, free from seams, cracks or other structural defects, to meet following size distribution for use intended.

Table 2.1.1.1
Riprap Grading Limits

Mass (kg)	Size[1] (mm)	Finer by mass (%)
15 220		100
10	190	70 – 90
5	150	40 – 55
2.5 120		
0.5	70	0 – 15
Note: 1) Approximate diameter (for information only)		

2.2 GEOTEXTILE FILTER

.1 Geotextile: in accordance with Section 31 32 19.01 - Geotextiles.

Part 3 Execution

3.1 PLACING

.1 Where rip-rap is to be placed on slopes, excavate trench at toe of slope to dimensions as indicated.

.2 Fine grade area to be rip-rapped to uniform, even surface. Fill depressions with suitable material and compact to provide firm bed.

.3 Place geotextile on prepared surface in accordance with Section 31 32 19.01- Geotextiles and as indicated. Avoid puncturing geotextile. Vehicular traffic over geotextile not permitted.

.4 Place rip-rap to thickness and details as indicated.

.5 Place stones in manner approved by the Departmental Representative to secure surface and create a stable mass. Place larger stones at bottom of slopes.

END OF SECTION