Part 1 General

1.1 SUMMARY

.1 Section Includes:

.1 Materials and installation for fertilizing and preserving root systems of plants affected by changing grades or excavation.

1.2 REFERENCES

.1 Canadian Standards Association (CSA International).

.1 CSA G30.5-M1983(R1998), Welded Steel Wire Fabric for Concrete Reinforcement.

.2 Department of Justice Canada (Jus).

.1 Canadian Environmental Protection Act (CEPA), 1999, c. 33.

.2 Fertilizers Act (R.S. 1985, c. F-10).

.3 Fertilizers Regulations (C.R.C., c. 666).

.4 Transportation of Dangerous Goods Act (TDGA), 1992, c. 34.

.3 Health Canada - Pest Management Regulatory Agency (PMRA).

.1 National Standard for Pesticide Education, Training and Certification in Canada (1995).

.4 Health Canada/Workplace Hazardous Materials Information System (WHMIS).

.1 Material Safety Data Sheets (MSDS).

1.3 DEFINITIONS

.1 Mycorrhiza: association between fungus and roots of plants. This symbiosis enhances plant establishment in newly landscaped and imported soils.

1.4 ACTION AND INFORMATIONAL SUBMITTALS

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

.2 Submit monthly written reports on maintenance during warranty period, to Departmental Representative identifying:

.1 Maintenance work carried out.

.2 Development and condition of plant material.

.3 Preventative or corrective measures required which are outside Contractor's responsibility.

.3 Submit WHMIS MSDS in accordance with Section 01 35 29 – Health and Safety Requirements.

1.5 QUALITY ASSURANCE

.1 Health and Safety:

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

1.6 DELIVERY, STORAGE AND HANDLING

.1 Waste Management and Disposal:

.1 Separate waste materials for recycling in accordance with Section 01 74 22 - Construction/Demolition Waste Management and Disposal.

.2 Remove from site and dispose of packaging materials at appropriate recycling facilities.

.3 Collect and separate for disposal paper, plastic, polystyrene, corrugated cardboard and packaging material for recycling in accordance with Waste Management Plan.

.4 Separate for recycling and place in designated containers Steel, Metal and Plastic waste in accordance with Waste Management Plan.

.5 Divert unused metal and wiring materials from landfill to metal recycling facility as approved by Departmental Representative.

.6 Divert unused wood materials from landfill by mulching approved by Departmental Representative.

.7 Divert unused stone and aggregate materials from landfill to local quarry approved by Departmental Representative.

.8 Divert unused plastic materials from landfill to local recycling facility approved by Departmental Representative.

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

.10 Dispose of unused fertilizer material at official hazardous material collections site approved by Departmental Representative.

.11 Handle and dispose of hazardous materials in accordance with Regional and Municipal regulations.

.12 Do not dispose of unused fertilizer material into sewer system, into streams, lakes, onto ground or in any other location where they will pose health or environmental hazard.

.13 Ensure emptied containers are sealed and stored safely.

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

1.7 SCHEDULING

.1 Obtain approval from Departmental Representative of schedule indicating beginning of Work.

1.8 MAINTENANCE DURING WARRANTY PERIOD

.1 From time of acceptance by Departmental Representative to end of warranty period, perform following maintenance operations.

.1 Water to maintain soil moisture conditions for optimum growth and health of plant material without causing erosion.

.2 Apply pesticides in accordance with National Standard for Pesticide Education, Training and Certification in Canada, Federal, Provincial and Municipal

regulations as and when required to control insects, fungus and disease. Obtain product approval from Departmental Representative.

.3 Apply fertilizer in early spring at manufacturer's suggested rate.

.4 Remove dead, broken or hazardous branches from plant material. Dispose of debris through mulching.

Part 2 Products

2.1 MATERIALS

.1 Fill:

.1 Type (A): clean, natural river sand and gravel material, free from silt, clay, loam, friable or soluble materials and organic matter.

.2 Type (B): excavated soil, free from roots, rocks larger than 75 mm, building debris, and toxic ingredients (salt, oil, etc). Excavated material shall be approved by Departmental Representative before use as fill.

.2 Coarse washed stones: 35-75 mm diameter clean round hard stone.

.3 Drain tile: 100 mm diameter corrugated plastic perforated tubing complete with snap couplings. Fill vents with 20 mm clear stone.

.4 Peatmoss:

.1 Derived from partially decomposed species of Sphagnum Mosses.

.2 Elastic and homogeneous.

.3 Free of wood and deleterious material which could prohibit growth.

.4 Shredded minimum particle size: 5 mm.

.5 Fertilizer:

.1 To Canada Fertilizer Act and Fertilizers Regulations.

.2 Complete, commercial, slow release with 35 % of nitrogen content in water-insoluble form.

.6 Anti-desiccant: commercial, wax-like emulsion.

.7 Filter Cloth:

.1 Type 1: 100 % non-woven needle punched polyester, 2.75 mm thick, 240 g/m^2 mass.

.2 Type 2: biodegradable burlap.

Part 3 Execution

3.1 IDENTIFICATION AND PROTECTION

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

.2 Identify plants and limits of root systems to be preserved as approved by Departmental Representative.

.3 Protect plant and root systems from damage, compaction and contamination resulting from construction as approved by Departmental Representative.

.4 Ensure no pruning is done inside drip line. If pruning inside drip line is required consult an arborist or Canadian Certified Horticultural Technician (CCHT) as approved by Departmental Representative.

3.2 ROOT CURTAIN SYSTEM

.1 Identify limits for required construction excavation as approved by Departmental Representative.

.2 Prior to construction excavation, hand dig trench minimum 500 mm wide x 1500 mm deep, along perimeter of excavation limits.

.3 Prune exposed roots cleanly at side of trench nearest plants to be preserved. Pruned ends to point obliquely downwards.

.4 Install recycled composite plastic posts and welded wire fabric against construction edge of trench.

.5 Securely attach Type 2 filter fabric on plant side of wire mesh.

.6 Prepare homogeneous mixture of fertilizer, parent material and organic matter.

.1 Add organic matter to mixture to achieve 7-9% organic matter content by weight.

.2 Incorporate with mixture grade 2:12:8 ratio fertilizer (dry) at rate of 1.5kg/m^3.

.7 Backfill with homogeneous mixture between curtain wall and plants to be preserved in layers not exceeding 150 mm in depth. Compact each layer to 85% Standard Proctor Density.

.8 Protect root curtain from damage during construction operations.

.9 Water plants and root curtain sufficiently during construction to maintain optimum soil moisture condition until backfill operations are complete.

.10 Protect root curtain before backfill operations. Ensure root curtain is cut down to 300 mm below finished grade and remove cut material.

3.3 AIR LAYERING SYSTEM

.1 Using manual methods, carefully remove turf, plants, leaves and organic matter in area of root system, dispose of plant matter through compost site and slightly loosen topsoil surface. Avoid damage to root system.

.2 Lay horizontal system of perforated recycled content drain pipe on surface of existing grade.

.1 Slope drain tile minimum 3% for drainage away from trunk of tree.

.2 Connect system with general site drainage system or drain to low point on site.

.3 Install plastic "vent" pipes vertically over joints in horizontal pipe system or where indicated. Top of vent pipe to be 20 mm above finished grade of fill. Keep top of vent pipe covered during construction.

.4 Cover joints with Type 1 filter fabric and place coarse washed stone around joints and vertical pipes to secure their position.

.5 Construct drywell around trunk of tree.

.1 Ensure open ends of vertical vent pipes are left exposed for air circulation to root system.

.2 Protect openings from blockage during construction.

.3 Install protective caps on exposed horizontal openings.

.6 Place 200 mm depth of coarse washed stone on surface of original ground and horizontal pipe system to limits.

.7 Place Type 1 filter fabric over surface of granular layer.

.8 Place Type A fill over filter fabric to required depth without disturbing or damaging drain pipe system. Avoid damage to filter fabric.

.9 Complete finished paving over area of sub-surface system within one week of placing fill.

.10 Remove temporary protective covering from vent pipe openings. Install protective caps flush with finished grade.

3.4 TRENCHING AND TUNNELING FOR UNDERGROUND SERVICES

.1 Centre line location and limits of trench/tunnel excavation to be approved by Departmental Representative prior to excavation. Tunnel excavation to extend 2000 mm from edge of trunk on either side.

.2 Excavate manually within zone of root system. Do not sever roots greater than 40 mm diameter except at greater than 500 mm below existing grade. Protect roots, and cut roots cleanly with sharp disinfected tools.

.3 Excavate tunnel under centre of tree trunk using methods and equipment approved by Departmental Representative.

.4 Minimum acceptable depth to top of tunnel: 1000 mm.

.5 Backfill for tunnel and trench to 85% Standard Proctor Density. Avoid damage to trunk and roots of tree.

.6 Complete tunnelling and backfilling at tree within 2 weeks of beginning Work.

3.5 LOWERING GRADE AROUND EXISTING TREE

.1 Begin Work in accordance with schedule approved by Departmental Representative.

.2 Cut slope not less than 500 mm from tree trunk to new grade level.

.3 Excavate to depths as indicated. Protect from damage root zone which is to remain.

.4 When severing roots at excavation level, cut roots with sharp tools.

.5 Cultivate excavated surface manually to 15 mm depth.

.6 Prepare homogeneous soil mixture consisting by volume of:

.1 60 % excavated soil cleaned of roots, plant matter, stones, debris.

.2 25 % coarse, clean sterile sand.

.3 15 % organic matter.

.4 Grade 2:12:8 fertilizer at rate of 1.5 kg/m^3.

.7 Place soil mixture over area of excavation to finished grade level. Compact to 85% Standard Proctor Density.

.8 Water entire root zone to optimum soil moisture level.

.9 Install surface cover of seeding in accordance with Section 32 92 19.16 - Hydraulic Seeding.

3.6 PRUNING

.1 Prune crown to compensate for root loss while maintaining general form and character of plant. Dispose of debris through mulching.

3.7 ANTI-DESICCANT

.1 Apply anti-desiccant to foliage where applicable and as directed by Departmental Representative.

END OF SECTION

Part 1 General

1.1 PRODUCTS INSTALLED BUT NOT SUPPLIED UNDER THIS SECTION

.1 Granular based material: supplied by Contractor.

1.2 RELATED REQUIREMENTS

.1 Section 32 12 16.02 – Asphalt Paving for Building Sites.

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

1.3 MEASUREMENT AND PAYMENT

.1 All costs associated with the supply and placement of granular sub-base materials must be included in the Lump Sum item in the Form of Tender.

.2 Adjustments to roadway structures and manholes shall be incidental to the work.

1.4 REFERENCES

.1 ASTM International

.1 ASTM C117-13, Standard Test Methods for Material Finer Than 0.075 mm Sieve in Mineral Aggregates by Washing.

.2 ASTM C131-14, Standard Test Method for Resistance to Degradation of Small-Size Coarse Aggregate by Abrasion and Impact in the Los Angeles Machine.

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

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

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

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

.7 ASTM D1883-16, Standard Test Method for CBR (California Bearing Ratio) of Laboratory Compacted Soils.

.8 ASTM D4318-10e1, 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 U.S. Environmental Protection Agency (EPA) / Office of Water

.1 EPA 832/R-92-005, Storm Water Management for Construction Activities: Developing Pollution Prevention Plans and Best Management Practices.

1.5 ACTION AND INFORMATIONAL SUBMITTALS

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

1.6 DELIVERY, STORAGE AND HANDLING

.1 Deliver, store and handle materials in accordance with Section 01 61 00 – Common Product Requirements.

.2 Storage and Handling Requirements:

.1 Store materials in accordance with manufacturer's recommendations.

.2 Replace defective or damaged materials with new.

.3 Develop Construction Waste Management Plan related to Work of this Section and in accordance with Section.

Part 2 Products

2.1 GENERAL

.1 Granular base and subbase materials shall be to the following requirements:

.1 Crushed stone or gravel consisting of clean, hard, sound, durable, angular and uncoated particles free from clay lumps, cementation, organic material, frozen material and other deleterious materials.

.2 Gradations to be within limits specified when tested to the latest version of ASTM C136 and ASTM C117 and to have a smooth curve without sharp breaks when plotted on semi-log grading chart.

.3 Pit run gravel, crushed gravel and crushed sandstone subbase shall conform to the latest standards in the NBDTI Standard Specification, Item 201.2 and 201.4.

.4 Gravel shall have a minimum of 20% of the particles, by mass, having at least one fractured face, when tested in accordance with MTO LS607 on a combined sample composed of and divided into sieve size ranges using the methods of ASTM C136.

.2 Crushed rock base/subbase shall be produced by the processing of rock to conform to the grading limits as set out in Table 315-1, when tested in accordance with ASTM C136 and C117.

Table 315-1
Grading Limits - Crushed Rock Base/Subbase

ASTM Sieve Size	Aggregate Base	Aggregate Subbase
	31.5 mm % passing	75 mm % passing
90.0 mm	-	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

.3 Crushed gravel base/subbase shall be produced by the processing of gravel to conform to the grading limits as set out in Table 315-2, when tested in accordance with ASTM C136 and C117.

Table 315-2
Grading Limits - Crushed Gravel Base/Subbase

ASTM Sieve Size	**Aggregate Base**	**Aggregate Subbase**
	31.5 mm % passing	**75 mm % passing**
90.0 mm	-	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

.4 Aggregates shall meet the requirements of Table 315-3.

Table 315-3
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)	Cover Material	22%
	Aggregate Base	25%
	Aggregate Subbase and Shoulder material	30%
Freeze Thaw (MTO LS-614)	All Roadway Aggregates	20%
Flat and Elongated Particles @ 4:1 (MTO LS-608)	All Roadway Aggregates	35%
Plasticity Index (AASHTO T89 and T90)	Aggregate Base	3%
Plasticity Index (AASHTO T89 and T90)	Aggregate Subbase	5%

Part 3 Execution

3.1 EXAMINATION

.1 Verification of Conditions: verify conditions of substrate previously installed under other Sections or Contracts are acceptable for granular sub-base installation in accordance with manufacturer's written instructions.

.1 Visually inspect substrate in presence of Departmental Representative.

.2 Inform Departmental Representative of unacceptable conditions immediately upon discovery.

.3 Proceed with installation only after unacceptable conditions have been remedied and after receipt of written approval to proceed from Departmental Representative.

3.2 PREPARATION

.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.

3.3 PLACING

.1 Place granular sub-base after subgrade is inspected and approved by Departmental Representative.

.2 Construct granular sub-base to depth and grade in areas indicated.

.3 Ensure no frozen material is placed.

.4 Place material only on clean unfrozen surface, free from snow or ice.

.5 Begin spreading sub-base material on crown line or high side of one-way slope.

.6 Place granular sub-base materials using methods which do not lead to segregation or degradation.

.7 For spreading and shaping material, use spreader boxes having adjustable templates or screeds which will place material in uniform layers of required thickness.

.8 Place material to full width in uniform layers not exceeding 150 mm compacted thickness.

.1 Departmental Representative may authorize thicker lifts if specified compaction can be achieved.

.9 Shape each layer to smooth contour and compact to specified density before succeeding layer is placed.

.10 Remove and replace portion of layer in which material has become segregated during spreading.

3.4 COMPACTION

.1 Compaction equipment to be capable of obtaining required material densities.

.2 Efficiency of equipment not specified to be proved at least as efficient as specified equipment at no extra cost and written approval must be received from Departmental Representative before use.

.3 Equipped with device that records hours of actual work, not motor running hours.

.4 Compact to density of not less than 98% corrected maximum dry density with ASTM D698 and ASTM D1557.

.5 Shape and roll alternately to obtain smooth, even and uniformly compacted sub-base.

.6 Apply water as necessary during compaction to obtain specified density.

.7 In areas not accessible to rolling equipment, compact to specified density with mechanical tampers approved by Departmental Representative.

.8 Correct surface irregularities by loosening and adding or removing material until surface is within specified tolerance.

3.5 PROOF ROLLING

.1 For proof rolling use standard roller of 45400 kg gross mass with four pneumatic tires each carrying 11350 kg and inflated to 620 kPa. Four tires arranged abreast with centre to centre spacing of 730 mm maximum.

.2 Obtain written approval from Departmental Representative to use non standard proof rolling equipment.

.3 Proof roll at level in sub-base as indicated.

.1 If non standard proof rolling equipment is approved, Departmental Representative will determine level of proof rolling.

.4 Make sufficient passes with proof roller to subject every point on surface to three separate passes of loaded tire.

.5 Where proof rolling reveals areas of defective subgrade:

.1 Remove sub-base and subgrade material to depth and extent as directed by Departmental Representative.

.2 Backfill excavated subgrade with sub-base material and compact in accordance with this section.

.3 Replace sub-base material and compact.

.6 Where proof rolling reveals areas of defective sub-base, remove and replace in accordance with this section at no extra cost.

3.6 CLEANING

.1 Progress Cleaning: clean in accordance with Section 01 74 11 – Cleaning.

.1 Leave Work area clean at end of each day.

.2 Final Cleaning: upon completion remove surplus materials, rubbish, tools and equipment in accordance with Section 01 74 11 – Cleaning.

.3 Waste Management: separate waste materials for reuse in accordance with Section 01 74 22 – Construction/Demolition Waste Management and Disposal.

.1 Remove recycling containers and bins from site and dispose of materials at appropriate facility.

3.7 SITE TOLERANCES

.1 Finished sub-base surface to be within 10 mm of elevation as indicated but not uniformly high or low.

3.8 PROTECTION

.1 Maintain finished sub-base in condition conforming to this section until succeeding base is constructed, or until granular sub-base is accepted by Departmental Representative.

END OF SECTION

Part 1 General

1.1 RELATED REQUIREMENTS

.1 Section 32 12 16.02 – Asphalt Paving for Building Sites.

.2 Section 31 23 33.01 – Excavation, Trenching and Backfilling

1.2 MEASUREMENT AND PAYMENT

.1 All costs associated with the supply and placement of asphalt surfaces must be included in the Lump Sum item in the Form of Tender.

.2 Cold milling of the 300mm wide key joint to the existing asphalt surface shall be considered incidental to the work.

.3 Placement of tack coat on existing pavement shall be considered as incidental to the work.

1.3 REFERENCES

.1 NB Department of Transportation and Infrastructure Standard Specifications for Highway Construction, January 2015.

.2 Asphalt Institute (AI)

.1 AI MS-2-15, Mix Design Methods.

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

.1 EPA 832/R-92-005, Storm Water Management for Construction Activities: Developing Pollution Prevention Plans and Best Management Practices.

1.4 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 asphalt paving mix, aggregate, and coatings and include product characteristics, performance criteria, physical size, finish and limitations.

.3 Samples:

.1 Submit asphalt concrete mix design and trial mix test results for review.

.2 Inform Departmental Representative of proposed source of aggregates and provide access for sampling at least 4 weeks prior to commencing work.

.3 Submit samples of following materials proposed for use at least 4 weeks prior to commencing work:

.1 One 5 L container of asphalt cement.

.4 Test and Evaluation Reports:

.1 Materials to be tested by independent testing laboratory approved by Departmental Representative.

.2 Submit test certificates showing suitability of materials at least 4 weeks prior to commencing work.

1.5 DELIVERY, STORAGE AND HANDLING

.1 Deliver, store and handle materials in accordance with Section 01 61 00 – Common Product Requirements with manufacturer's written instructions.

.2 Storage and Handling Requirements:

.1 Store materials in accordance with manufacturer's recommendations.

.2 Store and protect aggregate from damage.

.3 Replace defective or damaged materials with new.

Part 2 Products

2.1 MATERIALS

.1 All materials shall be supplied by the Contractor and must meet or exceed all requirements of the NBDTI Standards Specification Item 261 for superpave asphalt concrete mix requirements, as stipulated in their Standard Specifications, latest edition, unless these specifications provide otherwise.

.2 Crushed stone or gravel consisting of hard, sound, durable, particles, free from adherent coatings, shale, clay, loam, schist, organic material, frozen material and other soft or disintegrating pieces or other deleterious materials.

.3 Aggregate material to the following requirements:

.1 Coarse aggregate is the portion retained on the 4.75 mm sieve and fine aggregate is the portion passing the 4.75 mm sieve when tested in accordance with ASTM C136.

.2 Micro-Deval MTO LS618 for coarse aggregates and MTO LS619 for fine aggregates. Maximum % loss:

Coarse aggregate, surface mix:	15
Fine aggregate, surface mix:	17
Coarse aggregate, base mix:	18
Fine aggregate, base mix:	20

.3 Flat and elongated particles (coarse aggregate): DTI Method. Maximum % @ 4:1:

Surface mix:	15
Base mix:	20

.4 Petrographic number (coarse aggregate): DTI Method

Maximum, surface mix:	180

Maximum, base mix: 230

.5 Crushed particles (coarse aggregate): DTI Method Minimum % by weight, one face/two faces:

Surface mix: 95/80
Base mix: 95/80

.6 Absorption (coarse aggregate): ASTM C127 Maximum % by mass retained:

Surface mix: 1.5%
Base mix: 1.5%

.7 Freeze/Thaw (coarse aggregate): DTI Method Maximum % loss:

Surface mix: 12.0%
Base mix: 14.0%

.8 Un-compacted Void Content of Fine Aggregate: ASTM C1252 % minimum:

Surface or base mix: 45.0%

.9 Asphalt concrete pavement shall be dense graded hot laid plant mix conforming to the requirements of NBDTI superpave asphalt concrete mixes for Type "B" Base Course, Type "C" Surface Course and Type "D" Surface Course.

TABLE 340-1
GRADING LIMITS OF COMBINED AGGREGATES

ASTM SIEVE SIZE	TYPE B BASE	TYPE C BASE OR SURFACE	TYPE D SURFACE
25.0 mm	100.0		
19.0 mm	84.0 - 98.0		
16.0 mm	72.0 - 94.0	100.0	
12.5 mm	60.0 - 87.0	88.0 - 98.0	100.0
9.5 mm	51.0 - 75.0	68.0 - 90.0	76.0 - 98.0
6.3 mm	41.0 - 66.0	54.0 - 77.0	60.0 - 84.0
4.75 mm	34.0 - 60.0	46.0 - 69.0	52.0 - 77.0
2.36 mm	22.0 - 50.0	28.0 - 58.0	36.0 - 65.0
1.18 mm	12.0 - 42.0	20.0 - 50.0	25.0 - 55.0
600 µm	6.0 - 32.0	13.0 - 40.0	16.0 - 44.0
300 µm	3.0 - 20.0	7.0 - 27.0	8.0 - 26.0
150 µm	2.0 - 8.0	3.0 - 10.0	4.0 - 12.0
75 µm	2.0 - 6.0	2.0 - 6.0	2.0 - 6.0

.3 Blending sand shall be used to obtain acceptable physical asphalt concrete mix properties as outlined in Table 340-2 and the source shall be approved by Department Representative before the material is incorporated into the asphalt concrete mix.

.1 The maximum mass of blending sand to be used in the total asphalt concrete mix shall not exceed 10%.

TABLE 340-2
MAXIMUM AVERAGE GRADING TOLERANCES BY SIEVE RANGE

Sieve Range	Blending Sand
Passing the 25.0 mm to 150 µm sieves	± 10.0%
Passing the 75 µm sieve	± 5.0%

.4 Finished pavement shall conform to the lines, grades, dimensions and cross-sections as specified herein, or as set in the field, or in the case of patching, to the surrounding pavement conforming to the existing roadway crown and slope.

.5 Asphalt binder shall be Performance Grade (PG) 58-28 and shall meet the requirements of AASHTO M320, Table 1 – Performance Graded Asphalt Binder Specification. Certified producer's test data shall be supplied or representative samples on request.

.6 Tack coat shall be SS-1 Grade asphalt emulsion and shall conform in all respects to the provisions of CAN/CGSB 16.2, Table 1. Certified producer's test data shall be supplied or representative samples on request.

.7 Anti-stripping admixtures:

.1 Anti-stripping admixtures shall be supplied by the Contractor.

.1 The requirements for an anti-stripping admixture is determined at the asphalt concrete mix design stage.

.2 The approved anti-stripping admixtures are listed in NBDTI Standard specification table 261-2:

.3 The type and dosage of all asphalt cement anti-stripping admixtures shall be noted on the delivery slip.

.8 Asphalt concrete mixes shall meet the following physical requirements when tested by the "Marshal Method" using 75 blows per face:

TABLE 340-3
PHYSICAL REQUIREMENTS OF ASPHALT CONCRETE MIX DESIGN

PROPERTY	TYPE B BASE	TYPE C BASE OR SURFACE	TYPE D SURFACE
Percent Air Voids in Mixture	3-5	3-5	3-5
Percent Voids in Mineral Aggregate (minimum)	13.5	14.5	15.5
Percent Voids Filled with Asphalt	70.0 – 75.0	70.0 – 75.0	70.0 – 77.0
Theoretical Density for Calculation Purposes	2.35	2.45	2.56

In determining these properties, the ASTM bulk specific gravity for the aggregate shall be used and allowance shall be made for asphalt cement absorbed by the aggregate.

.9 Water supply required for the works shall be supplied by the Contractor. The Contractor will not be permitted to use the Owner's hydrants.

2.2 MIX DESIGN

.1 Design of mix: by section 261.2.2 Mix Design of the Standard Specifications of Department of Transportation and Infrastructure of New Brunswick.

Part 3 Execution

3.1 EQUIPMENT

.1 All equipment and construction methods shall conform with the requirements and practices of the NBDTI as stipulated in their Standard Specifications, latest edition, unless these specifications provide otherwise.

.2 All areas that are found to be loose, soft, spongy or composed of unsuitable material must be dug out, refilled with material as specified and compacted to a minimum of 100% of maximum dry density as determined by ASTM D698.

.3 When the rolling is completed, the surface must be nowhere more than 20 mm below, nor more than 10 mm above the finished grade of crushed stone base either as set or in conformity with the standard roadway cross section.

.4 Immediately prior to placing of the asphalt concrete base coarse, the granular base material shall be reshaped and rolled in a manner which leaves the surface smooth, firm and true to grade. When checked with a straight edge, the surfaces shall not vary more than 10 mm in 3 m.

.5 For the purpose of payment, subgrade preparation shall mean the excavation, removal and disposal of in-situ material to a maximum depth of 300 mm including backfilling, grading and compaction of crushed rock subbase material prior to paving. This shall also apply to widening of streets where a centre strip of asphalt exists.

.6 For the purpose of payment, fine grading shall mean grading of existing granular base material to a maximum depth of 100 mm including the disposal of excess material and compaction prior to paving.

.7 All structures such as manholes, inlets and valve boxes shall be adjusted to match the finished surface transverse and longitudinal grade.

.8 Structures that have been set to finished grade must not be disturbed. Damage to these structures due to grading or asphalting operations shall be repaired at the Contractor's expense.

.9 If crushed stone or asphaltic material should fall inside the structures, they shall be cleaned out immediately following occurrence.

3.2 PREPARATION OF SUBGRADE

.1 Reshape granular roadbed in accordance with 32 11 16.01 – Granular Sub-Base.

.2 Apply asphalt tack coat to existing asphalt surfaces, concrete surfaces and/or curb sides prior to paving.

.3 Prior to laying mix, clean surfaces of loose and foreign material.

3.3 PREPARATION OF EXISTING ASPHALT SURFACE

.1 Where asphalt concrete is placed as a resurfacing for existing pavement, all holes and areas showing signs of surface or base failure shall be cut out using a saw, cutting wheel or jack hammer to give a square edge for bonding.

.2 If the subbase granular material is excessively wet and/or does not meet minimum compaction requirements, the areas so affected shall be excavated, filled with new granular material and compacted all as per Section 32 11 16.01 – Granular Sub-Base of the technical specifications.

.3 The holes or excavated areas shall be brought level with the surrounding pavement with a layer of Type "B" Base Course material, placed and compacted to these specifications. The edge of the surrounding pavement must first be painted with tack coat. Disposal of the excavated material shall be incidental to the work. Thickness of asphalt placed shall be within the guidelines for the street designation.

.4 Where asphalt concrete paving is placed as a resurfacing layer over existing pavement, tack coat shall be applied at a coverage rate of 0.25 litres per square metre prior to placing new asphalt concrete. The full width of surface to be treated shall be cleaned with a power or hand broom, to remove all sand, gravel, mud, etc. from existing paved area. This shall be considered incidental to the work.

.5 Where asphalt widening is undertaken, the edges of existing asphalt shall be cut, removed, cleaned thoroughly and tack applied before new base asphalt is placed. The cuts shall be made with a cutting wheel giving a straight vertical face through the thickness of the pavement to provide a butt joint.

.6 Tack coat shall be applied in a uniform manner by means of approved pressure distributors. The use of brooms for manual application on patching contracts is acceptable. Temperature range of tack coat, when applied, shall be between 38°C and 66°C. The tack coat shall not be applied in wet weather or at an ambient temperature lower than 10°C.

.7 Distributors shall be equipped with a tank gauge and measuring stick graduated in litres; and a sampling valve. The Contractor may place the bituminous tack coat by hand at longitudinal joint locations. Tack shall be applied only when the surface to be treated in dry and swept clean over the full width of surfaces to be treated.

.8 The Contractor shall protect or cover concrete walks, curbs, walls, adjacent structures and other appurtenances, prior to spraying bituminous tack coat, to avoid over-spray of these sites. Any tack coat adhering to concrete walks, curb or adjacent structures along the street shall be removed at the Contractor’s expense.

.9 Traffic shall be diverted around freshly sprayed surfaces, if possible, until tack coat has set. Tack coat shall not be applied over an area greater than can be covered by the asphaltic concrete placed in the same day.

.10 The Contractor shall be responsible to reinstate, at his own expense, any bituminous tack-coated surface which has become fouled due to weather and/or traffic.

.11 Where the Department Representative has designated use of pavement reinforcement, GlasGrid Type 8501 (or approved equal) for full width cracking shall be used unless otherwise specified. All remedial work such as base repairs, crack sealing, pothole filling, levelling or padding course application, etc. shall be performed prior to placing the reinforcement. Surface must be prepared as a clean, dry, even surface. On a milled or planed surface, a minimum 19mm levelling course of asphalt must be placed prior to the pavement reinforcement and final lift of asphalt.

.12 Major concrete cracks and spalled areas should be thoroughly cleaned of all dirt and debris and shall be filled with hot mix asphalt concrete and compacted, immediately prior to placement of asphalt concrete overlay, where approved by Departmental Representative.

3.4 TRANSPORTATION OF MIX

.1 Transport mix to job site in trucks with tight, metal boxes free of foreign materials.

.2 Loads shall be covered with tarpaulins of sufficient size to overhang the fully loaded boxes and be tied down on three sides and the front shall be tight to the box of the truck or shielded to prevent air infiltration. Tarpaulins shall be rolled back and the hot mix shall be uncovered immediately prior to dumping the load into the paver.

.3 Trucks may be lightly lubricated with an approved release agent, as required, but must be raised and drained after each application and before loading. No excess solution will be permitted.

.4 Schedule delivery of material for placing in daylight, unless Departmental Representative approves artificial light.

.5 Deliver material to paver at a uniform rate and in an amount within capacity of paving and compacting equipment.

3.5 PLACING

.1 Place asphalt concrete to proper line and grade to give compacted depth, crown, profile, and cross-section as per these specifications and detailed drawings.

.2 Placing conditions:

.1 Place asphalt mixtures only when air temperature is above 5°C and rising.

.2 When temperature of surface on which material is to be placed falls below 10°C, provide extra rollers as necessary to obtain required compaction before cooling.

.3 Do not place hot-mix asphalt when pools of standing water exist on surface to be paved, during rain, or when surface is damp. Asphalt concrete shall not be placed when weather conditions of fog or rain prevail, nor when the pavement surface shows any signs of moisture.

.3 Place asphalt concrete in compacted lifts of thickness as follows:

.1 Levelling course(s) to thicknesses required but not exceeding 100 mm.

.2 Lower course in layers of 100 to 125 mm each.

.3 Surface course in layers of maximum 60 mm each.

.4 Where possible do tapering and levelling where required in lower lifts. Overlap joints by not less than 300 mm.

.5 Place individual strips no longer than 500 m.

.6 On parking lots commence spreading at high side of pavement or at crown and span crowned centerlines with initial strip.

.7 Spread and strike off mixture with self-propelled mechanical finisher:

.1 Construct longitudinal joints and edges true to line markings. Lines for paver to follow will be established by Departmental Representative parallel to centerline of proposed pavement. Position and operate paver to follow established line closely.

.2 Correct irregularities in alignment left by paver by trimming directly behind machine.

.3 Correct irregularities in surface of pavement course directly behind paver. Remove by shovel or lute excess material forming high spots. Fill and smooth indented areas with hot mix. Do not broadcast material over such areas.

.4 Do not throw surplus material on freshly screened surfaces.

.8 When hand spreading is used:

.1 Approved wood or steel forms, rigidly supported to assure correct grade and cross-section, may be used. Use measuring blocks and intermediate strips to aid in obtaining required cross-section.

.2 Distribute material uniformly. Do not broadcast material.

.3 During spreading operation, thoroughly loosen and uniformly distribute material by lutes or covered rakes. Reject material that has formed into lumps and does not break down readily.

.4 After placing and before rolling, check surface with templates and straightedges and correct irregularities.

.5 Provide heating equipment to keep hand tools free from asphalt. Avoid high temperatures which may burn material. Do not use tools at a higher temperature than temperature of mix being placed.

.9 Temperature of the mixture shall not exceed 165ºC and the minimum asphalt concrete temperature prior to placement shall be 115ºC.

.10 Mixture that does not comply with specifications and mixture which cannot be incorporated into the work shall be rejected.

.11 Along curb and gutter, sluice boxes, manholes and similar structures and places not accessible to roller, the mixture shall be thoroughly compacted by means of hot hand tampers and effectively sealed.

.12 Each course after compaction shall be smooth and true to required crown and grade. It shall have average thickness specified and shall vary no more than 6mm from specified thickness.

.13 The surface of finished pavement shall be free from depressions exceeding 3mm as measured with a 3m straight edge.

.14 Any part of pavement not meeting the requirements of specifications shall be removed by the Contractor and replaced with fresh, hot mixture compacted to conform with surrounding area and thoroughly bonded to it.

.15 Fuel spills from the Contractor's equipment shall be immediately repaired by the Contractor to the satisfaction of the Departmental Representative.

.16 All placement, spreading, compacting and rolling shall occur only during daylight hours and any loads arriving at the Work Site such that these requirements cannot be met shall be rejected by the Departmental Representative.

3.6 COMPACTING

.1 Roll asphalt continuously to a density not less than 92.5% of the maximum theoretical density (MTD) obtained with specimens prepared from samples of mix being used.

.2 Compaction equipment shall consist of at least one of each of the following and as many additional rollers as necessary to achieve specified pavement density:

.1 Vibratory roller;

.2 Pneumatic tire roller;

.3 Finish roller

.3 Start rolling operations as soon as placed mix can bear weight of roller without undue displacement of material or cracking of surface.

.4 Operate roller slowly initially to avoid displacement of material. For subsequent rolling do not exceed 5 km/h for static steel-wheeled rollers and 8 km/h for pneumatic-tired rollers.

.5 For lifts 50 mm thick and greater, adjust speed and vibration frequency of vibratory rollers to produce minimum of 20 impacts per metre of travel. For lifts less than 50 mm thick, impact spacing should not exceed compacted lift thickness.

.6 Overlap successive passes of roller by at least one-half width of roller and vary pass lengths.

.7 Keep wheels of roller slightly moistened with water to prevent pick-up of material but do not over-water.

.8 Do not stop vibratory rollers on pavement that is being compacted with vibratory mechanism operating.

.9 Do not permit heavy equipment or rollers to stand on finished surface before it has been compacted and has thoroughly cooled. No traffic shall be allowed on newly placed asphalt concrete until finish rolling is complete and the finished mat has been permitted to cool to 60^{o}C.

.10 After transverse and longitudinal joints and outside edge have been compacted, start rolling longitudinally at low side and progress to high side.

.11 Where rolling causes displacement of material, loosen affected areas at once with lutes or shovels and restore to original grade of loose material before re-rolling.

.12 If damage to street components and/or adjacent property is occurring while using vibratory compaction equipment, the Contractor shall immediately cease using this equipment and proceed with the Work using static rolling equipment.

3.7 FINISH ROLLING

.1 Accomplish finish rolling with a steel drum roller, without vibration and exerting an initial contact pressure on compression roll of at least 3.0 kg/mm of drum width. Ensure material is still warm enough for removal of roller marks.

.2 Conduct rolling operations in close sequence.

3.8 JOINTS

.1 General:

.1 Joints shall be constructed to ensure thorough and continuous bond and to provide a smooth riding surface.

.2 Trim to vertical face to provide true surface and cross section against which new pavement may be laid. Dirt or other foreign and loose material shall be removed from the faces against which joints are to be made.

.3 Paint joint edges with bituminous tack coat prior to placing adjacent pavement.

.4 Overlap previously laid strip with spreader by 100 mm.

.5 Remove surplus material from surface of previously laid strip. Do not dispose on surface of freshly laid strip.

.6 Construct joints between asphalt concrete pavement and Portland cement concrete pavement as indicated.

.7 Paint contact surfaces of existing structures such as manholes, curbs or gutters with bituminous tack coat prior to placing adjacent pavement.

.8 The Contractor shall remove and dispose of waste materials, resulting from joint construction before the end of each Work Day.

.2 Transverse joints:

.1 A transverse construction joint shall be constructed at the end of each day's work and at other times when paving is halted for a period of time which will permit the asphalt to cool below 115ºC.

.2 On Arterial and Collector streets, where the asphalt concrete surface and/or base course has been terminated, the mat shall be tapered at 50:1 minimum. When paving resumes, tapers from surface courses previously laid shall be cut back to full mat thickness to expose fresh, straight vertical surfaces, free from broken or loose material and tacked in accordance with Construct and thoroughly compact transverse joints to provide a smooth riding clause 3.3.

.3 A transverse key joint shall be constructed between existing and new asphalt concrete pavement at the beginning and at the end of the project and other locations where the new pavement terminates against existing pavement. If a key is cut in advance of paving the joint area, the Contractor shall construct a smooth taper at the joint area to a minimum slope of 50:1.

.4 Offset transverse joint in succeeding lifts by at least 600 mm.

.3 Longitudinal Joints:

.1 All longitudinal joints left exposed overnight or which are exposed to moisture from rain, and all curb, manhole, culvert or other abutting structures, shall receive an application of tack coat.

.2 Longitudinal joints shall be constructed to ensure that maximum compression under rolling is achieved. There should not be any excess material scattered on the surface of the freshly lain mat and all excess material shall be carefully removed.

.3 When rolling with static roller, shift roller over onto previously placed lane in order that 100 to 150 mm of drum width rides on newly laid lane, then operate roller to pinch and press fines gradually across joint. Continue rolling until thoroughly compacted neat joint is obtained.

.4 When rolling with vibratory roller, have most of drum width ride on newly placed lane with remaining 100 to 150 mm extending onto previously placed and compacted lane.

.5 Offset longitudinal joints in succeeding lifts by at least 150 mm.

.4 Construct feather joints so that thinner portion of joint contains fine graded material obtained by changed mix design or by raking out coarse aggregate in mix. Place and compact joint so that joint is smooth and without visible breaks in grade.

3.9 TEMPORARY TRAFFIC MARKINGS

.1 The Contractor shall place daily, temporary markings on all newly constructed or milled pavement surfaces to be exposed to traffic, in areas designated by the Departmental Representative.

.2 All materials for temporary traffic markings shall be supplied by the Contractor. Supply and placement of all temporary markings is incidental to the Work.

.3 Spacing for temporary traffic markings shall be 50 metre centre to centre on tangent sections and 25 metre centre to centre on curved sections.

3.10 FINISH TOLERANCES

.1 Finished asphalt surface to be within 5 mm of design elevation but not uniformly high or low.

.2 Finished asphalt surface not to have irregularities exceeding 5 mm when checked with a 4.5 m straight edge placed in any direction.

3.11 DEFECTIVE WORK

.1 Correct irregularities which develop before completion of rolling by loosening surface mix and removing or adding material as required. If irregularities or defects remain after final compaction, remove surface course promptly and lay new material to form a true and even surface and compact immediately to specified density.

.2 Repair areas showing checking or rippling.

.3 Adjust roller operation and screed settings on paver to prevent further defects such as rippling and checking of pavement.

.4 If, at any time before the work is finally accepted, any ravelling, shoving or other fault develops in the pavement as laid, all materials in such place shall be removed, the edges of the joints cut square and painted with tack coat and fresh mixture placed and compacted. All such removal and replacement of unsatisfactory material shall be done at the expense of the Contractor.

3.12 FINAL CLEAN-UP

.1 Immediately after the completion of the work, or any consecutive portion of it, the Contractor shall remove from the street all unused material, refuse and dirt placed by him on or in the vicinity of the work and leave the street in a neat and clean condition.

3.13 CONSTRUCTION OF SUBSTRUCTURES

.1 Departmental Representative reserves the right during the progress of the Work to construct, rebuild or replace with as little inconvenience to the Contractor as possible, any structures such as manholes, inlets, valve boxes and to make any necessary connections or renewals with sewers, water mains or gas pipes lying within the limits to be paved and Departmental Representative reserves the right to suspend the work at any time for the purpose above stated, without compensation to the Contractor other than extension of time for the completion of the work equal to the delay thereby caused.

END OF SECTION

Part 1 General

1.1 RELATED REQUIREMENTS

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

.2 Section 32 11 16.01 – Granular Sub-Base.

1.2 REFERENCES

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

.1 ASTM C117-13, Standard Test Method for Materials 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 D260-15, Standard Specification for Boiled Linseed Oil.

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

.2 Canadian General Standards Board (CGSB)

.1 CAN/CGSB-3.3-(March 2004), Kerosene, Amend. No. 1, National Standard of Canada.

.2 CAN/CGSB-8.1-88, Sieves, Testing, Woven Wire, Inch Series.

.3 Canadian Standards Association (CSA International)

.1 CSA-A23.1-14/A23.2-14, Concrete Materials and Methods of Concrete Construction/Methods of Test and Standard Practices for Concrete.

1.3 ACTION AND INFORMATIONAL SUBMITTALS

.1 Submittals in accordance with Section 01 33 00 – Submittal Procedures.

.2 Product Data: submit WHMIS MSDS in accordance with Section 01 35 29 – Health and Safety Requirements.

.3 Inform Departmental Representative of proposed source of materials and provide access for sampling at least 4 weeks prior to commencing work.

.4 If materials have been tested by independent testing laboratory within previous 2 months and have passed tests equal to requirements of this specification, submit test certificates from testing laboratory showing suitability of materials for this project.

1.4 DELIVERY, STORAGE AND HANDLING

.1 Waste Management and Disposal:

.1 Separate waste materials for recycling in accordance with Section 01 47 22 – Construction/Demolition Waste Management and Disposal.

Part 2 Products

2.1 MATERIALS

.1 Concrete mixes and materials: in accordance with Section 03 30 00 – Cast-in-Place Concrete.

.2 Reinforcing steel: in accordance with Section 03 20 00 – Concrete Reinforcing.

.3 Joint filler Curing Compound: in accordance with Section 03 30 00 – Cast-in-Place Concrete.

.4 Granular base: material to Section 31 23 33.01 – Excavation, Trenching and Backfilling following requirements:

- .1 Type 1, 2 or 3 fill.
- .2 Crushed stone or gravel.
- .3 Gradations: within limits specified when tested to ASTM C117. Sieve sizes to CAN/CGSB-8.1.

.5 Non-staining mineral type form release agent: chemically active release agents containing compounds that react with free lime to provide water-soluble soap.

.6 Fill material: to Section 31 23 33.01 – Excavation, Trenching and Backfilling following requirements:

- .1 Type 1, 2 or 3 fill.
- .2 Crushed stone or gravel.
- .3 Gradations: within limits specified when tested to ASTM C117. Sieve sizes to CAN/CGSB-8.1.

.7 Boiled linseed oil: to ASTM D260.

.8 Kerosene: to CAN/CGSB-3.3.

Part 3 Execution

3.1 GRADE PREPARATION

.1 Do grade preparation work in accordance with Section 31 23 33.01 – Excavating, Trenching and Backfilling.

.2 Construct embankments using excavated material free from organic matter or other objectionable materials.

- .1 Dispose of surplus and unsuitable excavated material off site.

.3 Place fill in maximum 150 mm layers and compact to at least 95% of maximum dry density to ASTM D698.

3.2 GRANULAR BASE

.1 Obtain Departmental Representative's approval of subgrade before placing granular base.

.2 Place granular base material to lines, widths, and depths as indicated.

.3 Compact granular base in maximum 150 mm layers to at least 95% of maximum density to ASTM D698.

3.3 CONCRETE

.1 Obtain Departmental Representative's approval of granular base and reinforcing steel prior to placing concrete.

.2 Do concrete work in accordance with Section 03 30 00 – Cast-in-Place Concrete.

.3 Immediately after floating, give sidewalk surface uniform broom finish to produce regular corrugations not exceeding 2 mm deep, by drawing broom in direction normal to centre line.

.4 Provide edging as indicated with 10 mm radius edging tool.

.5 Slip-form pavers equipped with string line system for line and grade control may be used if quality of work acceptable to Departmental Representative can be demonstrated. Hand finish surfaces when directed by Departmental Representative.

3.4 TOLERANCES

.1 Finish surfaces to within 3 mm in 3 m as measured with 3 m straightedge placed on surface.

3.5 EXPANSION AND CONTRACTION JOINTS

.1 Install tooled transverse contraction joints after floating, when concrete is stiff, but still plastic, at intervals of 1.5 m.

.2 Install expansion joints as directed by Departmental Representative at intervals of 6 m.

.3 When sidewalk is adjacent to curb, make joints of curb, gutters and sidewalk coincide.

3.6 ISOLATION JOINTS

.1 Install isolation joints around manholes and catch basins and along length adjacent to concrete curbs, catch basins, buildings, or permanent structure.

.2 Install joint filler in isolation joints as indicated in accordance with Section 03 30 00 – Cast-in-Place Concrete.

.3 Seal isolation joints with sealant approved by Departmental Representative.

3.7 CURING

.1 Cure concrete by adding moisture continuously in accordance with CSA-A23.1/A23.2 to exposed finished surfaces for at least 1 day after placing, or sealing moisture in by curing compound as directed by Departmental Representative.

.2 Where burlap is used for moist curing, place two prewetted layers on concrete surface and keep continuously wet during curing period.

.3 Apply curing compound evenly to form continuous film, in accordance with manufacturer's requirements.

3.8 BACKFILL

.1 Allow concrete to cure for 7 days prior to backfilling.

.2 Backfill to designated elevations with material as directed by Departmental Representative.

.1 Compact and shape to required contours as directed by Departmental Representative.

3.9 LINSEED OIL TREATMENT

.1 Apply two coats of linseed oil mixture uniformly to surfaces of curbs, walks and gutters, after concrete has cured for specified curing time and when surface of concrete is clean and dry.

.2 Linseed oil mixture to consist of 50% boiled linseed oil and 50% mineral spirits by volume.

.3 Apply treatment when air temperature above 10 degrees C.

.4 Apply first coat at 135 mL/m^2.

.5 Apply second coat at 90 mL/m^2 when first coat has dried.

3.10 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 REQUIREMENTS

.1 Section 32 92 19.16 – Hydraulic Seeding.

1.2 MEASUREMENT AND PAYMENT

.1 Payment for seeding will be made at unit price bid per square metre of actual surface measurements taken and computed by Departmental Representative. Areas of blending into existing turf grass will not be measured for payment.

1.3 ADMINISTRATIVE REQUIREMENTS

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

.2 Scheduling:

.1 Schedule sod laying to coincide with preparation of soil surface.

.2 Schedule sod installation when frost is not present in ground.

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

1.4 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 seed, and fertilizer.

.2 Submit 2 copies of WHMIS MSDS in accordance with Section 01 35 29 – Health and Safety Requirements.

.3 Samples:

.1 Submit 0.5 kg container of each type of fertilizer used.

.4 Certificates: product certificates signed by manufacturer certifying materials comply with specified performance characteristics and criteria and physical requirements.

.5 Test Reports: submit certified test reports showing compliance with specified performance characteristics and physical properties.

1.5 QUALITY ASSURANCE

.1 Qualifications:

.1 Landscape Contractor: to be a Member in Good Standing of New Brunswick Horticultural Trades Association.

.2 Landscape Planting Supervisor: Landscape Industry Certified Technician with Softscape Installation designation.

.3 Landscape Maintenance Supervisor: Landscape Industry Certified Technician with Turf Maintenance designation.

1.6 DELIVERY, STORAGE AND HANDLING

.1 Deliver, store and handle materials in accordance with manufacturer's written instructions.

.2 Delivery and Acceptance Requirements:

.1 Labelled bags of fertilizer identifying mass in kg, mix components and percentages, date of bagging, supplier's name and lot number.

.2 Fertilizer must be dry.

.3 Storage and Handling Requirements:

.1 Store fertilizer in accordance with manufacturer's recommendations in clean, dry, well-ventilated area.

.2 Replace defective or damaged materials with new.

1.7 WARRANTY

.1 For seeding, 12 months warranty period is extended to 24 months.

.2 Contractor hereby warrants that seeding will remain free of defects in accordance with General Conditions CCDC GC 12.3, but for 24 months.

.3 End-of-warranty inspection will be conducted by Departmental Representative.

Part 2 Products

2.1 GRASS SEED

.1 Canada "Certified" seed, "Canada No. 1 Lawn Grass Mixture" in accordance with Government of Canada "Seeds Act" and "Seeds Regulations".

.1 Grass seed mixture.

.1 Mixture composition:

.1 50% Kentucky Bluegrass.

.2 30% Creeping Red Fescue.

.3 20% Annual Ryegrass.

.2 Canada "Certified" seed, "Canada No. 2 Ground Cover Mixture" in accordance with Government of Canada "Seeds Act" and "Seeds Regulations".

.1 Grass seed mixture.

.1 Mixture composition:

.1 40% Kentucky Bluegrass.

.2 40% Creeping Red Fescue.

.3 20% Annual Ryegrass.

.3 In packages individually labelled in accordance with "Seeds Regulations" and indicating name of supplier.

2.2 WATER

.1 Free of impurities that would inhibit germination and growth.

.2 Supplied by Departmental Representative at designated source.

.3 Water for required irrigation will be supplied via hydrant or hose bib.

2.3 FERTILIZER

.1 To Canada "Fertilizers Act" and Regulations.

.2 Complete synthetic fertilizer with guaranteed minimum analysis as specified.

Part 3 Execution

3.1 EXAMINATION

.1 Verification of Conditions: verify conditions of substrate previously installed under other Sections or Contracts are acceptable for mechanical seeding installation in accordance with manufacturer's written instructions.

.1 Visually inspect substrate in presence of Departmental Representative.

.2 Inform Departmental Representative of unacceptable conditions immediately upon discovery.

.3 Proceed with installation only after unacceptable conditions have been remedied and after receipt of written approval to proceed from Departmental Representative.

3.2 INSTALLERS

.1 Use installer’s members in Good Standing of New Brunswick Horticultural Trades Association.

3.3 SEED BED PREPARATION

.1 Do not perform work under adverse field conditions as determined by Departmental Representative.

.2 Remove and dispose of weeds; debris; stones 50 mm in diameter and larger; soil contaminated by oil, gasoline and other deleterious materials; off site as directed by Departmental Representative in accordance with Section 01 74 22 – Construction/Demolition Waste Management and Disposal.

.3 Verify that grades are correct. If discrepancies occur, notify Departmental Representative and commence work when instructed by Departmental Representative.

.4 Fine grade surface free of humps and hollows to smooth, even grade, to elevations indicated to tolerance of plus or minus 15 mm, surface draining naturally.

.5 Cultivate fine graded surface approved by Departmental Representative to 25 mm depth immediately prior to seeding.

3.4 SEED PLACEMENT

.1 Ensure seed is placed under supervision of certified Landscape Planting Supervisor.

.2 For mechanical seeding:

.1 Mechanical landscape drill seeder ("Brillion" type or equivalent) which accurately places seed at specified depth and rate and rolls in single operation.

.2 Use equipment and method acceptable to Departmental Representative.

.3 For manual seeding:

.1 Use manually operated drop seeder ("Cyclone" type or equivalent).

.2 Use manually operated, water ballast, landscaping type, smooth steel drum roller. Ballast as directed by Departmental Representative.

.3 Use equipment and method acceptable to Departmental Representative.

.4 On cultivated surfaces, sow seed uniformly at rate of:

.1 125 kg/hectare lawn grass mixture.

.2 200 kg/hectare ground cover mixture.

.5 Blend applications 150 mm into adjacent grass areas to form uniform surfaces.

.6 Sow half of required amount of seed in one direction and remainder at right angles as applicable.

.7 Incorporate seed by light raking in cross directions.

.8 Consolidate mechanically seeded areas by rolling area if soil conditions warrant or if directed by Departmental Representative with equipment approved by Departmental Representative immediately after seeding.

3.5 CLEANING

.1 Progress Cleaning: clean in accordance with Section 01 74 11 – Cleaning.

.1 Leave Work area clean at end of each day.

.2 Keep pavement and area adjacent to site clean and free from mud, dirt, and debris at all times.

.2 Final Cleaning: upon completion remove surplus materials, rubbish, tools and equipment in accordance with Section 01 74 11 – Cleaning.

.1 Clean and reinstate areas affected by Work.

3.6 PROTECTION

.1 Erect [plastic snow fence] around newly seeded areas sufficient to protect against deterioration due to pedestrian or other traffic.

3.7 FERTILIZING PROGRAM

.1 Fertilize during establishment and warranty periods to following program:

Date Range	Date		Date	Application Rate	Formulation (NPK Ratio)
Between	June 1	and	September 30	375 kg/ ha	10:20:20

3.8 MAINTENANCE DURING ESTABLISHMENT PERIOD

.1 Ensure maintenance is carried out under supervision of certified Landscape Maintenance Supervisor.

.2 Perform following operations from time of seed application until acceptance by Departmental Representative:

.1 Water seeded area to maintain optimum soil moisture level for germination and continued growth of grass. Control watering to prevent washouts.

.2 Repair and reseed dead or bare spots to allow establishment of seed prior to acceptance.

.3 Cut grass to 50 mm whenever it reaches height of 70 mm. Remove clippings which will smother grass as directed by Departmental Representative.

.4 Fertilize seeded areas after first cutting in accordance with fertilizing program. Spread half of required amount of fertilizer in one direction and remainder at right angles and water in well.

.5 Control weeds by mechanical or chemical means utilizing acceptable integrated pest management practices.

.6 Adjust protection barrier as necessary to protect against deterioration due to pedestrian or other traffic as needed.

3.9 FINAL ACCEPTANCE

.1 Seeded areas will be accepted by Departmental Representative provided that:

.1 Areas are uniformly established free of rutted, eroded, bare or dead spots and extent of weeds apparent in grass is acceptable.

.2 Areas have been cut at least twice.

.3 Areas have been fertilized.

.2 Areas seeded in fall will be accepted in following spring, one month after start of growing season provided acceptance conditions are fulfilled.

3.10 MAINTENANCE DURING WARRANTY PERIOD

.1 Perform following operations from time of acceptance until end of warranty period.

.1 Water seeded area to maintain optimum soil moisture level for continued growth of grass. Control watering to prevent washouts.

.2 Repair and reseed dead or bare spots to satisfaction of Departmental Representative.

.3 Cut grass to 50 mm whenever it reaches height of 70 mm. Remove clippings which will smother grass as directed by Departmental Representative.

.4 Fertilize seeded areas in accordance with fertilizing program. Spread half of required amount of fertilizer in one direction and remainder at right angles and water in well.

.5 Control weeds by mechanical or chemical means utilizing acceptable integrated pest management practices.

END OF SECTION

Part 1 General

1.1 RELATED REQUIREMENTS

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

1.2 MEASUREMENT AND PAYMENT

.1 Measure hydraulic seeding hectares of actual surface area for:

.1 Grass mixture including fertilizer.

.2 Legume mixture including fertilizer.

.3 Areas of blending into existing turf grass will not be measured for payment.

.2 Measure maintenance during establishment period of areas seeded in hectares.

.3 Payment for seeding made at unit price bid of actual area surface measurements taken and computed by Departmental Representative.

1.3 ADMINISTRATIVE REQUIREMENTS

.1 Pre-Installation Meetings: conduct pre-installation meetings to verify project requirements, installation instructions and warranty requirements in accordance with Section 01 31 19 – Project Meetings.

.2 Scheduling:

.1 Schedule hydraulic seeding to coincide with preparation of soil surface.

.2 Schedule hydraulic seeding using grass mixtures and mixtures containing Trefoil between dates recommended by Provincial Agricultural Department.

1.4 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 seed, mulch, tackifier, fertilizer, liquid soil amendments and micronutrients.

.2 Submit 2 copies of WHMIS MSDS in accordance with Section 01 35 29 – Health and Safety Requirements.

.3 Submit in writing 5 days prior to commencing work:

.1 Volume capacity of hydraulic seeder in litres.

.2 Amount of material to be used per tank based on volume.

.3 Number of tank loads required per hectare to apply specified slurry mixture per hectare.

.4 Samples:

.1 Submit 0.5 kg container of each type of fertilizer used.

.5 Certificates: product certificates signed by manufacturer certifying materials comply with specified performance characteristics and criteria and physical requirements.

.6 Test Reports: submit certified test reports showing compliance with specified performance characteristics and physical properties.

1.5 QUALITY ASSURANCE

.1 Qualifications:

.1 Landscape Contractor: to be a Member in Good Standing of New Brunswick Horticultural Trades Association.

.2 Landscape Planting Supervisor: Landscape Industry Certified Technician with Softscape Installation designation.

.3 Landscape Maintenance Supervisor: Landscape Industry Certified Technician with Turf Maintenance designation.

1.6 DELIVERY, STORAGE AND HANDLING

.1 Deliver, store and handle materials in accordance with manufacturer's written instructions.

.2 Delivery and Acceptance Requirements:

.1 Labelled bags of fertilizer identifying mass in kg, mix components and percentages, date of bagging, supplier's name and lot number.

.2 Inoculant containers to be tagged with expiry date.

.3 Storage and Handling Requirements:

.1 Store fertilizer in accordance with manufacturer's recommendations in clean, dry, well-ventilated area.

.2 Replace defective or damaged materials with new.

1.7 WARRANTY

.1 For seeding, 12 months warranty period is extended to 24 months.

.2 Contractor hereby warrants that seeding will remain free of defects in accordance with General Conditions CCDC GC 12.3, but for 24 months.

.3 End-of-warranty inspection will be conducted by Departmental Representative.

Part 2 Products

2.1 MATERIALS

.1 Seed: "Canada pedigreed grade" in accordance with Government of Canada Seeds Act and Regulations.

.1 Grass mixture: "Certified", "Canada No. 1 Lawn Grass Mixture" in accordance with Government of Canada "Seeds Act" and "Seeds Regulations".

.1 Mixture composition:

.1 50% Kentucky Bluegrass.

.2 30% Creeping Red Fescue.

.3 20% Annual Ryegrass.

.2 Legume mixture: "Certified", "Specialty Seed", "Canada No. 2" in accordance with Government of Canada "Seeds Act" and "Seeds Regulations".

.1 Mixture composition:

.1 40% Kentucky Bluegrass.

.2 40% Creeping Red Fescue.

.3 20% Annual Ryegrass.

.2 Mulch: specially manufactured for use in hydraulic seeding equipment, non-toxic, water activated, green colouring, free of germination and growth inhibiting factors with following properties:

.1 Type I mulch:

.1 Made from wood cellulose fibre.

.2 Organic matter content: 95% plus or minus 0.5%.

.3 Value of pH: 6.0.

.4 Potential water absorption: 900%.

.2 Type II mulch:

.1 Made from newsprint, processed to produce fibre lengths of 15 mm minimum and 25 mm maximum. Greater proportions of ingredients to be straw.

.3 Tackifier: water dilutable, liquid dispersion.

.4 Water: free of impurities that would inhibit germination and growth.

.5 Fertilizer:

.1 To Canada "Fertilizers Act" and Regulations.

.2 Complete synthetic, slow release with 35% of nitrogen content in water-insoluble form.

.6 Inoculants: inoculant containers to be tagged with expiry date.

Part 3 Execution

3.1 EXAMINATION

.1 Verification of Conditions: verify conditions of substrate previously installed under other Sections or Contracts are acceptable for hydraulic seeding in accordance with manufacturer's written instructions.

.1 Visually inspect substrate in presence of Departmental Representative.

.2 Inform Departmental Representative of unacceptable conditions immediately upon discovery.

.3 Proceed with installation only after unacceptable conditions have been remedied and after receipt of written approval to proceed from Departmental Representative.

3.2 INSTALLERS

.1 Use installer's members in Good Standing of New Brunswick Horticultural Trades Association.

3.3 PROTECTION OF EXISTING CONDITIONS

.1 Protect structures, signs, guide rails, fences, plant material, utilities and other surfaces not intended for spray.

.2 Immediately remove any material sprayed where not intended as directed by Departmental Representative.

3.4 PREPARATION OF SURFACES

.1 Do not perform work under adverse field conditions such as wind speeds over 10 km/h, frozen ground or ground covered with snow, ice or standing water.

.2 Fine grade areas to be seeded free of humps and hollows.

.1 Ensure areas are free of deleterious and refuse materials.

.3 Cultivated areas identified as requiring cultivation to depth of 25 mm.

.4 Ensure areas to be seeded are moist to depth of 150 mm before seeding.

.5 Obtain Departmental Representative's approval of grade and topsoil depth before starting to seed.

3.5 FERTILIZING PROGRAM

.1 Fertilize prior to fine grading applying fertilizer equally distributed in accordance with the following program:

Date Range	Date		Date	Application Rate	Formulation (NPK Ratio)
Between	June 01	and	September 30	375 kg/ha	10:20:20

.2 Fertilize during establishment and warranty periods applying fertilizer equally distributed in accordance with the following program:

Date Range	Date		Date	Application Rate	Formulation (NPK Ratio)
Between	June 01	and	September 30	375 kg/ha	10:20:20

3.6 PREPARATION OF SLURRY

.1 Measure quantities of materials by weight or weight-calibrated volume measurement satisfactory to Departmental Representative. Supply equipment required for this work.

.2 Charge required water into seeder. Add material into hydraulic seeder under agitation. Pulverize mulch and charge slowly into seeder.

.3 After materials are in seeder and well mixed, charge tackifier into seeder and mix thoroughly to complete slurry.

3.7 SLURRY APPLICATION

.1 Ensure seed is placed under supervision of certified Landscape Planting Supervisor.

.2 Hydraulic seeding equipment:

.1 Slurry tank.

.2 Agitation system for slurry to be capable of operating during charging of tank and during seeding, consisting of recirculation of slurry and/or mechanical agitation method.

.3 Capable of seeding by 50 m hand operated hoses and appropriate nozzles.

.4 Tank volume to be certified by certifying authority and identified by authorities "Volume Certification Plate".

.3 Slurry mixture applied per hectare.

.1 Seed: grass mixture 125 kg.

.2 Mulch: Type I kg.

.3 Tackifier: as per manufacturer’s recommendations.

.4 Water: Minimum 30,000 L.

.5 Fertilizer: 375 kg, ratio 10:20:20.

.6 Liquid Soil Amendment/Micronutrients: as per manufacturer’s recommendations.

.4 Apply slurry uniformly, at optimum angle of application for adherence to surfaces and germination of seed.

.1 Using correct nozzle for application.

.2 Using hoses for surfaces difficult to reach and to control application.

.5 Blend application 300 mm into adjacent grass areas or sodded areas to form uniform surfaces.

.6 Re-apply where application is not uniform.

.7 Remove slurry from items and areas not designated to be sprayed.

3.8 CLEANING

.1 Progress Cleaning: clean in accordance with Section 01 74 11 – Cleaning.

.1 Leave Work area clean at end of each day.

.2 Keep pavement and area adjacent to site clean and free from mud, dirt, and debris at all times.

.2 Final Cleaning: upon completion remove surplus materials, rubbish, tools and equipment in accordance with Section 01 74 11 – Cleaning.

.1 Clean and reinstate areas affected by Work.

.3 Waste Management: separate waste materials for recycling in accordance with Section 01 74 22 – Construction/Demolition Waste Management and Disposal.

.1 Remove recycling containers and bins from site and dispose of materials at appropriate facility.

.2 Divert unused fertilizer from landfill to official hazardous material collections site approved by Departmental Representative.

3.9 PROTECTION

.1 Protect seeded areas from trespass until plants are established.

.2 Remove protection devices as directed by Departmental Representative.

3.10 MAINTENANCE DURING ESTABLISHMENT PERIOD

.1 Ensure maintenance is carried out under supervision of certified Landscape Maintenance Supervisor.

.2 Perform following operations from time of seed application until acceptance by Departmental Representative.

.3 Grass Mixture:

.1 Repair and reseed dead or bare spots to allow establishment of seed prior to acceptance.

.2 Mow grass to 50 mm whenever it reaches height of 70 mm. Remove clippings which will smother grass as directed by Departmental Representative.

.3 Fertilize seeded areas after 10 weeks after germination provided plants have mature true leafs in accordance with fertilizing program. Spread half of required amount of fertilizer in one direction and remainder at right angles.

.4 Control weeds by mechanical or chemical means utilizing acceptable integrated pest management practices.

.5 Water seeded area to maintain optimum soil moisture level for germination and continued growth of grass. Control watering to prevent washouts.

.4 Legume Mixture:

.1 Repair minor dead and bare spots as determined by Departmental Representative to allow establishment of seed prior to acceptance.

.2 Repair major dead and bare spots as determined by Departmental Representative in accordance with site climatic averages and recommendations of local horticultural governmental representative.

.3 Mow legume mixtures to 100 mm whenever height reaches 200 mm and as follows:

.1 Do not mow within period commencing 3 weeks before and ending 3 weeks after first severe, average fall frost date and 3 weeks after actual severe fall frost.

.2 When mowing after first severe fall frost, mow at a height of not less than 300 mm.

.4 Remove clippings that will smother plants as directed by Departmental Representative.

.5 Water seeded areas to maintain optimum soil moisture level for germination and continued growth. Control watering to prevent washouts.

3.11 ACCEPTANCE

.1 Seeded areas will be accepted by Departmental Representative provided that:

.1 Plants are uniformly established.

.2 Areas have been mown at least twice.

.3 Areas have been fertilized.

.2 Areas seeded in fall will achieve final acceptance in following spring, one month after start of growing season provided acceptance conditions are fulfilled.

3.12 MAINTENANCE DURING WARRANTY PERIOD

.1 Perform following operations from time of acceptance until end of warranty period:

.1 Repair and reseed dead or bare spots to satisfaction of Departmental Representative.

.2 Mow areas seeded, remove clippings that will smother grassed areas, as directed by Departmental Representative, and in accordance with following schedule:

Seed Mixture	Frequency	Requirements for Cutting	Height of Cut
Grass mixture	2 times	7y0 mm height	70 mm

.3 Fertilize seeded areas in accordance with fertilizing program. Spread half of required amount of fertilizer in one direction and remainder at right angles and water in well.

END OF SECTION