

PART 1 - GENERAL

- 1.1 Related Work .1 Refer to other Specification Sections for related information.
- 1.2 Reference Standards .1 ASTM D698-91 (or latest edition) Laboratory Compaction Characteristics of Soil Using Standard Effort (12,400 ft-lbf/ft) - Method C.

PART 2 - PRODUCTS

- 2.1 Materials .1 Granular sub-base material to Section 31 05 17 and following requirements:
 - .1 Crushed stone or gravel consisting of hard durable angular particles free from clay lumps, cementation, organic material, frozen material and other deleterious materials.
 - .2 Type 2 granular material gradation will be within the following limits:

ASTM SIEVE SIZE	% PASSING BY MASS
56 mm	100
28 mm	60 - 80
5 mm	25 - 45
0.160 mm	0 - 10

- .3 Backfill material shall be material removed during demolition and removal operations provided the material is sorted such that it is free of dredge spoils, timber debris or concrete pieces greater than 300 mm diameter and is approved by the Departmental Representative.
- .4 The use of additional backfill material other than the material on site is subject to the approval of the Departmental Representative and is to be free from rocks larger than 150 mm, cinders, ashes, sods, refuse, or other deleterious materials.

PART 3 - EXECUTION

- 3.1 Inspection of Existing Sub-Base Surface .1 Do not place new granular sub-base until underlying backfill material is compacted, inspected and approved by the Departmental Representative.

- 3.2 Placing
- .1 Place material only on a clean unfrozen surface, properly shaped and compacted and free from snow or ice.
 - .2 Place Type 2 and backfill material to full width in uniform layers not exceeding 150mm compacted thickness. Departmental Representative may authorize thicker lifts (layers) if specified compaction can be achieved.
 - .3 Shape each layer to a smooth contour and compact to specified density before next layer is placed.
 - .4 Remove and replace portion of a layer in which material has become segregated during spreading.
- 3.3 Compacting
- .1 Compact to density of not less than 100% maximum dry density in accordance with ASTM D698.
 - .2 Shape and roll alternately to obtain a smooth, even and uniformly compacted sub-base.
 - .3 Apply water as necessary during compaction to obtain specified density. If sub-base is excessively moist, aerate by scarifying with suitable equipment until corrected.
 - .4 In areas not accessible to rolling equipment, compact to specified density with approved mechanical tampers.
- 3.4 Finish Tolerances
- .1 Granular sub-base compacted thicknesses will be as shown on drawings.
 - .2 Backfill material will be compacted to the thickness as required to attain the grades indicated on the drawings.
 - .3 Finish compacted surface to within plus or minus 25 mm of established grade but not uniformly high or low.
 - .4 Correct surface irregularities by loosening and adding or removing material until surface is within specified tolerance.
- 3.5 Maintenance
- .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 Work .1 Refer to other Specification Sections for related information.
- 1.2 Reference Standards .1 ASTM D698-91 (or latest edition) Laboratory Compaction Characteristics of Soil Using Standard Effort (12,400 ft-lbf/ft) - Method C.

PART 2 - PRODUCTS

- 2.1 Materials .1 Granular Base: Material to Section 31 05 17 and following requirements:
 - .1 Crushed stone or gravel consisting of hard, durable, angular particles, free from clay lumps, cementation, organic material, frozen material and other deleterious materials.
 - .2 Type 1 granular fill gradation will be within following limits:

ASTM SIEVE SIZE	% PASSING BY MASS
20 mm	100
14 mm	50 - 85
5 mm	20 - 50
0.16 mm	0 - 10
0.080 mm	0 - 7

PART 3 - EXECUTION

- 3.1 Inspection of Underlying Sub-Base .1 Do not place granular base until finished sub-base surface is inspected and approved by Departmental Representative.
- 3.2 Placing .1 Place material only on a clean unfrozen surface, properly shaped and compacted and free from snow and ice.
 - .2 Place using methods which do not lead to segregation or degradation of aggregates.
 - .3 Place material to full width in a uniform layer to mm compacted thickness.
 - .4 Shape each layer to a smooth contour and compact to specified density before next layer is placed.

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- 3.3 Compacting
- .1 Compact to density not less than 100% maximum dry density in accordance with ASTM D698.
 - .2 Shape and roll alternately to obtain a smooth, even and uniformly compacted base.
 - .3 Apply water as necessary during compacting to obtain specified density. If material is excessively moist, aerate by scarifying with suitable equipment until corrected.
 - .4 In areas not accessible to rolling equipment, compact to specified density with approved mechanical tampers.
- 3.4 Finish Tolerances
- .1 Finished base surface shall be within plus or minus 10 mm of established grade but not uniformly high or low.
 - .2 Correct surface irregularities by loosening and adding or removing material until surface is within specified tolerance.
- 3.5 Maintenance
- .1 Maintain finished base in a condition conforming to this section until succeeding material is applied or until acceptance.

END OF SECTION

PART 1 - GENERAL

- 1.1 Related Work .1 Refer to other Specification Sections for related work.
- 1.2 Submissions .1 Provide samples of materials proposed for the work if requested by Departmental representative.
- .2 Provide methodology for carrying out the work as requested by Departmental Representative.

PART 2 - PRODUCTS

- 2.1 Materials .1 Nominal Clear Stone
- .1 Material to Section 31 05 17 and to be a stone consisting of hard, durable particles, free from clay lumps, silt, cementation, organic material, frozen material and other deleterious foreign materials. Clear stone to be free from splits, seams or defects likely to impair its soundness during handling or under action of water.
- .2 Specific gravity of not less than 2.65 when tested to ASTM C127-81 (AASHTO T85-88).
- .3 Gradation will be within the following limits:

ASTM SIEVESIZE	% PASSING BY MASS
38 mm	100
25 mm	90 - 100
12.5 mm	0 - 10

PART 3 - EXECUTION

- 3.1 Placement .1 Clear stone can be end dumped provided that no breakage of stone occurs. Any broken rock shall be removed at the contractor's expense.
- .2 Place clear stone at maximum density.
- 3.3 Protection .1 Schedule and carry out construction so that each phase of work is not left exposed longer than necessary.

END OF SECTION

PART 1 - GENERAL

- 1.1 Description .1 This section specifies requirements for supplying, placing, and grading topsoil material to lines, grades, and dimensions indicated or directed in preparation for grass planting.
- 1.2 References .1 Agriculture and Agri-Food Canada
.1 The Canadian System of Soil Classification
.2 Canadian Council of Ministers of the Environment
.1 PN1340-2005 , Guidelines for Compost Quality.
- 1.3 Related Work .1 Section 32 92 19.16 - Hydraulic Seeding
- 1.4 Definitions .1 Compost:
.1 Mixture of soil and decomposing organic matter used as fertilizer, mulch, or soil conditioner.
.2 Compost is processed organic matter containing 40% or more organic matter as determined by Walkley-Black or Loss On Ignition (LOI) test.
.3 Product must be sufficiently decomposed (i.e. stable) so that any further decomposition does not adversely affect plant growth (C:N ratio below 25), and contain no toxic or growth inhibiting contaminates.
.4 Composed bio-solids to: CCME Guidelines for Compost Quality, Category A.
- 1.5 Submittals .1 Quality control submittals:
.1 Soil testing: submit certified test reports showing compliance with specified performance characteristics and physical properties as described throughout this specification.
.2 Certificates: submit product certificates signed by manufacturer certifying materials comply with specified performance characteristics and criteria and physical requirements.
- 1.6 Quality Assurance .1 Pre-installation meetings: conduct pre installation meeting to verify project requirements, installation instructions and warranty requirements.
- 1.7 Waste Management .1 Separate waste materials for reuse and recycling.

- .2 Divert unused soil amendments from landfill to official hazardous material collections site Departmental Representative.
- .3 Do not dispose of unused soil amendments into sewer systems, into lakes, streams, onto ground or in locations where it will pose health or environmental hazard.

PART 2 - PRODUCTS

2.1 Topsoil

- .1 Topsoil for seeded areas: mixture of particulates, micro organisms and organic matter which provides suitable medium for supporting intended plant growth.
 - .1 Soil texture based on The Canadian System of Soil Classification, to consist of 20 to 70 % sand, minimum 7 % clay, and contain 2 to 10 % organic matter by weight.
 - .2 Contain no toxic elements or growth inhibiting materials.
 - .3 Finished surface free from:
 - .1 Debris and stones over 50 mm diameter.
 - .2 Course vegetative material, 10 mm diameter and 100 mm length, occupying more than 2% of soil volume.
 - .4 Consistence: friable when moist.

2.2 Soil Amendments

- .1 Fertilizer: industry accepted standard medium containing nitrogen, phosphorous, potassium and other micro-nutrients suitable to specific plant species or application or defined by soil test. Major soil nutrients present in following amounts:
 - .1 Nitrogen (N): 20 to 40 micrograms of available N per gram of topsoil.
 - .2 Phosphorus (P): 40 to 50 micrograms of phosphate per gram of topsoil.
 - .3 Potassium (K): 75 to 110 micrograms of potassium per gram of topsoil.
 - .4 Calcium, magnesium, sulphur and micro-nutrients present in balanced ratios to support germination and/or establishment of intended vegetation.
 - .5 Ph value: 6.5 to 8.0
- .2 Peatmoss:
 - .1 Derived from partially decomposed species of Sphagnum Mosses.
 - .2 Elastic and homogeneous, brown in colour.
 - .3 Free of wood and deleterious material which could prohibit growth.
 - .4 Shredded particle minimum size: 5 mm.

- .3 Sand: washed coarse silica sand, medium to course textured.
 - .4 Organic matter: compost Category A , in accordance with CCME PN1340 , unprocessed organic matter, such as rotted manure, hay, straw, bark residue or sawdust, meeting the organic matter, stability and contaminant requirements.
 - .5 Limestone:
 - .1 Ground agricultural limestone.
 - .2 Gradation requirements: percentage passing by weight, 90% passing 1.0 mm sieve, 50% passing 0.125 mm sieve.
- 2.3 Source Quality Control
- .1 Advise Departmental Representative of sources of topsoil to be utilized with sufficient lead time for testing.
 - 2 Contractor is responsible for amendments to supply topsoil as specified.
 - .3 Soil testing by recognized testing facility for PH, P and K, and organic matter.
 - .4 Testing of topsoil will be carried out by testing laboratory designated by Departmental Representative.
 - .1 Soil sampling, testing and analysis to be in accordance with Provincial standards.

PART 3 - EXECUTION

- 3.1 Temporary Erosion and Sediment 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.

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- 3.2 Stripping of Topsoil .1 Begin topsoil stripping of areas after area has been cleared of weeds, brush, grasses and removed from site. Avoid mixing topsoil with subsoil where textural quality will be moved outside acceptable range of intended application.
- .2 Stockpile in locations as Departmental Representative. Stockpile height not to exceed 2 m.
- .3 Disposal of unused topsoil is to be in an environmentally responsible manner but not used as landfill.
- .4 Protect stockpiles from contamination and compaction.
- 3.3 Preparation of Existing Grade .1 Verify that grades are correct. If discrepancies occur, notify Departmental Representative and do not commence work until instructed by Departmental Representative.
- .2 Grade soil, eliminating uneven areas and low spots, ensuring positive drainage.
- .3 Remove debris, roots, branches, stones in excess of 50 mm diameter and other deleterious materials.
- .1 Remove soil contaminated with calcium chloride, toxic materials and petroleum products.
- .2 Remove debris which protrudes more than 50 mm above surface.
- .3 Dispose of removed material off site.
- .4 Cultivate entire area which is to receive topsoil to minimum depth of 100 mm.
- .1 Cross cultivate those areas where equipment used for hauling and spreading has compacted soil.
- 3.4 Placing and Spreading Of Topsoil .1 Place topsoil after Departmental Representative has accepted subgrade.
- .2 Spread topsoil in uniform layers not exceeding 150 mm.
- .3 Spread topsoil as indicated to following minimum depths after settlement.
- .1 150 mm for seeded areas.

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- .4 Manually spread topsoil/planting soil around trees, shrubs and obstacles.
 - 3.5 Finish Grading
 - .1 Grade to eliminate rough spots and low areas and ensure positive drainage.
 - .2 Prepare loose friable bed by means of cultivation and subsequent raking.
 - .3 Consolidate topsoil to required bulk density.
 - .1 Leave surfaces smooth, uniform and firm against deep foot-printing.
 - 3.6 Acceptance
 - .1 Departmental Representative may inspect and test topsoil in place and determine acceptance of material, depth of topsoil and finish grading.
 - 3.7 Surplus Material
 - .1 Dispose of materials except topsoil not required where directed Departmental Representative.
 - 3.8 Cleaning
 - .1 Upon completion of installation, remove surplus materials, rubbish, tools and equipment barriers.

END OF SECTION

PART 1 - GENERAL

- 1.1 Description .1 This section specifies requirements for supplying, placing, and maintain hydraulic seeding grass planting.
- 1.2 Related Work .1 Section 32 92 19.13- Topsoil Placement and Grading
- 1.3 Submittals .1 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 electronic copy of WHMIS SDS for all controlled products.
.3 Submit in writing:
.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, if requested by Departmental Representative.
.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.
- 1.4 Quality Assurance .1 Pre-Installation Meetings: conduct pre-installation meeting to verify project requirements, installation instructions and warranty requirements.
.2 Scheduling:
.1 Schedule hydraulic seeding to coincide with preparation of soil surface.
- 1.5 Delivery, Storage, And Handling .1 Deliver, store and handle materials in accordance with

manufacturer 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 indoors in dry location, off ground, and in accordance with manufacturer's recommendations in dry, well-ventilated area.
 - .2 Replace defective or damaged materials with new.

- 1.6 Warranty
 - .1 For seeding, 12 months warranty period is extended to 1 full growing season.
 - .2 Contractor hereby warrants that seeding will remain free of defects 1 full growing season.
 - .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".
 - .2 Mixture composition: to approval of Departmental Representative.
 - .2 Mulch: specially manufactured for use in hydraulic seeding equipment, non-toxic, water activated, green coloring, free of germination and growth inhibiting factors with following properties:
 - .1 Type I mulch:
 - .1 Made from wood cellulose fiber.
 - .2 Organic matter content: 95% plus or minus 0.5%.
 - .3 Value of pH: 6.0.
 - .4 Potential water absorption: 900%.
 - .3 Tackifier: water soluble vegetable carbohydrate powder.

- .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.

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 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.
- 3.3 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 Cultivate identified areas to depth of 25 mm prior to seeding operations.
 - .4 Ensure areas to be seeded are moist to depth of 150 mm before seeding.

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- .5 Obtain Departmental Representative's approval of grade and topsoil depth before starting to seed.
 - 3.4 Fertilizing Program .1 Develop and establish fertilization program for initial application, establishment period, and warranty period. Submit program to Departmental Representative for review prior to seeding operation. Contractor responsible for all fertilization up to end of establishment and warranty period.
 - 3.5 Preparation of Slurry .1 Measure quantities of materials by weight or weight-calibrated volume measurement. 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.
 - 3.6 Application of Slurry .1 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.
 - .2 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.
 - .3 Blend application 300 mm into adjacent grass areas or sodded areas to form uniform surfaces.
 - .4 Re-apply where application is not uniform.
 - .5 Remove slurry from items and areas not designated to be sprayed.
 - 3.7 Cleaning .1 Progress Cleaning: clean in accordance with Section 01 74 00- 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 00- Cleaning.
 - .1 Clean and reinstate areas affected by Work.
 - .3 Waste Management: separate waste materials for reuse and recycling.
 - .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.
- 3.8 Protection
 - .1 Protect seeded areas from trespass until plants are established.
 - .2 Remove protection devices as directed by Departmental Representative.
- 3.9 Maintenance During Establishment Period
 - .1 Perform following operations from time of seed application until acceptance by Departmental Representative.
 - .2 Grass Mixture:
 - .1 Repair and reseed dead or bare spots to allow establishment of seed prior to acceptance.
 - .2 Mowing during the establishment period will be completed by the Departmental representative. Unless instructed otherwise by Contractor, grass will be mowed to 50 mm whenever it reaches height of 70 mm and clippings will be removed.
 - .3 Fertilize seeded areas 10 weeks after germination provided plants have mature true leaves in accordance with fertilizing program. Spread half of required amount of fertilizer in one direction and remainder at right angle to first pass; water in well.
 - .4 Water seeded area to maintain optimum soil moisture level for germination and continued growth of grass. Control watering to prevent washouts.
- 3.10 Acceptance
 - .1 Seeded areas will be accepted by the Departmental

Representative provided that:

- .1 Plants are uniformly established.
- .2 Seeded areas are free of rutted, eroded, bare or dead spots.
- .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

3.11 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 Fertilize seeded areas in accordance with fertilizing program. Spread half of required amount of fertilizer in one direction and remainder at right angle to first pass and water in well.

END OF SECTION