

Part 1 General

1.1 REFERENCE STANDARDS

- .1 ASTM C117, Test Method for Material Finer Than 0.075 mm Sieve in Mineral Aggregates by Washing.
- .2 ASTM C131, Test Method for Resistance to Degradation of Small Size Coarse Aggregate by Abrasion and Impact in the Los Angeles Machine.
- .3 ASTM C136, Method for Sieve Analysis of Fine and Coarse Aggregates.
- .4 ASTM D698, Test Methods for Moisture Density Relations of Soils and Soil Aggregate Mixtures Using 2.49 kg Rammer and 304.8 mm Drop.
- .5 CAN/CGSB-8.1, Sieves Testing, Woven Wire.
- .6 CAN/CGSB-8.2, Sieves Testing, Woven Wire, Metric.
- .7 ASTM D1557, Test Methods for Moisture-Density Relations of Soils and Soil-Aggregate Mixtures Using 4.54 kg Rammer and 457 mm Drop.
- .8 ASTM D1883, Test Method for CBR (California Bearing Ratio) of Laboratory Compacted Soils.
- .9 ASTM D4318, Test Method for Liquid Limit, Plastic Limit and Plasticity Index of Soils.
- .10 ASTM D422, Method for Particle-Size Analysis of Soils.
- .11 NS Department of Transportation Standard Specifications, 2017.

Part 2 Products

2.1 SUBBASE COURSE

- .1 Subbase material (75 mm minus) to be either crushed rock, crushed gravel or pit run gravel with characteristics and grading limits consistent with the Department of Transportation Standard Specifications for Highway Construction.
- .2 Gradations to be within limits specified when tested to ASTM C-136 and ASTM C-117. Sieve sizes to CAN/CGSB-8.1.
- .3 Maximum abrasion loss of 30% when tested to MTO LS 618.
- .4 Maximum Freeze Thaw loss of 20% when tested to MTO LS 614.
- .5 Plasticity Index to a maximum of three (3) when tested to D4318-05.

.6 Table:

Sieve Size, mm	% Passing
90	100
75	95 - 100
63	85 - 100
50	73 - 95
37.5	58 - 87
19	35 - 69
9.5	25 - 54
4.75	17 - 43
2.36	12 - 35
1.18	8 - 28
0.3	4 - 16
0.075	0 - 9

Part 3 Execution

3.1 INSPECTION OF EXISTING SUBGRADE SURFACE

.1 Place granular subbase after subgrade is inspected and approved by the Departmental Representative.

3.2 PLACING

.1 Construct granular subbase to depth and grade in areas indicated.

.2 Ensure no frozen material is placed.

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

.4 Place granular subbase materials using methods which do not lead to segregation or degradation.

.5 Place material to full width in uniform layers not exceeding 300 mm compacted thickness.

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

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

3.3 COMPACTION EQUIPMENT

.1 Compaction equipment must be capable of obtaining required densities in materials on project.

3.4 COMPACTING

- .1 Compact to density of not less than 95% maximum dry density in accordance with ASTM D698.
- .2 Granular subbase should be placed and compacted in lifts no greater than 300 mm in thickness.
- .3 Shape and roll alternately to obtain smooth, even and uniformly compacted subbase.
- .4 Apply water as necessary during compaction to obtain specified density.
- .5 In areas not accessible to rolling equipment, compact to specified density with mechanical tampers approved by the Departmental Representative.

3.5 FINISH TOLERANCES

- .1 Finished subbase surface to be within plus or minus 10 mm of established grade and cross section but not uniformly high or low.
- .2 Correct surface irregularities by loosening and adding or removing material until surface is within specified tolerance.

3.6 MAINTENANCE

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

END OF SECTION

Part 1 General

1.1 REFERENCE STANDARDS

- .1 ASTM C117, Test Method for Material Finer Than 0.075 mm Sieve in Mineral Aggregates by Washing.
- .2 ASTM C131, Test Method for Resistance to Degradation of Small Size Coarse Aggregate by Abrasion and Impact in the Los Angeles Machine.
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- .7 ASTM D1557, Test Methods for Moisture-Density Relations of Soils and Soil-Aggregate Mixtures Using 4.54 kg Rammer and 457 mm Drop.
- .8 ASTM D1883, Test Method for CBR (California Bearing Ratio) of Laboratory Compacted Soils.
- .9 NS Department of Transportation Standard Specifications, 2017.

Part 2 Products

2.1 BASE COURSE

- .1 Base course material (31.5 mm minus) to be either crushed rock or crushed gravel with characteristics and grading limits consistent with the NS Department of Transportation Standard Specifications for Highway Construction.
- .2 Gradations to be within limits specified when tested to ASTM C-136 and ASTM C-117. Sieve sizes to CAN/CGSB-8.1.
- .3 Maximum abrasion loss of 30% when tested to MTO LS 618.
- .4 Maximum Freeze Thaw loss of 20% when tested to MTO LS 614.
- .5 Plasticity Index to a maximum of three (3) when tested to D4318-05.

.6 Table:

Sieve Size, mm	% Passing
37.5	100
31.5	95 - 100
25	81 - 100
19	66 - 90
12.5	50 - 77
9.5	41 - 70
4.75	27 - 54
2.36	17 - 43
1.18	11 - 32
0.30	4 - 19
0.075	0 - 8

Part 3 Execution

3.1 CONSTRUCTION METHODS

- .1 Base course material must be approved by the Departmental Representative before it is incorporated into the work.
- .2 Place base material to the lines and grades indicated on the drawings and as specified herein.
- .3 Prior to placing of granular base course, properly shape and compact subbase or subgrade so as to be firm and able to support the construction equipment without displacement. Correct soft or yielding subbase and make suitable before base construction proceeds.
- .4 Spread and compact the granular base in layers having a depth not greater than 150 mm. Compact with a steel-drummed or wobble-wheel machine to 95% of modified maximum density (ASTM D1557).
- .5 Shape the surface following compaction to the required line, grade and cross Section. Make surface smooth, dense and free from ridges or loose material conforming to the finished surface cross section as detailed on the drawings.
- .6 Base construction on wet, muddy, or rutted subbase or subgrade is not permitted.
- .7 Loaded gravel trailers are not permitted to travel directly on the subbase layer at any time before or after compaction.
- .8 Shape each layer to smooth contour and compact to specified density before succeeding layer is placed.
- .9 Remove and replace that portion of layer in which material becomes segregated during spreading.

3.2 FINISH TOLERANCES

- .1 Finished subbase surface to be within plus or minus 10 mm of established grade and cross section but not uniformly high or low.
- .2 Correct surface irregularities by loosening and adding or removing material until surface is within specified tolerance.

END OF SECTION

- Part 1 General
- 1.1 RELATED SECTIONS
 - .1 Section 32 92 23 – Sodding
- 1.2 REFERENCE STANDARDS
 - .1 Agriculture and Agri-Food Canada
 - .1 The Canadian System of Soil Classification, Third Edition, 1998.
 - .2 Canadian Council of Ministers of the Environment
 - .1 PN1340-2005, Guidelines for Compost Quality.
 - .3 Canadian Green Building Council (CaGBC)
 - .1 LEED Canada-NC Version 1.0-December 2004, LEED (Leadership in Energy and Environmental Design): Green Building Rating System For New Construction and Major Renovations.
 - .4 U.S. Environmental Protection Agency (EPA)/Office of Water
 - .1 EPA 832R92005, Storm Water Management for Construction Activities: Developing Pollution Prevention Plans and Best Management Practices.
- 1.3 DEFINITIONS
 - .1 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) (50)), and contain no toxic or growth inhibiting contaminants.
 - .4 Composed bio-solids to: CCME Guidelines for Compost Quality, Category (A) (B).
- 1.4 ACTION AND INFORMATIONAL SUBMITTALS
 - .1 Provide submittals in accordance with Section 01 33 00 – Submittal Procedures.
 - .2 LEED Submittals:
 - .1 Submit erosion and sedimentation control plan for Credit SSp1 in accordance with LEED Canada-NC.

- .3 Quality control submittals:
 - .1 Soil testing: submit certified test reports showing compliance with specified performance characteristics and physical properties as described in PART 2 - SOURCE QUALITY CONTROL.
 - .2 Certificates: submit product certificates signed by manufacturer certifying materials comply with specified performance characteristics and criteria and physical requirements.
- 1.5 QUALITY ASSURANCE
 - .1 Pre-installation meetings: conduct pre-installation meeting to verify project requirements, installation instructions and warranty requirements in accordance with Division 01 – General Requirements.
- 1.6 WASTE MANAGEMENT AND DISPOSAL
 - .1 Separate waste materials for reuse and recycling in accordance with Division 01 – General Requirements.
 - .2 Divert unused soil amendments from landfill to official hazardous material collections site approved by 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: to be used on all areas to meet following criteria:
 - .1 50% sand maximum and 3 to 10% organic content.
 - .2 Fertility: major soil nutrients present in following ratios:
 - .1 Nitrogen (N): 20 to 40 micrograms of available N per gram of topsoil.
 - .2 Natural Phosphorus (P): 10 to 20 micrograms of phosphate per gram of topsoil.
 - .3 Potassium (K): 80 to 120 micrograms of potash per gram of topsoil.
 - .4 Calcium, magnesium, sulfur and micro-nutrients present in balanced ratios to support germination and/or establishment of intended vegetation.
 - .3 Ph value: 6.0 – 7.5.
 - .4 Contain no toxic elements or growth inhibiting materials.
 - .5 Free from:
 - .1 Debris and stones over 10 mm diameter.
 - .2 Coarse vegetative material, 10 mm diameter and 100 mm length, occupying more than 2% of soil volume.
 - .6 Consistence: friable when moist.

- .7 Double screen salvaged topsoil to remove all stones over 10 mm diameter.

2.2 SOIL AMENDMENTS

.1 Fertilizer:

- .1 Fertility: major soil nutrients present in following amounts:

- .1 Nitrogen (N): 20 to 40 micrograms of available N per gram of topsoil.
- .2 Natural Phosphate products (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, sulfur and micro-nutrients present in balanced ratios to support germination and/or establishment of intended vegetation.
- .5 Ph value: 5.5 to 7.5.

.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 coarse textured.

.4 Organic matter: compost Category A, B 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.

.6 Fertilizer: industry accepted "phosphate free" standard medium containing nitrogen, phosphorous, potassium and other micro-nutrients suitable to specific plant species or application or defined by soil test.

Part 3 Execution

3.1 TEMPORARY EROSION AND SEDIMENTATION CONTROL

- .1 Provide temporary erosion and sedimentation control measures to prevent soil erosion and discharge of soil-bearing water runoff or airborne dust to adjacent properties and walkways, according to requirements of authorities having jurisdiction sediment and erosion control drawings sediment and erosion control plan, specific to site, that complies with EPA 832/R-92-005 or requirements of authorities having jurisdiction, whichever is more stringent.

- .2 Inspect, repair, and maintain erosion and sedimentation control measures during construction until permanent vegetation has been established.
- .3 Remove erosion and sedimentation controls and restore and stabilize areas disturbed during removal.

3.2 STRIPPING OF TOPSOIL

- .1 Begin topsoil stripping of areas as indicated after area has been cleared of brush weeds and grasses and removed from site.
- .2 Strip topsoil to depths as directed by Departmental Representative.
 - .1 Avoid mixing topsoil with subsoil where textural quality will be moved outside acceptable range of intended application.
- .3 Stockpile in locations as indicated.
 - .1 Stockpile height not to exceed 2-3 m.
- .4 Disposal of unused topsoil is to be in an environmentally responsible manner but not used as landfill as directed by Departmental Representative.
- .5 Protect stockpiles from contamination and compaction.

3.3 PREPARATION OF EXISTING GRADE

- .1 Verify that grades are correct.
 - .1 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 25 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/PLANTING SOIL
 - .1 Place topsoil after Departmental Representative has accepted subgrade.
 - .2 Spread topsoil in uniform layers not exceeding 150 mm.
 - .3 For sodded areas keep topsoil 15 mm below finished grade.
 - .4 Spread topsoil as indicated to following minimum depths after settlement.
 - .1 150 mm for sodded areas.
 - .5 Manually spread topsoil/planting soil around trees, shrubs and obstacles.
- 3.5 SOIL AMENDMENTS
 - .1 Apply soil amendments with rules as specified and as determined by soil sample test.
- 3.6 FINISH GRADING
 - .1 Grade to eliminate rough spots and low areas and ensure positive drainage.
 - .1 Prepare loose friable bed by means of cultivation and subsequent raking.
 - .2 Consolidate topsoil to required bulk density using equipment approved by Departmental Representative.
 - .1 Leave surfaces smooth, uniform and firm against deep footprinting.
- 3.7 ACCEPTANCE
 - .1 Departmental Representative will inspect and test topsoil in place and determine acceptance of material, depth of topsoil and finish grading.
- 3.8 SURPLUS MATERIAL
 - .1 Dispose of materials except topsoil not required where directed by Departmental Representative.

END OF SECTION

Part 1 General

1.1 RELATED SECTIONS

- .1 Section 01 33 00 – Submittal Procedures.
- .2 Section 32 91 19.13 – Topsoil Placement and Grading.
- .3 Samples.
 - .1 Submit samples in accordance with Division 01 – General Requirements.
 - .2 Submit:
 - .1 Sod for each type specified.
 - .1 Install approved samples in one square metre mock-ups and maintain in accordance with maintenance requirements during establishment period.
 - .3 Obtain approval of samples by Departmental Representative.

1.2 QUALITY ASSURANCE

- .1 Test Reports: certified test reports showing compliance with specified performance characteristics and physical properties.
- .2 Certificates: product certificates signed by manufacturer certifying materials comply with specified performance characteristics and criteria and physical requirements.
- .3 Pre-Installation Meetings: conduct pre-installation meeting to verify project requirements, installation instructions and warranty requirements.

1.3 SCHEDULING

- .1 Schedule sod laying to coincide with preparation of soil surface.
- .2 Schedule sod installation when frost is not present in ground.
- .3 No phosphates to be used in fertilizers.

1.4 WASTE MANAGEMENT AND DISPOSAL

- .1 Separate and recycle waste materials in accordance with Division 01 – General Requirements.
- .2 Divert unused fertilizer from landfill to official hazardous material collections site approved by Departmental Representative.
- .3 Do not dispose of unused fertilizer into sewer systems, into lakes, streams, onto ground or in locations where it will pose health or environmental hazard.

Part 2 Products

2.1 MATERIALS

- .1 Number One Turf Grass Nursery Sod: sod that has been especially sown and cultivated in nursery fields as turf grass crop.
 - .1 Turf Grass Nursery Sod types:
 - .1 Number One Kentucky Bluegrass Sod - Fescue Sod: Nursery Sod grown solely from seed mixture of cultivars of Kentucky Bluegrass and Chewing Fescue or Creeping Red Fescue, containing not less than 40% Kentucky Bluegrass cultivars and 30% Chewing Fescue or Creeping Red Fescue cultivars.
 - .2 Number One Named Cultivars: Nursery Sod grown from certified seed.
 - .3 Mow sod at height directed by Departmental Representative within 36 hours prior to lifting, and remove clippings
 - .2 Water:
 - .1 Supplied by Contractors at designated source.
 - .3 Fertilizer:
 - .1 To Canada "Fertilizers Act" and "Fertilizers Regulations".
 - .2 Complete, synthetic, slow release with 65 % of nitrogen content in water-insoluble form.

2.2 SOURCE QUALITY CONTROL

- .1 Obtain approval from Departmental Representative of sod at source.
- .2 When proposed source of sod is approved, use no other source without written authorization from Departmental Representative.

Part 3 Execution

3.1 PREPARATION

- .1 Verify that grades are correct and prepared in accordance with Section 32 91 19.13 – Topsoil Placement and Grading. If discrepancies occur, notify Departmental Representative and do not commence work until instructed by Departmental Representative.
- .2 Do not perform work under adverse field conditions such as frozen soil, excessively wet soil or soil covered with snow, ice, or standing water.
- .3 Fine grade surface free of humps and hollows to smooth, even grade, to contours and elevations indicated, to tolerance of plus or minus 8 mm for Turf Grass Nursery, surface to drain naturally.
- .4 Remove and dispose of weeds; debris; stones 25 mm in diameter and larger; soil contaminated by oil, gasoline and other deleterious materials; off site.

3.2 SOD PLACEMENT

- .1 Lay sod within 24 hours of being lifted if air temperature exceeds 20 degrees C.
- .2 Lay sod sections in rows, joints staggered. Butt sections closely without overlapping or leaving gaps between sections. Cut out irregular or thin sections with sharp implements.
- .3 Roll sod as directed by Departmental Representative. Provide close contact between sod and soil by light rolling. Use of heavy roller to correct irregularities in grade is not permitted.

3.3 FERTILIZING PROGRAM

- .1 Fertilizer:
 - .1 Complete commercial synthetic fertilizer with minimum 65% insoluble nitrogen – No phosphate fertilizers to be used.
 - .2 Formulation ratio: 1:4:4
 - .3 Bonemeal: finely ground with minimum analysis of 20% phosphoric acid. Ratio for 1 year maintenance applications:
 - .4

Date	Rate	Ratio
June 2021	N @ 60 kg/ha	3:1:3

Date is adjustable depending upon construction schedule. These dates should be met when work has been completed.

3.4 MAINTENANCE DURING ESTABLISHMENT PERIOD

- .1 Perform following operations from time of installation until acceptance.
- .2 Water sodded areas in sufficient quantities and at frequency required to maintain optimum soil moisture condition to depth of 75 to 100 mm.
- .3 Cut grass (sodded area only) to 70 mm when or prior to it reaching height of 90 mm. Remove clippings which will smother grassed areas as directed by Departmental Representative.
- .4 Maintain sodded areas 95% weed free.
- .5 Fertilize 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.

3.5 ACCEPTANCE

- .1 Turf Grass Nursery Sod areas will be accepted by Departmental Representative provided that:
 - .1 Sodded areas are properly established.
 - .2 Sod is free of bare and dead spots.

- .3 No surface soil is visible from height of 1500 mm when grass has been cut to height of 60 mm.
- .4 Sodded areas have been cut minimum 2 times prior to acceptance.
- .2 Areas sodded late fall will be accepted in the following June (2021) after start of growing season and fertilizer application provided acceptance conditions are fulfilled.

3.6 MAINTENANCE DURING WARRANTY PERIOD

- .1 Perform following operations from time of installation until acceptance.
- .2 Water sodded areas in sufficient quantities and at frequency required to maintain optimum soil moisture condition to depth of 75 to 100 mm.
- .3 Cut grass to 70 mm when or prior to it reaching height of 90 mm. Remove clippings which will smother grassed areas as directed by Departmental Representative. Ditches to be given only maintenance mowing – future mowing to be done on an annual basis.
- .4 Maintain sodded areas weed free 95%.
- .5 Fertilize 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