

GRANULAR SUB-BASE**PART 1 GENERAL****1.1 REFERENCES**

- .1 American Society for Testing and Materials (ASTM).
 - .1 ASTM D698-12. Standard Test Methods for Laboratory Compaction Characteristics of Soil Using Standard Effort (12 400 ft-lbf/ft³ (600 kN-m/m³))
- .2 Ontario Provincial Standard Specifications (OPSS)
 - .1 OPS.PROV 1010 April 2013. Material Specification for Aggregates - Base. Subbase, Select Subgrade and Backfill Material.

1.2 WASTE MANAGEMENT AND DISPOSAL

- .1 Divert unused granular material from landfill to local facility as approved by Departmental Representative.

PART 2 PRODUCTS**2.1 MATERIALS**

- .1 Granular sub-base material: in accordance with the following requirements:
 - .1 Crushed stone, Granular B in accordance with OPSS 1010.

PART 3 EXECUTION**3.1 PLACING**

- .1 Place granular sub-base after subgrade is inspected and approved by Department 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 Place granular sub-base materials using methods which do not lead to segregation or degradation.
- .6 Place material to full width in uniform layers not exceeding 150 mm compacted thickness.
- .7 Shape each layer to smooth contour and compact to specified density before succeeding layer is placed.

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

3.2 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 Department 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 100% SPMDD in accordance with ASTM D698.
- .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 Department Representative. Heavy machinery is not permitted within 2m of new and existing foundation walls.
- .8 Correct surface irregularities by loosening and adding or removing material until surface is within specified tolerance.

3.3 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.
- .2 Obtain approval from Departmental Representative to use non standard proof rolling equipment.
- .3 Proof roll at level in granular base as indicated. If use of non standard proof rolling equipment is approved, Departmental representative to determine level of proof rolling.

3.4 SITE TOLERANCES

- .1 Finished sub-base surface to be within 5 mm of elevation as indicated but not uniformly high or low.

3.5 PROTECTION

- .1 Maintain finished sub-base in condition conforming to this section until

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succeeding base is constructed, or until granular sub-base is accepted by Department Representative.

END OF SECTION

AGGREGATE BASE COURSES**PART 1 GENERAL****1.1 RELATED SECTIONS**

- .1 Section 32 11 19 - Granular Sub-base.

1.2 REFERENCES

- .1 American Society for Testing and Materials (ASTM)
 - .1 ASTM D1557-12. Standard Test Methods for Laboratory Compaction Characteristics of Soil Using Modified Effort (56,000 ft-lbf/ft³ (2,700 kN-m/m³)).
- .2 Ontario Provincial Standard Specifications (OPSS)
 - .1 OPS.PROV 1010 April 2013. Material Specification for Aggregates - Base. Subbase, Select Subgrade and Backfill Material.

1.3 DELIVERY, STORAGE, AND HANDLING

- .1 Deliver and stockpile aggregates in accordance with the following:
 - .1 Stockpile aggregates on site in locations as indicated unless approved otherwise by Department Representative. Do not stockpile on completed pavement surfaces.
 - .2 Stockpile aggregates in sufficient quantities to meet Project schedules.
 - .3 Stockpiling sites to be level, well drained, and of adequate bearing capacity and stability to support stockpiled materials and handling equipment.
 - .4 Except where stockpiled on acceptably stabilized areas, provide compacted sand base not less than 300mm in depth to prevent contamination of aggregate. Stockpile aggregates on ground but do not incorporate bottom 300mm of pile into Work.
 - .5 Separate different aggregates by strong, full depth bulkheads, or stockpile far enough apart to prevent intermixing.
 - .6 Do not use intermixed or contaminated materials. Remove and dispose of rejected materials as approved by Department Representative within 48 hrs of rejection.
 - .7 Stockpile materials in uniform layers of thickness as follows:
 - .1 Max 1.5m for coarse aggregate and base course materials.
 - .2 Max 1.5m for fine aggregate and sub-base materials.
 - .3 Max 1.5m for other materials.
 - .8 Uniformly spot-dump aggregates delivered to stockpile in trucks and build up stockpile as specified.
 - .9 Do not cone piles or spill material over edges of piles.
 - .10 Do not use conveying stackers.
 - .11 During winter operations, prevent ice and snow from becoming mixed into stockpile or in material being removed from stockpile.
- .2 Stockpile minimum 50% of total aggregate required prior to beginning operation.
- .3 Store cement in weathertight bins or silos that provide protection from dampness and easy access for inspection and identification of each shipment.

AGGREGATE BASE COURSES**1.4 WASTE MANAGEMENT AND DISPOSAL**

- .1 Separate and recycle waste materials in accordance with Section 01 74 21 - Construction/Demolition Waste Management and Disposal.
- .2 Divert unused granular material from landfill to local facility as approved by Department Representative.

PART 2 PRODUCTS**2.1 MATERIALS**

- .1 Granular base: material in accordance with the following requirements:
 - .1 Crushed stone, Granular A in accordance with OPSS 1010.

PART 3 EXECUTION**3.1 SEQUENCE OF OPERATION**

- .1 Place granular base after sub-base surface is inspected and approved by Department Representative.
- .2 Placing:
 - .1 Construct granular base 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 and ice.
 - .4 Place material to full width in uniform layers not exceeding compacted thickness noted. Department Representative may authorize thicker lifts (layers) if specified compaction can be achieved.
 - .5 Shape each layer to smooth contour and compact to specified density before succeeding layer is placed.
 - .6 Remove and replace that portion of layer in which material becomes segregated during spreading.
- .3 Compaction Equipment
 - .1 Compaction equipment to be capable of obtaining required material densities.
 - .2 Equipped with device that records hours of actual work, not motor running hours.
- .4 Compacting
 - .1 Compact to density not less than 100% SPMD in accordance with ASTM D1557.
 - .2 Shape and roll alternately to obtain smooth, even and uniformly compacted base.
 - .3 Apply water as necessary during compacting to obtain specified density.
 - .4 In areas not accessible to rolling equipment, compact to specified density with mechanical tampers approved by Department Representative. Heavy machinery is not permitted within 2m of new and existing foundation walls.
 - .5 Correct surface irregularities by loosening and adding or removing material

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until surface is within specified tolerance.

- .5 Proof rolling
 - .1 Proof rolling to be performed prior to placing the granular base course in sidewalk and interlock paving areas where granular sub-base is not required.
 - .2 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.
 - .3 Obtain approval from Departmental Representative to use non standard proof rolling equipment.
 - .4 Proof roll at level in granular base as indicated. If use of non standard proof rolling equipment is approved, Departmental representative to determine level of proof rolling.
 - .5 Make sufficient passes with proof roller to subject every point on surface to three separate passes of loaded tire.
 - .6 Where proof rolling reveals areas of defective subgrade:
 - .1 Remove base, sub-base and subgrade material to depth and extent as approved by Departmental Representative.
 - .2 Backfill excavated subgrade with sub-base material and compact in accordance with Section 32 11 19 - Granular Sub-Base.
 - .3 Replace sub-base material and compact in accordance with Section 32 11 19 - Granular Sub-base.
 - .4 Replace base material and compact in accordance with this Section.
 - .7 Where proof rolling reveals defective base or sub-base, remove defective materials to depth and extent as approved by Departmental Representative and replace with new materials in accordance with Section 32 11 19 - Granular Sub-base and this section at no extra cost.

3.2 SITE TOLERANCES

- .1 Compacted base course to be full depth of excavated area. Allow for sub-base and finished grade material.
- .2 Finished base surface to be within plus or minus 5 mm of established grade and cross section but not uniformly high or low.

3.3 PROTECTION

- .1 Maintain finished base in condition conforming to this Section until succeeding material is applied or until acceptance by Department Representative.

END OF SECTION

Part 1 General**1.1 RELATED SECTIONS**

- .1 Section 31 23 33.01 - Excavating, Trenching and Backfilling
- .2 Section 32 11 23 - Aggregate Base Courses.

1.2 REFERENCES

- .1 It is the Contractors responsibility to obtain the required standard specification documents.
- .2 American Society for Testing and Materials (ASTM).
 - .1 ASTM D698-12. Standard Test Methods for Laboratory Compaction Characteristics of Soil Using Standard Effort (12 400 ft-lbf/ft³ (600 kN-m/m³)).
 - .2 ASTM D1559-89. Test Method for Resistance of Plastic Flow of Bituminous Mixtures Using Marshall Apparatus.
- .3 Canadian General Standards Board (CGSB)
 - .1 CAN/CGSB-1.74-2001. Alkyd Traffic Paint.
- .4 Ontario Provincial Standard Specifications (OPSS).
 - .1 OPSS 310-November 2010. Construction Specification for Hot Mix Asphalt.
 - .2 OPSS 314-November 2004. Construction Specification For Untreated Granular, Subbase, Base, Surface Shoulder, And Stockpiling.
 - .3 OPSS 1150-November 2010. Material Specification for Hot Mix Asphalt.

1.3 PROTECTION

- .1 Keep vehicular traffic off newly paved areas until paving surface temperature has cooled below 38 degrees C. Do not permit stationary loads on pavement until 24 h after placement.
- .2 Where applicable provide access to buildings as required. Arrange paving schedule so as not to interfere with normal use of premises.

1.4 WASTE MANAGEMENT AND DISPOSAL

- .1 Separate and recycle waste materials.
- .2 Remove from site and dispose of all packaging materials at appropriate recycling facilities.
- .3 Place materials defined as hazardous or toxic in designated containers.
- .4 Divert unused aggregate materials from landfill to facility for reuse as approved by

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Departmental Representative.

- .5 Dispose of unused paint and paint thinner materials at official hazardous material collections site as approved by Departmental Representative.
- .6 Fold up metal banding, flatten and place in designated area for recycling.
- .7 Do not dispose of unused paint and paint thinner material into sewer system, into streams, lakes, onto ground or in other location where it will pose health environmental hazard.
- .8 Divert unused asphalt from landfill to facility capable of recycling materials.

Part 2 Products**2.1 MATERIALS**

- .1 All materials and dimensions shall be as described in OPSS 310 and 1150, and associated specifications.
- .3 Asphaltic concrete: approved plant hot-mixes, hot laid to Ontario Provincial Standard Specification OPSS 1150.
- .4 Traffic Paint: yellow traffic paint to CAN/CGSB-1.74.

Part 3 Execution**3.1 GENERAL**

- .1 Construction of asphalt pavement shall be as described in OPSS 310 and 1150.

3.2 PLANT AND MIXING REQUIREMENTS

- .1 To Ontario Provincial Standard Specification OPSS 310 and 1150.

3.3 EQUIPMENT

- .1 Pavers: mechanical self-powered pavers capable of spreading mix within specified tolerances, true to line, grade and crown indicated.
- .2 Rollers, general: sufficient number of rollers of type and weight to obtain specified density of compacted mix.
- .3 Vibratory rollers:
 - .1 Minimum drum diameter: 1500 mm.
 - .2 Maximum amplitude of vibration (machine setting): 0.5 mm for lifts less than 40 mm thick.
- .4 Haul trucks: of adequate size, speed and condition to ensure orderly and continuous operation.

- .5 Suitable hand tools.

3.4 FOUNDATIONS

- .1 Asphalt Foundations:
 - .1 450 mm compacted thickness of granular subbase B Type II.
 - .2 150 mm compacted thickness of granular base A.
- .2 Construction of granular foundations: OPSS 314.
- .3 Compaction: compact each lift of granular material to 100% maximum density to ASTM D698. Maximum lift thickness: 150 mm.

3.5 PAVEMENT THICKNESS

- .1 Pavements for parking lots:
 - .1 Wear course: 50mm HL3.
 - .2 Base course: 50mm HL3.

3.6 ASPHALT CONCRETE PAVING

- .1 Obtain approval of base from Departmental Representative before placing asphalt mix for asphalt walks and surfaces.
- .2 Adjust catch basins, manholes and other iron work encountered in accordance with Ontario Provincial Standards, to match finish grades.
- .3 Place asphalt mix only when base or previous course is dry and air temperature is above 5 degrees Celsius.
- .4 Place asphalt concrete in compacted layers not exceeding 50 mm.
- .5 Minimum 120 degrees Celsius mix temperature required when spreading.
- .6 Maximum 160 degrees Celsius mix temperature permitted at any time.
- .7 Compact each course with roller as soon as it can support roller weight without undue cracking or displacement.
- .8 Roll until roller marks are eliminated. Compact to density not less than 95% of density obtained with Marshall specimens prepared in accordance with ASTM D1559 from samples of mix being used.
- .9 Keep roller speed slow enough to avoid mix displacement and do not stop roller on fresh pavement.
- .10 Moisten roller wheels with water to prevent mix adhesion.

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- .11 Compact mix with hot tampers or other equipment approved by Departmental Representative, in areas inaccessible to roller.
- .12 Tamp all edges as per drawings.
- .13 Finish surface smooth, true to grade to within 10 mm and with no irregularities greater than 10 mm in 4.5 m.
- .14 Paint traffic markings as indicated on the site plan.

3.7 JOINTS

- .1 Cut bituminous course to full depth in neat lines to provide full cross section against which new paving may be laid. Remove loose material.
- .2 Paint exposed vertical edge of asphaltic joints, edges of manholes and catch basin frames, curbs and similar items with hot asphalt cement or liquid cut back asphalt prior to placing of fresh mix.
- .3 Overlap previously laid strip with spreader by 150 mm.
- .4 Carefully place and compact hot asphaltic material against joints.

3.8 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.

3.9 TRAFFIC MARKINGS

- .1 Paint parking space divisions and other pavement markings in accordance with Manufacturer's recommendations and as indicated.
- .2 Use paint thinner in accordance with manufacturer's requirements.

END OF SECTION

CONCRETE WALKS, CURBS AND GUTTERS**PART 1 GENERAL****1.1 REFERENCES**

- .1 American Society for Testing and Materials International (ASTM).
 - .1 ASTM D698-12. Standard Test Methods for Laboratory Compaction Characteristics of Soil Using Standard Effort (12 400 ft-lbf/ft³ (600 kN-m/m³)).
- .2 Canadian Standards Association (CSA International).
 - .1 CSA-A23.1-09/A23.2-09. Concrete Materials and Methods of Concrete Construction/Test Methods and Standard Practices for Concrete.
- .3 Ontario Provincial Standard Specifications (OPSS).
 - .1 OPSS 314-November 2004. Construction Specification For Untreated Granular, Subbase, Base, Surface Shoulder, And Stockpiling.

1.3 SUBMITTALS

- .1 Submittals in accordance with Section 01 33 00 - Submittal Procedures
- .2 Inform Departmental Representative of proposed source of materials and provide access for sampling at least 4 weeks prior to commencing work.

1.4 DELIVERY STORAGE AND HANDLING

- .1 Waste Management and Disposal: Separate waste materials for reuse and recycling in accordance with Section 01 74 21 - 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 and Curing Compound: in accordance with Section 03 30 00 - Cast-in-Place Concrete.
- .4 Granular material: in accordance with Section 32 11 19 - Granular Sub-base and Section 32 11 23 - Aggregate Base Courses.
- .5 Non-staining mineral type form release agent: chemically active release agents containing compounds that react with free lime to provide water-soluble soap.

PART 3 EXECUTION**3.1 GRADE PREPARATION**

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

3.2 GRANULAR BASE

- .1 Obtain Departmental Representative's approval of fill placement before placing granular base.

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 2mm deep, by drawing broom in direction normal to centre line.
- .4 Provide edging with 10 mm radius edging tool.

3.4 TOLERANCES

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

3.5 ISOLATION JOINTS

- .1 Install joint filler in isolation joints in accordance with Section 03 30 00 - Cast-in-Place Concrete.

3.6 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 approved by Departmental Representative.
- .2 Where burlap is used for moist curing, place two pre-wetted 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.

3.7 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.

3.8 FOUNDATIONS

- .1 Sidewalk Foundations:
 - .1 300 mm compacted thickness of granular subbase B Type II.
 - .2 150 mm compacted thickness of granular base A .
 - .3 Construction of granular foundations: OPSS 314.
 - .4 Compaction: compact each lift of granular material to 100% maximum density to ASTM D698. Maximum lift thickness: 150 mm.

END OF SECTION

PART 1 GENERAL**1.1 RELATED SECTIONS**

- .1 Section 32 93 10 – Trees, Shrubs and Groundcover Planting.

1.2 DEFINITIONS

- .1 **COMPOST:** A mixture of soil and decomposing organic matter used as a fertilizer, mulch, or soil conditioner. Compost is processed organic matter containing 40% or more organic matter as determined by the Walkley-Black or LOI test. 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. Composed bio-solids must meet the requirements of the Guidelines for Compost Quality, Category (A) (B) produced by the Canadian Council of the Ministers of the Environment (CCME), 2005.

1.3 QUALITY ASSURANCE

- .1 **Test Reports:** certified test reports showing compliance with specified performance characteristics and physical properties.
- .2 **Pre-Installation Meetings:** conduct pre-installation meeting to verify project requirements, installation instructions and warranty requirements. Comply with Section 01 71 00 – Examination and Preparation.

1.4 WASTE MANAGEMENT AND DISPOSAL

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

TOPSOIL PLACEMENT AND GRADING

- .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:
 - .1 Fertility: major soil nutrients present in following amounts:
 - .2 Nitrogen (N): 20 to 40 micrograms of available N per gram of topsoil.
 - .3 Phosphorus (P): 40 to 50 micrograms of phosphate per gram of topsoil.
 - .4 Potassium (K): 75 to 110 micrograms of potassium per gram of topsoil.
 - .5 Calcium, magnesium, sulfur and micro-nutrients present in balanced ratios to support germination and/or establishment of intended vegetation.
 - .6 Ph value: 6.5 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: 5mm.
- .3 Sand: washed coarse silica sand, medium to course textured.
- .4 Organic matter: compost Category A, unprocessed organic matter, such as rotted manure, hay, straw, bark residue or sawdust, meeting the organic matter, stability and contaminant requirements.
- .5 Use composts meeting Category B requirements for land fill reclamation and large scale industrial applications.
- .6 Limestone Stone dust:
 - .1 Ground agricultural limestone.
 - .2 Gradation requirements: percentage passing by weight, 90% passing 1.0 mm sieve, 50% passing 0.125 mm sieve.
- .7 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.

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

TOPSOIL PLACEMENT AND GRADING

Departmental Representative. Soil sampling, testing and analysis to be in accordance with Provincial standards. Departmental Representative will pay for cost of tests.

PART 3 EXECUTION**3.1 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 25mm diameter and other deleterious materials. Remove soil contaminated with calcium chloride, toxic materials and petroleum products. Remove debris which protrudes more than 25 mm above surface. Dispose of removed material off site.
- .4 Cultivate entire area which is to receive topsoil to minimum depth of 100mm. Cross cultivate those areas where equipment used for hauling and spreading has compacted soil.

3.2 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 15mm below finished grade.
- .4 Spread topsoil to following minimum depths after settlement.
 - .1 150mm for sodded areas.
 - .2 600mm for shrub plantings
 - .3 800mm for tree plantings
 - .4 300mm for perennial and ground cover planting beds
- .5 Manually spread topsoil/planting soil around trees, shrubs and obstacles.

3.3 FINISH GRADING

- .1 Grade to eliminate rough spots and low areas and ensure positive drainage. Prepare loose friable bed by means of cultivation and subsequent raking.
- .2 Consolidate topsoil to required bulk density using equipment approved by Departmental Representative. Leave surfaces smooth, uniform and firm against deep footprinting.

3.4 ACCEPTANCE

TOPSOIL PLACEMENT AND GRADING

- .1 Departmental Representative will inspect and test topsoil in place and determine acceptance of material, depth of topsoil and finish grading.

3.5 SURPLUS MATERIAL

- .1 Dispose of materials except topsoil not required where directed by Departmental Representative off site.

3.6 CLEANING

- .1 Upon completion of installation, remove surplus materials, rubbish, tools and equipment barriers.

END OF SECTION

PART 1 GENERAL**1.1 RELATED SECTIONS**

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

1.2 REFERENCES

- .1 Agriculture and Agri-Food Canada (AAFC).
 - .1 Plant Hardiness Zones in Canada-2013.
- .2 Canadian Nursery Landscape Association (CNLA).
 - .1 Canadian Standards for Nursery Stock 8th edition 2006.
- .3 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 SUBMITTALS

- .1 Make submittals in accordance with Section 01 33 00 - Submittal Procedures.
- .2 Submit product data for:
 - .1 Fertilizer.
 - .2 Mycorrhiza.
 - .3 Anti-desiccant.
 - .4 Guying assembly including clamps, collar, guying wire, anchors and wire tightener.
 - .5 Mulch.
- .3 Submit WHMIS MSDS for review.
- .4 Submit samples for:
 - .1 Mulch.
 - .2 Mycorrhiza.

1.5 QUALITY ASSURANCE

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

1.6 STORAGE AND PROTECTION

- .1 Protect plant material from frost, excessive heat, wind and sun during delivery.

TREES, SHRUBS, AND GROUNDCOVER PLANTING

- .2 Immediately store and protect plant material which will not be installed within 1 hour after arrival at site in storage location approved by Departmental Representative.
- .3 Protect plant material from damage during transportation:
 - .1 When delivery distance is less than 30 km and vehicle travels at speeds under 80 km/h, tie tarpaulins around plants or over vehicle box.
 - .2 When delivery distance exceeds 30 km or vehicle travels at speeds over 80 km/h, use enclosed vehicle where practical.
 - .3 Protect foliage and root balls using anti-desiccants and tarpaulins, where use of enclosed vehicle is impractical due to size and weight of plant material.
- .4 Protect stored plant material from frost, wind and sun and as follows:
 - .1 For bare root plant material, preserve moisture around roots by heeling-in or burying roots in sand or topsoil, or mulch and watering to full depth of root zone.
 - .2 For pots and containers, maintain moisture level in containers. Heel-in fibre pots.
 - .3 For balled and burlapped and wire basket root balls, place to protect branches from damage. Maintain moisture level in root zones.
- .5 Safely store and manage hazardous materials.
- .6 Waste Management and Disposal:
 - .1 Separate waste materials for reuse and recycling in accordance with Section 01 74 21 - Construction/Demolition Waste Management and Disposal.
 - .2 Remove from site and dispose of packaging materials at appropriate recycling facilities.
 - .3 Collect and separate for disposal paper plastic polystyrene corrugated cardboard packaging material in appropriate on-site bins for recycling in accordance with Waste Management Plan (WMP).
 - .4 Separate for reuse and recycling and place in designated containers Steel Metal Plastic waste in accordance with WMP.
 - .5 Place materials defined as hazardous or toxic in designated containers.
 - .6 Handle and dispose of hazardous materials in accordance with Regional and Municipal regulations.
 - .7 Divert unused metal materials from landfill to metal recycling facility as approved by Departmental Representative.
 - .8 Fold up metal and plastic banding, flatten and place in designated area for recycling.
 - .9 Divert discarded plastic plant containers materials from landfill to plastic recycling facility approved by Departmental Representative.
 - .10 Dispose of unused fertilizer at official hazardous material collection site approved by Departmental Representative.
 - .11 Dispose of unused anti-desiccant at official hazardous material collections site approved by Departmental Representative.
 - .12 Divert unused wood and mulch materials from landfill to recycling composting facility approved by Departmental Representative.

1.7**SCHEDULING**

TREES, SHRUBS, AND GROUNDCOVER PLANTING

- .1 Obtain approval from Departmental Representative of schedule 7 days in advance of shipment of plant material.
- .2 Schedule to include:
 - .1 Quantity and type of plant material.
 - .2 Shipping dates.
 - .3 Arrival dates on site.
 - .4 Planting Dates.

1.8 WARRANTY

- .1 End-of-warranty inspection will be conducted by Departmental Representative, one year from interim completion date.

PART 2 PRODUCTS**2.1 PLANT MATERIAL**

- .1 Type of root preparation, sizing, grading and quality: comply to Canadian Standards for Nursery Stock.
 - .1 Source of plant material: grown in Zone 5 in accordance with Plant Hardiness Zones in Canada.
 - .2 Plant material must be planted in zone indicated as appropriate for its species.
 - .3 Plant material in location appropriate for its species.
- .2 Plant material: free of disease, insects, defects or injuries and structurally sound with strong fibrous root system.
- .3 Trees: with straight trunks, well and characteristically branched for species except where specified otherwise.
- .4 Trees larger than 200mm in caliper: half root pruned during each of two successive growing seasons, the latter at least one growing season prior to arrival on site.
- .5 Bare root stock: nursery grown, in dormant stage, not balled and burlapped or container grown.
- .6 Collected stock: maximum 40 mm in caliper, with well developed crowns and characteristically branched; no more than 40% of overall height may be free of branches.

2.3 WATER

- .1 Free of impurities that would inhibit plant growth.

2.4 STAKES

- .1 T-bar, steel, 40 x 40 x 5 x 2440 mm.

2.5 WIRE TIGHTENER

- .1 Type 1: galvanized steel, stamped plate type, rod, triangular shape.
- .2 Type 2: turnbuckle, galvanized steel, 9.5mm diameter with 270mm open length.

2.6 GUYING WIRE

- .1 Type 1: steel, 3mm wire.
- .2 Type 2: 1.5mm diameter multi-wire steel cable.
- .3 Type 3: 3mm diameter multi-wire steel cable.

2.7 CLAMPS

- .1 U-bolt: galvanized, 13mm diameter, c/w curved retaining bar and hex nuts.
- .2 Crimp type.

2.8 GUYING COLLAR

- .1 Tube: plastic, 13mm diameter, nylon reinforced.

2.9 TRUNK PROTECTION

- .1 Wire mesh: galvanized, electrically welded 1.4mm wire with 25 x 25mm mesh and fastener.
- .2 Plastic: perforated spiralled strip.
- .3 Burlap: clean, minimum 2.5 kg/m² mass and 150 mm wide, and twine fastener.
- .4 Tar impregnated crepe paper and twine fastener.

2.10 MULCH

- .1 Shredded wood: varying in size from 25 to 75mm in length, from coniferous trees. Mulch depth as noted on drawings.

2.11 FERTILIZER

- .1 Synthetic commercial type as recommended by soil test report.
- .2 Add mycorrhiza during planting operation. It is important that new root growth be in contact with mycorrhiza. Use as recommended by manufacturer.

2.12 ANTI-DESICCANT

- .1 Wax-like emulsion.

2.13 FLAGGING TAPE

- .1 Fluorescent, orange colour.

2.14 SOURCE QUALITY CONTROL

- .1 Obtain approval from Departmental Representative of plant material prior to planting.
- .2 Imported plant material must be accompanied with necessary permits and import licenses. Conform to Federal, Provincial or Territorial regulations.

PART 3 EXECUTION**3.1 PRE-PLANTING PREPARATION**

- .1 Do construction occupational health and safety in accordance with Section 01 35 29.06 - Health and Safety Requirements.
- .2 Ensure plant material acceptable to Departmental Representative.
- .3 Remove damaged roots and branches from plant material.
- .4 Apply anti-desiccant to conifers and deciduous trees in leaf in accordance with manufacturer's instructions.

3.2 EXCAVATION AND PREPARATION OF PLANTING BEDS

- .1 For individual planting holes:
 - .1 Stake out location and obtain approval from Departmental Representative prior to excavating.
 - .2 Excavate to depth and width as indicated.
 - .3 Remove subsoil, rocks, roots, debris and toxic material from excavated material that will be used as planting soil for trees and individual shrubs. Dispose of excess material.
 - .4 Scarify sides of planting hole.
 - .5 Remove water which enters excavations prior to planting. Notify Departmental Representative if water source is ground water.

3.3 PLANTING

- .1 For bare root stock, place 50mm backfill soil in bottom of hole. Plant trees and shrubs with roots placed straight out in hole.
- .2 For jute burlapped root balls, cut away top one third of wrapping and wire basket without damaging root ball. Do not pull burlap or rope from under root ball.

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- .3 For container stock or root balls in non-degradable wrapping, remove entire container or wrapping without damaging root ball.
- .4 Plant vertically in locations as indicated. Orient plant material to give best appearance in relation to structure, roads and walks.
- .5 For trees and shrubs:
 - .1 Backfill soil in 150 mm lifts. Tamp each lift to eliminate air pockets. When two thirds of depth of planting pit has been backfilled, fill remaining space with water. After water has penetrated into soil, backfill to finish grade.
 - .2 Form watering saucer as indicated.
- .6 For ground covers, backfill soil evenly to finish grade and tamp to eliminate air pockets.
- .7 Water plant material thoroughly.
- .8 After soil settlement has occurred, fill with soil to finish grade.
- .9 Dispose of burlap, wire and container material off site.

3.4 TRUNK PROTECTION

- .1 Install trunk protection on deciduous trees as indicated.
- .2 Install trunk protection prior to installation of tree supports when used.

3.5 TREE SUPPORTS

- .1 Install tree supports as indicated.
- .2 Use single stake tree support for deciduous trees less than 3 m and evergreens less than 2 m.
 - .1 Place stake on prevailing wind side and 150 mm from trunk.
 - .2 Drive stake minimum 150 mm into undisturbed soil beneath roots. Ensure stake is secure, vertical and unsplit.
 - .3 Install 150 mm long guying collar 1500 mm above grade.
 - .4 Thread Type 1 guying wire through guying collar tube. Twist wire to form collar and secure firmly to stake. Cut off excess wire.
- .3 Use 3 guy wires and anchors for deciduous trees greater than 3 m and evergreens greater than 2 m.
 - .1 Use Type 2 guying wire with clamps for trees less than 75 mm in diameter and Type 3 guying wire with clamps for trees greater than 75 mm in diameter.
 - .2 Use Type 1 anchors for trees less than 75 mm in diameter and Type 2 anchors for trees greater than 75 mm in diameter.
 - .3 Install guying collars above branch to prevent slipping at approximately 2/3 height for evergreens and 1/2 height for deciduous trees. Collar mounting height not to exceed 2.5 m above grade.
 - .4 Guying collars to be of sufficient length to encircle tree plus 50mm space for

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trunk clearance. Thread guy wire through collar encircling tree trunk and secure to lead wire by clamp or multi-wraps; cut wire ends close to wrap. Spread lead wires equally proportioned about trunk at 120 degrees.

- .5 Install anchors at equal intervals about tree and away from trunk so that guy wire will form 45 degree angle with ground. Install anchor at angle to achieve maximum resistance for guy wire.
 - .6 Attach guy wire to anchors. Tension wire and secure by multi-wraps.
 - .7 Install wire tightener ensuring that guys are secure and leave room for slight movement of tree.
 - .8 Saw tops off wooden anchors which extend in excess of 100 mm above grade or as approved by Departmental Representative.
 - .9 Install flagging tape to guys as indicated.
- .4 After tree supports have been installed, remove broken branches with clean, sharp tools.

3.6 MULCHING

- .1 Ensure soil settlement has been corrected prior to mulching.
- .2 Spread mulch as indicated.

3.7 MAINTENANCE DURING ESTABLISHMENT PERIOD

- .1 Perform following maintenance operations from time of planting to acceptance by Departmental Representative.
 - .1 Water to maintain soil moisture conditions for optimum establishment, growth and health of plant material without causing erosion.
 - .1 For evergreen plant material, water thoroughly in late fall prior to freeze-up to saturate soil around root system.
 - .2 Remove weeds monthly.
 - .3 Replace or re-spread damaged, missing or disturbed mulch.
 - .4 For non-mulched areas, cultivate as required to keep top layer of soil friable.
 - .5 If required to control insects, fungus and disease, use appropriate control methods in accordance with Federal, Provincial and Municipal regulations. Obtain product approval from Departmental Representative prior to application.
 - .6 Remove dead or broken branches from plant material.
 - .7 Keep trunk protection and guy wires in proper repair and adjustment.
 - .8 Remove and replace dead plants and plants not in healthy growing condition. Make replacements in same manner as specified for original plantings.

3.8 MAINTENANCE DURING WARRANTY PERIOD

- .1 From time of acceptance by Departmental Representative to end of warranty period (one year from interim completion date), perform following maintenance operations.
 - .1 Water to maintain soil moisture conditions for optimum growth and health of plant material without causing erosion.

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- .2 Reform damaged watering saucers.
- .3 Remove weeds monthly.
- .4 Replace or re-spread damaged, missing or disturbed mulch.
- .5 For non-mulched areas, cultivate monthly to keep top layer of soil friable.
- .6 If required to control insects, fungus and disease, use appropriate control methods in accordance with Federal, Provincial and Municipal regulations. Obtain product approval from Departmental Representative prior to application.
- .7 Apply fertilizer in early spring as indicated by soil test.
- .8 Remove dead, broken or hazardous branches from plant material.
- .9 Keep trunk protection and tree supports in proper repair and adjustment.
- .10 Remove trunk protection, tree supports and level watering saucers at end of warranty period.
- .11 Remove and replace dead plants and plants not in healthy growing condition. Make replacements in same manner as specified for original plantings.
- .12 Submit monthly written reports 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.

END OF SECTION