CLS - Section 5

DRAFT - National Growing Medium Standard

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Growing Medium

5.1. General Requirements

5.1.1. Purpose Statement and Intent

1. The purpose of the Canadian Landscape Standard, Section 5 - Growing Medium is to define baseline conditions for growing media that ensure successful plant survival and establishment. Healthy plant establishment occurs when roots are able to permeate growing media, gaining access to nutrients, water, air and stability in the landscape. The primary goal of this section is to outline the required characteristics of growing media for different landscape settings.
2. Growing media, in the context of the Canadian Landscape Standard (Second Edition, Version 2, 2020), refers to any material in which plants grow. Growing media includes but is not limited to (i) landscape topsoil, (ii) green roof media (or landscape over structure growing media) and (iii) low impact development media, whose biological, chemical, and physical properties fall within the ranges outlined in this section. Excluded from this section are growing media for greenhouse and nursery applications.
3. Section 5 - Growing Medium, characterizes the range of measurable biological, chemical and physical growing media properties that are desired for different growing media types, applications and uses. These include but are not limited to lawns (seeding and sodding), planting beds for annuals and perennials, planting areas for shrubs and trees, naturalization areas, green roofs, and low impact development.
4. The goal of this section is to provide end users with the requisite tools needed to select growing media properties according to landscape setting and growing media type. Landscape setting has a profound and complex influence on growing media selection, given the compounding impacts of regional influences (including climate, geography, local resource availability, vegetation type, species) and site-specific aspects (including local utilities, topography and site typology [i.e. boulevards, residential, sports fields, green roof, etc.]). Therefore, the Consultant, Primary Contractor and/or Landscape Architect assigned to any landscape construction project should refer to this section to select an appropriate growing medium that accounts for the sites intended end use.

5.1.2. Related References, Standards and Legislation

1. Government:
    a. CFIA T-4-120. *The Fertilizer Act - Regulation of Compost,* 19971
    b. CFIA T-4-93. *Standards for Metals in Fertilizers and Supplements*,1997
    c. NMS Section 32 91 19.13 *Topsoil Placement and Grading,* 2019
    d. NMS Section 32 91 19.16 T*opsoil Placement for Vegetated Roofs,* 2019
    e. Standard CAN/BNQ 4013-200 *Organic Soil Conditioners - Composts*, 2016
    f. *Underground Infrastructure Safety Act*
    g. Any jurisdictional regulation applicable for growing media use
2. Industry:
    a. Agriculture and Agri-Food Canada website: *The Canadian System of Soil Classification,* current edition
    b. A & L Canada Laboratories. *Compost Management Program, 2004*
    c. American Society for Testing Materials [ASTM]
    d. Canadian Association for Laboratory Accreditation Inc., *CALA Guide to Current Sampling Practices,* April 2, 2014

e. Canadian Council of Ministers of the Environment, *CCME Guidelines for Compost* Quality, 2005
f. Compost Council of Canada
g. *Certified Landscape Designer Manual*, current edition
h. Guideline for the planning, construction, and maintenance of green roof sites [FLL]
i. NSC W200-18. *Design of Bioretention Systems*, 2018
j. The Sustainable Technologies Evaluation Program (STEP), *Preserving and Restoring Healthy Soil: Best Practices for Urban Construction,* 2012

5.2 Types of Growing Media

Section 5.2 Types of Growing Media, will identify the different applications and uses for growing media in urban, peri-urban and naturalized settings. Landscape setting has a profound influence on growing media selection, given the diverse range of regional climate and site-specific characteristics (5.1.1 Purpose Statement and Intent). The process of selecting growing media is inherently complex as it is contingent upon the local availability of growing media resources as well as the design and intended end use of the site or project. The purpose of this section is to identify and characterize three different types of growing media that can be used in landscape applications and provide background information that can be used to inform the selection process.

The three types of growing media are as follows:

1. **Landscape Growing Media:** Refers to growing media primarily composed of soil (topsoil, subsoil, coarse sand, etc.). Planting areas are typically associated with on-ground landscaping requirements (i.e. developments, parks, roadways, etc.).
2. **Over Structure Growing Media:** Refers to growing media used for landscape over structures including but not limited to on roof slabs, parking garages or contained planters. Depending on the environmental and aesthetic goals of the design, roof slabs may be categorized as extensive, semi-intensive or intensive green roof systems. Green roof systems with lower load bearing capacity typically use lightweight aggregate or soilless growing media. Green roof systems with higher load bearing capacity can use growing media similar to Landscape Topsoil (coarse sand based growing media). Only a Qualified Professional shall determine whether heavier based growing media can be used for landscape over structure scenarios.
3. **Low Impact Development Growing Media**: Refers to growing media that is designed to minimize the impact of landscape development (structural support, stormwater management, etc.) while simultaneously supporting plant growth and establishment. Current low impact development media types include (i) structural soil and (ii) biofiltration growing media (bioretention, swales, rain gardens).

5.2.1 Landscape Growing Media

Landscape Growing Medium refers to growing media that is primarily made up of soil, namely topsoil, mixed with organic (i.e. compost) and inorganic (i.e. coarse sand) amendments. For landscape settings, this can include but is not limited to (i) stockpiled soil, (ii) imported growing medium, (iii) restored in place topsoil and (iv) protected soil; whose biological, chemical and physical properties fall within the ranges defined in this Standard. Section 5.2.1 Landscape Growing Medium, presents a decision making tool that the Consultant, Primary Contractor and/or Landscape Architect should use in order to prepare growing media such that it demonstrates the appropriate properties based on site conditions and construction activities.

1. Figure 5.1 outlines a decision-making matrix that can be used to determine the type of growing medium recommended for on-site use. Recommendations are based on whether topsoil is present and whether it will be degraded, protected, or stockpiled during construction.

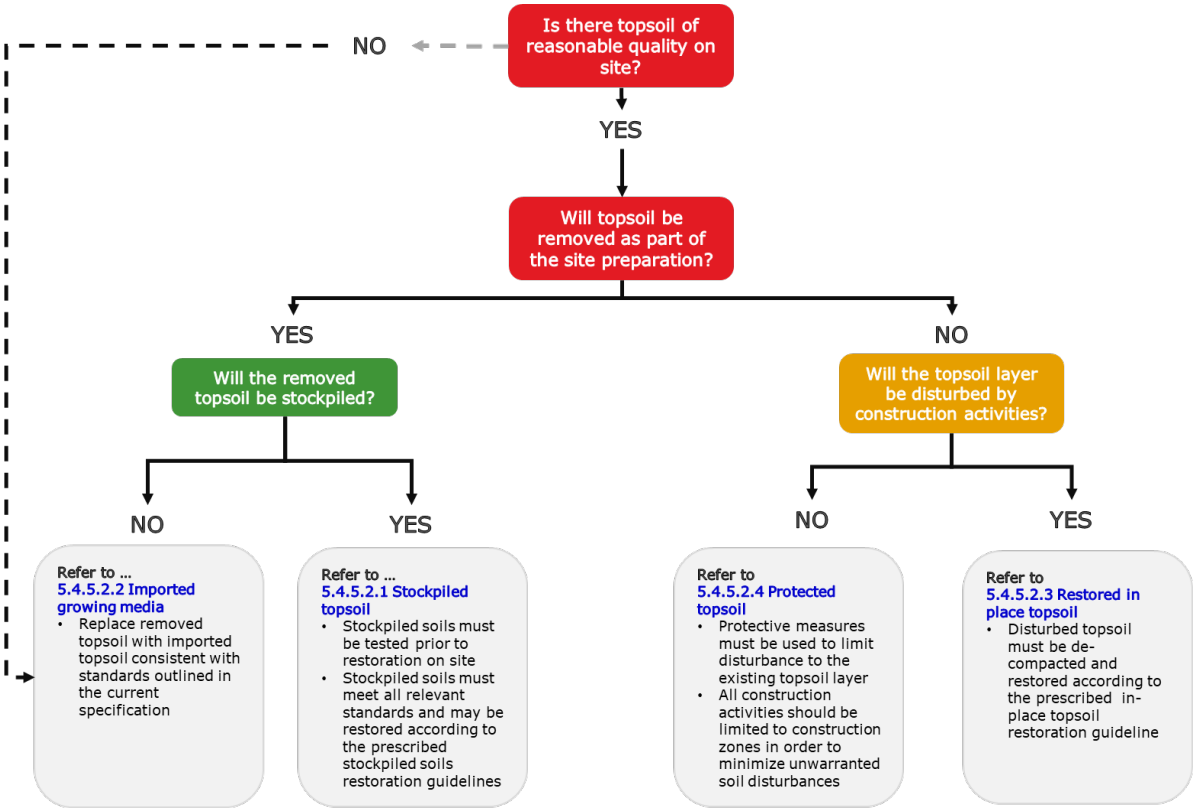


Figure 5.1. Decision making matrix that should be used to identify the type of growing media recommended for use on-site.

2. Landscape growing medium, as defined in the current Standard, should be relatively free of the following as advised by the Supplier:
    a. Plants, plant roots, invasive or noxious plants and their reproductive parts
    b. Building materials, non-composted wood and wood waste
    c. Insect pests and plant pathogenic organisms
    d. Chemical pollutants or substances at levels toxic to plants
    e. Any other extraneous materials that detract from the recommended biological, chemical, and physical properties outlined in this section
3. Herein, Landscape Topsoil will be classified as one of:
    a. **Stockpiled Topsoil**: Refers to the existing on-site topsoil that is stripped and temporarily stored in piles for reuse as the main or sole ingredient in the final growing media. Methods for soil stripping and stockpiling shall be consistent with those outlined in Section 3.2.7 Protection of the Environment and Site Elements.
    b. **Imported Growing Medium**: Refers to the finalized growing media blend that is imported onto a site where no other growing media is present or available.
    c. **Restored in Place Topsoil:** Refers to on-site topsoil that is left in place during construction, leading to its degradation such that it no longer meets the current Standard for growing media. Degraded topsoil must be de-compacted and restored according to the methods outlined in 5.4.4 Installation of

Final Growing Media. Once restored, topsoil can be used as the main component for the final growing media.

d. **Protected Topsoil:** Refers to on-site topsoil that is left in place during construction and sufficiently protected such that it meets the baseline growing media conditions for growing media outlined in the current Standard. Protective measures (ie. fencing) should be put into place to limit disturbance from construction activities and foot traffic.

5.2.2 Over Structure and Green roof Growing Media

Over Structure (also known as Green Roof) growing media, includes but is not limited to growing medium used for container planters, extensive, semi-intensive and intensive green roof systems. Section 5.2.2 Over Structure and Green Roof Medium, presents a decision making tool that the Consultant, Primary Contractor and/or Landscape Architect should use to prepare growing medium with the appropriate properties based on the environmental and aesthetic intent of the design.

1. Table 5.1 provides general guidelines for determining the type of growing media recommended for use in over structure and green roof scenarios. Recommended growing media types are generally defined according to the vegetation used as well as the building's structural integrity and loading capacity.
2. Growing medium for over structure landscapes and green roofs as defined in this Standard, should be relatively free of the following as advised by the Supplier:
    a. Plants, plant roots, invasive or noxious plants and their reproductive parts
    b. Building materials, non-composted wood and wood waste
    c. Insect pests and plant pathogenic organisms
    d. Chemical pollutants or substances at levels toxic to plants
    e. Any other extraneous materials that detract from the recommended biological, chemical, and physical properties outlined in this section
3. Herein, green roof medium will be classified as one of:
    a. Extensive green roof growing media
    b. Semi-intensive green roof growing media
    c. Intensive green roof growing media
4. Section 5 - Growing Medium provides details relevant to growing media as used in the aforementioned systems. Detailed information on design considerations for plant selection, structural components, the drainage layer (multi layered design), irrigation, construction and maintenance can be found in Section 13 - Landscape Over Structures.

Table 5.1. Decision making matrix that should be used to identify the type of growing medium recommended for use in over structure landscapes and green roof scenarios. Green roof media will be classified as one of extensive, semi-intensive or intensive green roof growing media.

	Extensive	Semi-Intensive	Intensive
Vegetation	Ornamental and succulent plants	Ornamental, meadow species, turf grass and woody perennial	Woody perennial, shrubs, trees
Media Thickness	< 20 cm	15-35 cm	> 35 cm
Growing Media Weight	Low 50-200 kg/m^2*	Moderate 100-350 kg/m^2*	Heavy 350-1000 kg/m^2*

* Substrate weight will vary according to product type, substrate depths, where products may be heavier than specified.

5.2.3 Low Impact Development Growing Media

Low impact development media refers to growing media that is designed to minimize the impact of landscape development (structural support, stormwater management, etc.) while simultaneously supporting plant growth and establishment. Current low impact development media types outlined in this Section include (i) engineered soil and (ii) biofiltration growing media (bioretention, swales, rain gardens).

5.2.3.1 Engineered Soil

Engineered Soil mixes are a two-part system comprised of a stone matrix for strength and growing medium for horticultural needs. Engineered Soil depends on a load-bearing stone lattice (the skeleton) to support the pavement. The lattice provides stability through stone-to-stone contacts while providing interconnected voids that are available for potential root penetration, air, and water movement. A narrow particle size distribution of the stone type is chosen to provide a uniform system of high porosity after compaction. By carefully choosing the stone, soil and mixing ratio, a base material capable of sidewalk and road support is created which is also able to provide the air and water balance necessary for root growth and plant establishment. After compaction, the engineered soil mixture forms a tight stone skeleton while the growing medium in between the stones remains largely non-compacted. When properly designed and compacted, the system will have large voids providing room for root growth and aeration of the root zone. The stone / growing medium mixture in this system has proven to provide full compaction to normal construction standards.

Figure 5.2 includes a diagram of the function of a typical engineered soil mix. The Consultant, Primary Contractor and/or Landscape Architect must determine the maximum load-bearing capacity prior to use, as it will vary from product to product.

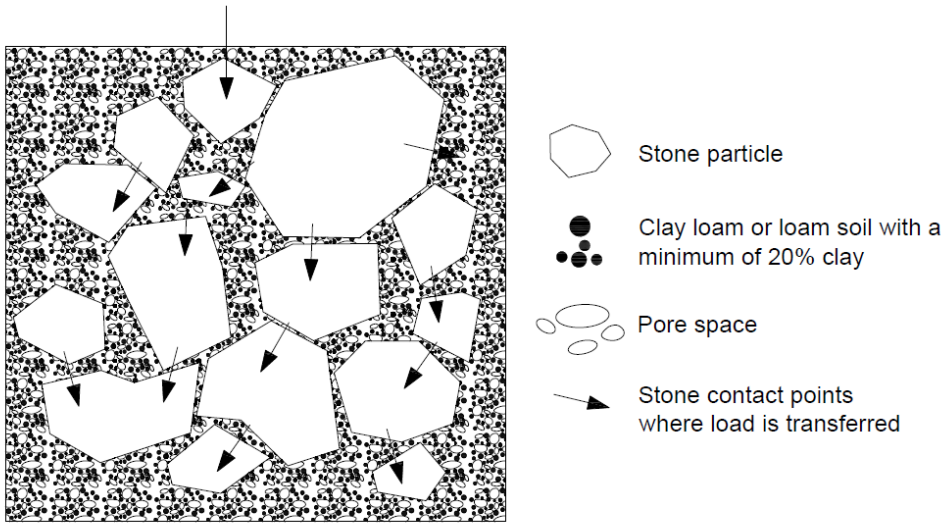


Figure 5.2. Components of engieered soil and how load capacity is transferred between the gap-graded gravel.

5.2.3.2 Biofiltration Growing Medium

Biofiltration growing media refers to growing media designed to maximize hydrological performance with specific properties that are used to treat, retain, and detain stormwater runoff while supporting plant growth. Biofiltration growing media is typically composed of a mixture of coarse sand, organic and inorganic material and is designed to have high hydraulic conductivity and pollutant removal capabilities. Biofiltration growing media can be used in bioretention, bioswales, and rain gardens.

5.3 Growing Medium Variations and Applications

Section 5.3 Growing Medium Variations and Applications identifies the factors that should be considered by the Consultant, Primary Contractor and/or Landscape Architect in order to identify and design growing conditions that can support healthy plant establishment according to the site's intended use and application.

5.3.1 Landscape Growing Media

Site conditions should be considered when determining an appropriate growing medium for landscape settings. Conditions include but are not limited to:

1. Maintenance level
2. Level of traffic/ability to resist soil compaction
3. Water storage capacity
4. Infiltration
5. Seasonal flooding/surface ponding
6. Road salt tolerance

Once the end use of the site is identified (i.e. lawns, planting beds, shrubs and trees and restoration areas), Figure 5.3 can be used to determine the appropriate texture of the final growing media blend. The figure identifies the characteristics for coarse (sand, loamy sand, sandy loam), medium (sandy clay loam, loam, silt loam, silt), and fine (clay loam, silty clay loam, silty clay, sandy clay, clay) textured soil. For example, if the level of foot traffic is high, as

is the case in the average sports field, a coarse texture soil is recommended to resist compaction and increase infiltration.

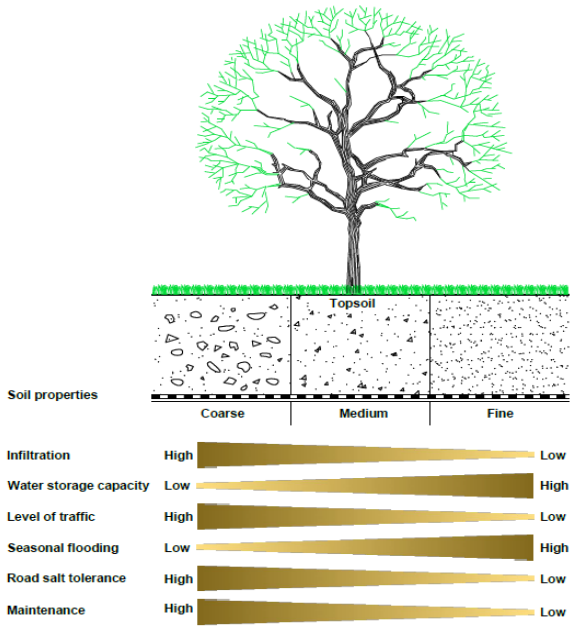
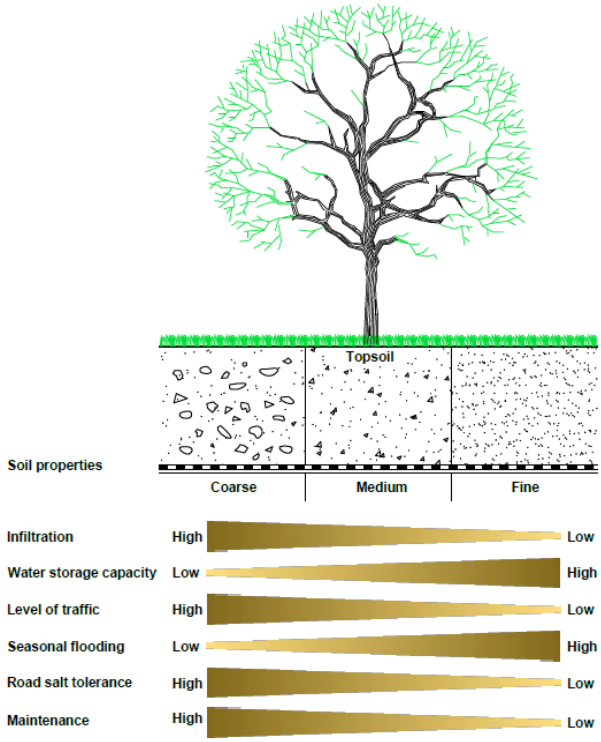


Figure 5.3. Specific characteristics for coarse (sand, loamy sand, sandy loam), medium (sandy clay loam, loam, silt loam, silt) and fine (clay loam, silty clay loam, silty clay, sandy clay, clay) textured soil.

5.3.2 Over Structure and Green Roof Media

Multiple factors should be considered when selecting an appropriate green roof medium. Factors include but are not limited to:

1. Vegetation size
2. Maintenance level
3. Water storage capacity
4. Cost
5. Weight



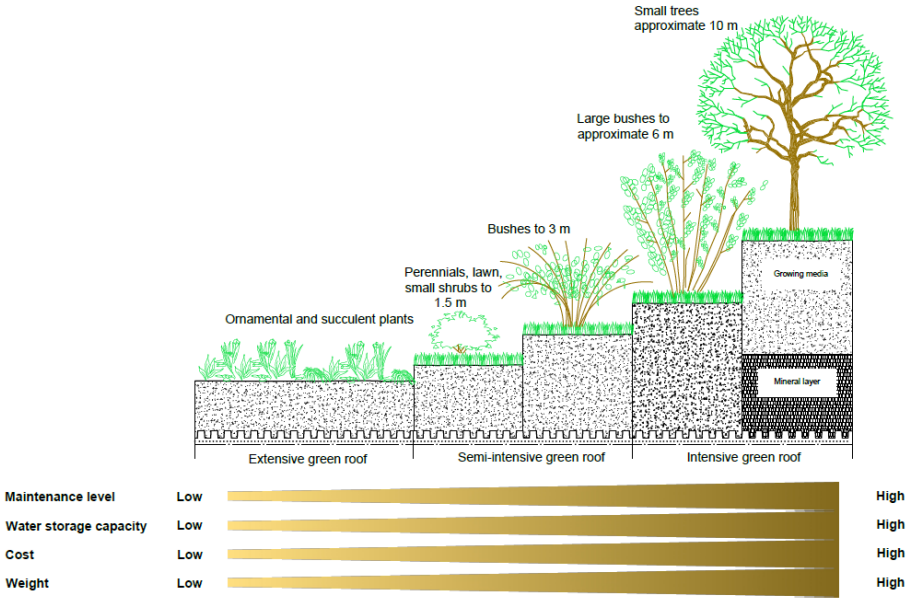


Figure 5.4. Specific characteristics for extensive, semi-intensive and intensive growing media.

Figure 5.4 can be used to select the appropriate growing media for over structure and green roof applications. In terms of green roof design, growing media is largely defined according to the size, volume and habit of installed vegetation, where green roofs are classified as one of (i) extensive, (ii) semi-intensive and (iii) intensive growing media. Accordingly, the Standard provides guidelines for the growing media physical, chemical and biological properties (here, Section 5- Growing Medium) while additionally outlining requirements for the design, implementation and maintenance (see Section 13 - Landscape Over Structures for information relevant to design, structural loading, growing media placement and maintenance).

5.3.3 Low Impact Development Media

Site management and objectives should be considered when determining an appropriate growing medium for Low Impact Development in landscape settings. In scenarios where structural support or stormwater management is required, the following factors should be taken into account:

1. Hydrological performance of base soil (i.e. subsoil)
2. Depth to groundwater table
3. Site topography and slope
4. Land use
5. Site size, including undisrupted surface area and subsurface depth
6. Distance to local infrastructure and water bodies
7. Presence and abundance of planted vegetation
8. Cost of installation and maintenance

Section 5 provides guidelines for the design, installation and management of growing media as it pertains to Low Impact Development, but does not outline requirements for the design, implementation and maintenance of associated infrastructure and vegetation.

5.4. Landscape Growing Media

This section outlines the key qualities required for landscape growing media that must be verified by the Consultant, Primary Contractor and/or Landscape Architect.

5.4.1 Qualities of On-Site Soil

On-site soil is classified as one of:

- Topsoil or Growing Media
- Subsoil

5.4.1.1 Topsoil

Topsoil shall meet the requirements as outlined below:

1. Topsoil shall have a pH range of 5.5 - 8.0, electrical conductivity/soluble salt content of less than 2.5 mmhos/cm and contain no less than 2% organic matter by weight.
2. Topsoil can be:
    a. **Stockpiled topsoil**: Refers to the existing on-site topsoil that is stripped and temporarily stored in piles for reuse as the main or sole ingredient in the final growing media. On-site topsoil that is stripped and stockpiled should be used, permitted that it meets the current Standard or can be modified to meet requirements as outlined in Tables A through C.
    b. **Restored in Place Topsoil:** Refers to on-site topsoil that is left in place during construction, leading to its degradation such that it no longer meets the current Standard for growing media. In-place soil restoration allows for disturbed topsoil to be used once it has been de-compacted and restored on-site to meet the requirements as outlined in Tables A through C.
    c. **Protected topsoil**- Refers to on-site topsoil that is left in place during construction and sufficiently protected such that it meets the baseline growing media conditions for growing media outlined in Tables A through C. Protective measures (ie. fencing) should be put into place to limit disturbance from construction activities and foot traffic.

5.4.1.2 Subsoil

Subsoil may be used only when it meets the requirements outlined in the current Standard or can be modified to meet requirements as outlined in Tables A through C. Subsoil shall meet the requirements as outlined below:

1. Subsoil shall be relatively free of scrub, plants and invasive and noxious species, grass and other extraneous organic and non-organic materials and toxins and shall meet the nutrient requirements as identified in the current Standard.

5.4.2 Soil Amendments

Section 5.4.2 Soil Amendments provides the Consultant, Primary Contractor and/or Landscape Architect with a comprehensive list of different organic and inorganic amendments that can be used to improve the biological, chemical and physical properties of the topsoil such that it meets the requirements outlined in the current Standard. These amendments can be added either (i) during the mixing and/or screening of the selected growing media, (ii) following decompaction of the on-site topsoil, or (iii) after topsoil is placed on-site. For more information on the methods related to the mixing and blending of soil amendments see Section 5.4.3 Mixing/Blending of Final Growing Media. Note that a representative sample of the selected soil amendment should be collected and submitted to a reputable Laboratory for analysis prior to mixing the final growing media, to ensure that the resulting blend meets the requirements as outlined in the current Standard (see Section 5.8 Growing Media Sampling for guidelines relevant to the sampling, testing and analysis of growing media). Soil amendments are classified as one of:

1. Organic Amendments
2. Inorganic Amendments

5.4.2.1 Organic Amendments

Organic amendments are classified as one of:

- Commercially prepared compost
- Manure
- Aged Bark Fines
- Un-composted wood residuals
- Municipal sewage sludge
- Peat moss

Due to the wide range of organic amendments used across Canada, any organic amendments used that are not included on this list shall be approved by Consultant, Primary Contractor and/or Landscape Architect.

1. Commercially prepared compost shall:
    a. Be classified as Category A Compost, as per guidelines outlined by the Canadian Council of Ministers of the Environment (CCME).
    b. Be substantially free of any viable weeds and invasive plants, including their seeds and other plant reproductive parts, coliform bacteria, pathogens and chemical or organic contaminants that may be detrimental to plant, animal or human health.
    c. Have a total carbon to nitrogen ratio of between 10:1 and 30:1, a pH between 6.0-8.4, a Solvita Maturity Index test result between 6-8 and an electrical conductivity/soluble salt content of 6.0 mmhos/cm or less.
2. Manure shall:
    a. Be either farm animal manure or mushroom manure.
    b. Be rotted to the extent that the material is crumbly.
    c. Be substantially free from weeds and invasive plants and their seeds and reproductive parts, coliform bacteria, pathogens, rocks, sticks and rubble.
    d. Not exceed a 40:1 total carbon to nitrogen ratio, neither should it contain more than 40% by volume sawdust, straw or shavings or have an electrical conductivity/soluble salt content greater than 12.0 mmhos/cm.
3. Aged Bark Fines shall:
    a. Be aged for a minimum of 6 months.
    b. Have a pH less than 6.5.
    c. Have an electrical conductivity of less than 2.0 mmhos/cm.
    d. Have an organic matter content greater than 80% by weight.
    e. Be made up of 95% (by weight) material with particle size less than 15 mm.
4. Un-composted wood residuals (such as wood chips, bark, sawdust and ground green wood) shall:
    a. Not make up more than 40% of the organic content of any growing media, by volume.
    b. Be used in conjunction with an appropriate application of fertilizer that is approved by a Qualified Professional. The application of fertilizers alongside is designed to supplement growing media and compensate for any loss of available nutrients that may occur alongside the use of un-composted wood residuals.
5. Municipal sewage sludge shall meet relevant requirements and be approved by the proper authority (i.e. municipal, provincial, federal, etc.) responsible for regulating its use as a landscape amendment. Where

there is a wide range of commercial products that utilize sewage sludge as a primary organic component in composted, raw and blended forms, the resulting impact of its use on key growing media properties including pH, electrical conductivity, organic matter content, texture and nutrient availability is highly varied. Accordingly, the current standard does not include requirements for municipal sewage sludge and requires that the Consultant, Primary Contractor and/or Landscape Architect coordinate with the supplier to familiarize themselves with relevant information related to the product quality, use and application. If municipal sewage sludge is used, it shall be incorporated into the final growing media, so as to ensure that the resulting blend meets the requirements as outlined in the current Standard.

6. Peat moss shall:
    a. Primarily be used as last resort and when all of the previously listed organic amendments are not locally available due to environmental limitations or other relevant concerns.
    b. Be classified as horticultural grade sphagnum moss.
    c. Be of medium to coarse texture, ranging from porous to spongy fibrous
    d. Be fairly elastic and substantially homogeneous.
    e. Have a pH ranging between 3.5 and 6.5.

5.4.2.2 Inorganic Amendments

Organic amendments are classified as one of:

- Sand

1. Sand shall:
    - Be either washed concrete sand, clean river pump sand or a locally available equivalent.
    - Have a pH less than 8.6.
    - Have an organic matter content of less than 0.75% by weight.
    - Have a particle size distribution such that:
        - 95-100% passes a USBS No. 4 (4.76mm) standard sieve
        - 0-40% passes a USBS No. 35 (0.5mm) standard sieve
        - 0-5% (fines) passes a USBS No. 270 (0.053mm) standard sieve

Due to the wide range of inorganic amendments used across Canada, any inorganic amendments used that are not included on this list shall be approved by Consultant, Primary Contractor and/or Landscape Architect.

5.4.3 Mixing and/or Blending of Final Landscape Growing Media

Section 5.4.3 Mixing and/or Blending of Final Growing Media provides the Consultant, Primary Contractor and/or Landscape Architect with an overview of the standard procedures required for mixing and/or blending the final growing media based on the type of topsoil found on-site.

5.4.3.1. Stockpiled topsoil

1. If stockpiled soil does not meet the baseline requirements for growing media specified in Tables A through C, it should be blended with one of the organic and/or inorganic amendments listed in Section 5.4.2 Soil Amendments, such that it meets the requirements outlined in the current Standard.

5.4.3.2. Imported growing media

1. Prior to on-site delivery, a representative sample of the growing media, as well as the most up to date test results and analyses; should be provided to the Consultant, Primary Contractor and/or Landscape Architect.

2. Growing media components shall undergo commercial processing and mixing via a mechanized screening process.
3. Growing media shall not be hand mixed.
4. Growing media shall be a homogeneous blend.
5. In circumstances where blending on-site is approved, trucks, equipment and machinery shall be cleaned prior to arrival and use on-site.
6. If peat moss is added to growing media, it should be pre-hydrated such that the material can form and hold a ball shape when squeezed and released.

5.4.3.3 Restored in place topsoil

1. If on-site topsoil does not meet the baseline requirements for growing media as outlined in Tables A through C, it should be blended with one or more of the organic and/or inorganic amendments listed in Section 5.4.2 Soil Amendments in order to meet the current Standard.

5.4.3.4 Protected topsoil

1. If protected topsoil does not meet the baseline requirements for growing media outlined in Tables A through C, it should be blended with one or more of the organic and/or inorganic amendments listed in Section 5.4.2 Soil Amendments in order to meet the current Standard.

5.4.4 Final Properties of Landscape Growing Media

Section 5.4.4 Final Landscape Growing Media Properties outlines the required properties of the final growing media that shall be satisfied in order to meet the current Standard for Landscape Growing Media.

1. Growing media are classified as one of (i) stockpiled soil, (ii) imported growing media, (iii) restored in place topsoil and (iv) protected topsoil and should be designated according to a site's intended use and objectives.
2. Growing media shall require no more than 0.5kg/m^2 (0.10lb/ft^2) of dolomite lime to meet the required pH level.
3. The electrical conductivity/soluble salts shall not exceed 3.0mmhos/cm.
4. The sodium adsorption ratio (SAR) shall not exceed 8.0.
5. Available phosphorus shall be within the range of 10 to 250ppm.
    a. In sensitive areas adjacent to water bodies, it is strongly recommended to limit the available phosphorus. Recommended range for these areas is 10 to 40 ppm.
6. Available potassium shall be within the range of 50 to 1000ppm.
7. pH shall fall within the ranges specified in Tables A through C, and is designated according to the sites intended use and application.
8. Particle size and particle size distribution shall fall within the ranges specified in Tables A through C, according to the sites intended use and application.

5.4.5 Installation of Final Landscape Growing Media

Section 5.4.5 Installation of Final Growing Media outlines the required methods that should be applied toward the installation of growing media in the landscape.

5.4.5.1. Delivery and Stockpiling of Growing Media and/or Soil Amendments

1. Action should be taken so as to ensure that growing media and/or soil amendments are not contaminated by foreign material prior to, during or following delivery (while stockpiled on-site).
2. Efforts should be made to have any growing media and/or soil amendments delivered to the site on the day of installation.

3. A designated storage area shall be identified and prepared prior to the delivery of any growing media and/or soil amendments.
4. All growing media delivered to the site and not immediately used should:
    a. Be placed on a clean tarpaulin, asphalt or concrete pad.
    b. Be covered with a tarpaulin for protection from rain, debris and weeds or invasive plant contamination.

5.4.5.2. Placing Growing Media and/or Soil Amendments

5.4.5.2.1 Stockpiled topsoil

1. Growing media shall only be placed over subgrades prepared according to the requirements outlined in the current Standard.
2. Subgrades shall be scarified to a minimum depth of 150mm (6“) immediately before growing media is placed.
3. Table F outlines the minimum depths required for growing media following settling.
4. Growing media shall be placed and spread with the appropriate equipment.
5. Once placed, growing media shall be allowed to settle or shall be compacted by light rolling such that it can maintain its structure and resist compaction under foot (as indicated by deep footprints) prior to planting. Compaction shall not be more than is necessary to meet this minimum requirement.
6. For depths greater than 300mm (12”), growing media should be installed in lifts no more than 150 to 300 mm (6 to 12”) deep. Topsoil shall be lifted and compacted with a suitably weighted landscape roller at the time of installation. Landscape rollers are not recommended for naturalization areas, where an uneven surface with micro topographic variation is appropriate given the site objectives and intended use. It is strongly advised that mechanical compactors, including plate compactors, are not used when installing growing media at any site, given that they are likely to affect levels of compaction far exceeding the recommended range for growing media.
7. The depth of homogeneous layers of soil shall not exceed a maximum depth of 500mm (20”)
8. Growing media shall be moist but not wet when placed. Material is considered moist if it is visibly hydrated but does not release or drip excess water when held and manually compressed.
9. Growing media shall not be handled or placed when excessively wet or frozen.

5.4.5.2.2 Imported growing media

1. Growing media shall only be placed over subgrades prepared according to the requirements outlined in the current Standard.
2. Subgrades shall be scarified to a minimum depth of 150mm (6”) immediately before growing media is placed.
3. Table F sets out the minimum depths required for growing media following settling.
4. Growing media shall be placed and spread with the appropriate equipment.
5. Once placed, growing media shall be allowed to settle or shall be compacted by light rolling such that it can maintain its structure and resist compaction under foot (as indicated by deep footprints) prior to planting. Compaction shall not be more than is necessary to meet this minimum requirement.
6. For depths greater than 300mm (12”), growing media should be installed in lifts no more than 150 to 300mm (6 to 12”) deep. Topsoil shall be lifted and compacted with a suitably weighted landscape roller at the time of installation. Landscape rollers are not recommended for naturalization areas, where an uneven surface with micro topographic variation is appropriate given the site objectives and intended use. It is strongly advised that mechanical compactors, including plate compactors; are not used when installing

growing media at any site, given that they are likely to affect levels of compaction far exceeding the recommended range for growing media.

7. The depth of homogeneous layers of soil shall not exceed a maximum depth of 500mm (20").
8. Growing media shall be moist but not wet when placed. Material is considered moist if it is visibly hydrated but does not release or drip excess water when held and manually compressed.
9. Growing media shall not be handled or placed when excessively wet or frozen.

5.4.5.2.3 Restored in place topsoil

1. Foreign materials resulting from construction operations, including oil drippings, stone, gravel and other construction material shall be removed from the existing soil surface.
2. Soil should be deep ripped or scarified to an appropriate depth, as defined according to landscape type, where
    a. Lawns shall be deep ripped from 200 to 300mm deep
    b. Planting beds shall be deep ripped from 200 to 500mm deep
    c. Shrub zones shall be deep ripped from 300 to 500mm deep
    d. Tree zones shall be deep ripped 500 to 900mm deep
3. Deep ripping should be conducted in a backwards direction to avoid driving over and settling the scarified areas.
4. Soil amendment(s) should be placed on top of deep ripped soil. The application and incorporation of soil amendments is designed to improve the biological, chemical, and physical properties of topsoil so as to meet the requirements outlined in Tables A through C.
5. Soil amendments should be incorporated from 200 to 300mm deep. Incorporation depth should be verified so as to ensure the required depth is sufficiently attained.

5.4.5.2.4 Protected topsoil

1. No amendment is required if existing topsoil meets the requirements outlined in the current Standard and has been sufficiently protected during the construction process. If protected topsoil does not meet the properties outlined in Tables A through C, topsoil should be blended with a soil amendment, as per the procedure outlined in section 5.4.5.2.3 Restored in place topsoil.

5.5. Over Structure and Green Roof Growing Media

5.5.1 Qualities of Green Roof Growing Media

In addition to the requirements and procedures defined in Subsection 5.3 Growing Media Variations and Applications, the Consultant, Primary Contractor and/or Landscape Architect should further consider the qualities of green roof growing medium.

5.5.1.1 Over Structure and Green Roof Growing Media

Green roof growing media refers to growing media used for landscape over structures that consists of a blend of mineral and organic materials. This type of growing media is generally composed of a higher percentage of mineral light weight material as compared to the organic material, where the former (mineral light weight materials) may include natural, artificial and recycled materials (Table 5.2). Materials vary in terms of cost, accessibility and performance and should be selected according to the intended use and application of the site. Generally, green roof growing media should be stable, permanent, and lightweight so as to maximize its longevity within green roof applications. Where there is an extensive range of mineral (inorganic) and organic materials used in the production

of green roof media, the current section seeks to provide guidelines and recommendations for evaluating the final green roof growing media blend, rather than the individual quality and function of its various components.

Table 5.2. Mineral and organic components for green roof substrates.

Component Category	Materials Used
Mineral; Natural	Sand, clay, lava (scoria), pumice, gravel
Mineral; Artificial	Perlite, vermiculite, expanded shale, clay and slate, rockwool
Mineral; Recycled	Crushed materials (i.e. bricks, tiles, brick rubble), crushed concrete, aerated concrete, subsoil, styrofoam
Organic	Peat, biochar, coir fiber dust, compost (i.e. bark, leaf and yard water, etc.), worm castings

5.5.2 Properties of Final Over Structure and Green Roof Growing Media Blend

1. Green roof growing media blends should be specified by a Qualified Professional with experience in designing and formulating media for landscape over structures. For more information of what constitutes a 'Qualified Professional', see Section 2.1.12. Qualified Professionals.
2. The commercial processing and blending of green roof growing media components shall be thorough and must include a mechanized screening process.
3. Processed and blended green roof growing media shall be a homogeneous mixture. Green roof growing media blends shall not be hand mixed.
4. Green roof growing media blends used in roof slabs and contained planters shall be designed so as to avoid plugging or caking at the filter cloth. Accordingly, green roof growing media intended for the two aforementioned applications should be formulated with a relatively low proportion of fines (ie. silt and clay materials).
5. Growing media properties for green roof growing media blends shall meet the requirements outlined in Table D.
6. Refer to Section 13 - Landscape Over Structures for design, installation and maintenance guidelines relevant to green roof applications.

5.6. Low Impact Development Media

5.6.1 Qualities of Low Impact Development Media

In addition to the factors listed in Section 5.3 Growing Media Variations and Applications the Consultant, Primary Contractor and/or Landscape Architect should further consider the qualities of low impact development media. Low impact development media refers to the range of growing media used to manage stormwater runoff and is an

integral part of many green infrastructure systems. The current Standard identifies two categories of low impact development media, namely (i) structural soil and (ii) biofiltration growing media.

5.6.1.1 Engineered Soil

Refers to growing media installed under pavement systems in order to provide structural support, increasing load-bearing capacity so as to meet engineering requirements. Engineered soil typically consists of a combination of gap-graded gravel and soil (including both mineral and organic material) that is formulated to resist compaction as well as provide and maintain pore space through which roots can extend and grow.

5.6.1.2 Biofiltration Growing Media

Biofiltration refers to growing media designed to temporarily store stormwater runoff in low lying planting beds or vertical-walled structures. Biofiltration growing media is typically comprised of a mixture of coarse sand, topsoil and organic matter and is designed to have high hydraulic conductivity and pollutant capture and removal capabilities while simultaneously retaining sufficient plant available water to support the establishment and growth of above ground vegetation. Depending on the baseline infiltration rate of existing soil and the innate characteristics of the site (topography, grade), biofiltration systems may be designed and constructed (i) without an underdrain, allowing for full infiltration, (ii) with an underdrain, allowing for partial infiltration or (iii) with an underdrain and impermeable liner, allowing for no infiltration.

5.6.2 Final Properties of Low Impact Development Growing Media

The key performance properties of low impact development growing media, including but not limited to load-bearing capacity, organic matter content and water holding capacity, are largely product dependant. Detailed information as to the key features and performance of growing media in low impact development should be specified by the Supplier, prior to installation. The current section seeks to provide guidelines and recommendations that can be used to formulate low impact development growing media, where analysis outlining growing media properties and design should be provided by the Supplier and approved by a Qualified Professional prior to installation. The current section does not provide any detailed requirements as to biological, chemical and physical properties of low impact development growing media.

5.6.2.1 Engineered Soil

1. Engineered soil should consist of a layer of uniformly sized, highly angular crushed stone (i.e. granite or limestone), a layer of fine textured soil (i.e. clay to clay loam), and a stabilizing agent.
2. Key performance properties of low impact development growing media include but are not limited to load-bearing capacity, saturated hydraulic conductivity, water holding capacity and pH. It is strongly advised that the Consultant, Primary Contractor and/or Landscape Architect work with the Supplier to ensure the properties of engineered soil are consistent with the intended use and application of the site.

5.6.2.2 Biofiltration Growing Media

1. Prior to on-site delivery, a representative sample of the biofiltration growing media should be made available to the Consultant, along with the most up to date test result evaluating key properties of all relevant growing media.
2. The commercial processing and blending of biofiltration growing media components shall be thorough and must include a mechanized screening process.
3. Processed and blended biofiltration growing media shall be a homogeneous mixture. Biofiltration growing media shall not be hand mixed.
4. In circumstances where blending on-site is approved, trucks, equipment and machinery shall be cleaned prior to arrival and use on-site.

5. Growing media properties, including texture, organic matter and pH shall meet the requirements outlined in Table E.

5.6.3 Installation of Final Low Impact Development Growing Media

Section 5.6.3 Installation of Final Low Impact Development Growing Media provides general guidelines that can be used for the installation of low impact development growing media. All design and construction aspects of low impact development features should be defined and approved by a Qualified Professional, prior to installation.

5.6.3.1 Engineered Soil

1. Ensure minimum depth requirements of 900mm (36") for street tree planting are met. It is also critical to ensure the adequate growing medium volume for tree growth support is provided.
2. Excavate soil and compact subgrade (as required) to increase the load-bearing capacity of the finished grade, directly prior to installation.
3. If it is advised by the Supplier, apply a small amount of stabilizing agent to act as a tackifier, preventing separation of stone and soil materials during mixing and installation.
4. Install and compact growing media in appropriate lifts to the equivalent of a minimum of 95% proctor density from a standard compaction curve (ASTM D 698). If the moisture content of growing media exceeds the advised maximum, compaction should be delayed until moisture content is within the recommended range. Uncompacted engineered soil should be protected with plastic or plywood as directed by a Qualified Professional.
5. Engineered soil should be graded and immediately protected from contamination with plastic or plywood as directed by a Qualified Professional.
6. Engineered soil shall not be stockpiled for extended periods of time. Any engineered soil that is not installed immediately should be protected by a tarp or other waterproof covering to limit contamination and degradation from the elements.

5.6.3.2 Biofiltration Growing Media

1. The design of the biofiltration system (i.e. bioretention, swale, rain garden, etc.) shall be determined prior to the installation of any growing media. This includes decision making relevant to the use of inflow (e.g. modified curbs, spillways), outflow (e.g. perforated pipes) and overflow systems as well as other relevant design features.
2. Where possible, biofiltration systems should be installed once all other site construction is complete, the drainage area is stabilized, and vehicle mud tracking has ended.
3. Growing media depths required to accommodate the installation of planted vegetation shall be identified according to the requirements outlined in Table E.

5.8 Sampling Growing Media

Prior to any use or application, a composite sample of growing media, including all relevant components, shall be collected and sent to a reputable, independent Laboratory for biological, chemical, and physical property analysis. Within the context of Section 5 - Growing Medium, a composite sample refers to a representative soil sample composed of five smaller samples that are collected from across a particular section or area of the stockpile or site. Composite sampling applies to all growing media types (5.2 Types of Growing Media) and soil amendments (5.4.2 Soil Amendments) relevant to the sites intended use and application.

1. All growing media sampling shall be conducted by a Qualified Professional. Prior to sample collection, the Qualified Professional should contact the relevant reputable, independent Laboratory to verify all

sampling and handling methodologies as well as determine the total volume of sample required for analysis.

2. Multiple samples should be collected and combined in a resealable plastic sampling bag (i.e. zippered sandwich bags) capable of holding approximately 2 cups of material. The number of samples collected shall be based on the volume of growing media used, stockpile size and/or size of the site. Sampling intensity shall be defined according to growing media type, as follows:
    a. When sampling stockpiled topsoil, a minimum of five composite samples shall be taken from a stockpile volume of 200m^3 (260yd^3) or less . One composite sample shall be collected from the top, two from the middle and two from the base of the pile. One additional composite sample shall be collected for every additional 200m^3 (260yd^3), up to a maximum of 10 samples per stockpile (Figure 5.5). Sampling shall be conducted by removing the top 15cm of surface material and collecting from within the pile with an auger, trowel or shovel.

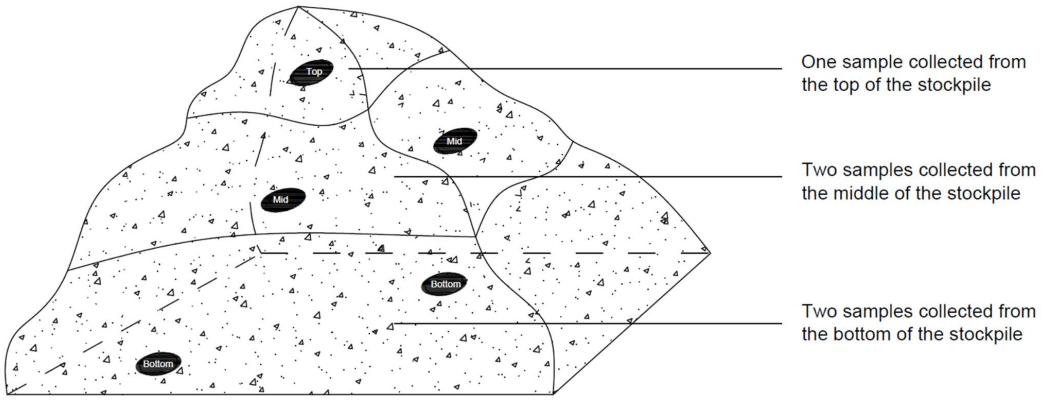


Figure 5.5. Methods for sampling stockpiled topsoil.

    b. When sampling restored in place topsoil and protected topsoil, a minimum of one composite sample shall be collected for every 4,000m^2 (10,760ft^2) of site area. Each sample should consist of a minimum of five subsamples, collected within a designated composite sampling zone (Figure 5.6). Additional samples should be collected to capture any variation that may be associated with major changes in site topography. Samples should be collected between 0 and 30cm (0 and 12") deep.

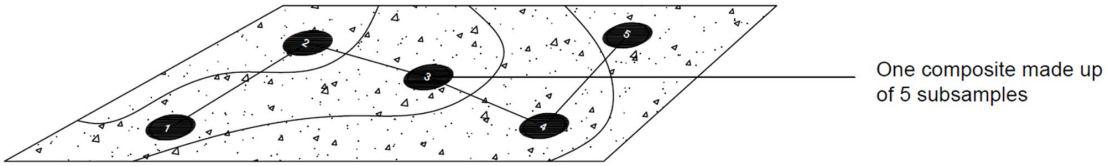


Figure 5.6. Methods for sampling restored in place and protected topsoil.

    c. When sampling imported topsoil, green roof media, and low impact development media, a minimum of three composite samples shall be collected from different sections of the growing media for volumes up to 200m^3 (260yd^3). One additional composite sample shall be collected for every additional 200m^3 (260yd^3) of growing media.

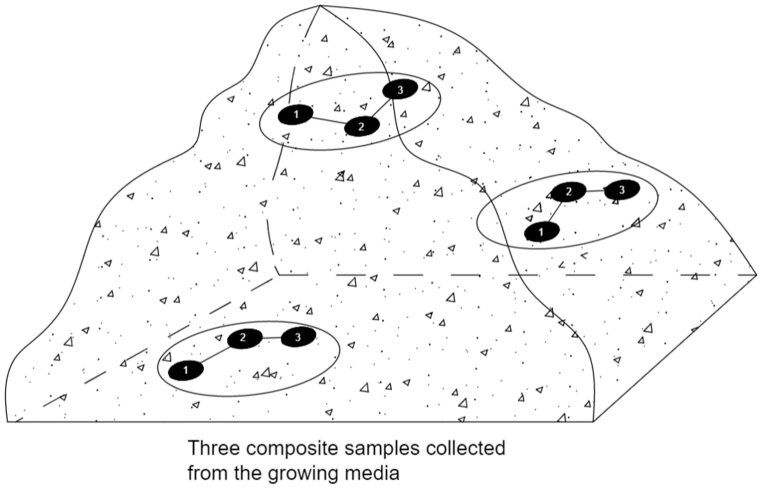


Figure 5.7. Methods for sampling imported topsoil, green roof media and low impact development media.

3. A representative sample of the final growing media should be collected and submitted for Laboratory testing and analysis. The Consultant, Primary Contractor and/or Landscape Architect is responsible for ensuring that the sample is representative of the final product that will or has been delivered to the site.

5.9 Requirements for Testing and Analyzing Growing Media

Section 5.9 Requirements for Testing and Analyzing Growing Media outlines the standard protocols and accepted methodologies that should be used to evaluate the biological, chemical and physical properties of all growing media types (5.2 Types of Growing Media). All growing media types shall adhere to the requirements referenced in Tables A through E as defined according to the intended use and application of the site (see Section 5.11 Growing Media Criteria Tables for more information).

5.9.1 Protocol for Testing and Analysis

1. All testing shall be conducted by a reputable, independent Laboratory, as identified by the Consultant, Primary Contractor and/or Landscape Architect. A reputable, independent Laboratory may include laboratories that are accredited by the CSA, ASTM International or CALA (Canadian Association for Laboratory Accreditation Inc.) and/or laboratories that are provincially-accredited, although accreditation is not explicitly required. In cases where accredited Laboratories (as outlined above) are not available, the Consultant, Primary Contractor and/or Landscape Architect shall identify a suitable alternative.
2. Failure to test and provide the associated documentation (ie. test results) should be considered grounds for rejection of any proposed growing media at the Contractor's expense.
3. In signing the contract, the Contractor is confirming that they have read, fully understand and will adhere to all requirements for growing media, including the associated testing of biological, chemical, and physical properties.
4. Wherever (i) landscape topsoil, (ii) green roof media, and (iii) low impact development media are used, the Contractor is required to test or coordinate the testing (for example, via the Soil Supplier) of all growing media. The cost of testing, as well as any costs associated with modifications to growing media that may arise as a result of testing, should be included in the service quote. All growing media shall be tested two months prior to delivery.

5. Once collected, all growing media samples and associated Laboratory testing analysis shall be approved by the relevant Authority prior to the installation of any growing media on site.
6. Follow up sampling, testing and analysis should be conducted following installation of growing media and prior to the seeding or planting any associated vegetation so as to confirm compliance with the Standard and verify that there have been no significant changes to the growing media subsequent to its initial testing.
7. A comprehensive list of approved Laboratory testing techniques relevant to growing media as referenced throughout Section 5 are outlined in Tables A through E (see Section 5.11 Growing Media Criteria Tables for more information).

5.10 Fertilizers and Biostimulants

1. Organic and/or inorganic fertilizers shall be applied as required, where growing media testing and analysis may support such intervention to improve the fertility of growing media such that it meets the requirements outlined in the current Standard.
2. Fertilizers shall be spread evenly over placed growing media with an appropriate mechanical spreader, after which they should be cultivated or raked to a minimum depth of 50mm (2").
3. There should be a minimum of three weeks between applications of granular or pelletized fertilizers (organic or inorganic). Any deviation from this required minimum is done at the discretion of a Qualified Professional according to the results of growing media testing and analysis and account for the type of fertilizer used. Consultation with a Qualified Professional is required in order to define the timing and dosage of any liquid fertilizer applications.
4. Biostimulants may be applied at the discretion of the Qualified Professional responsible for growing media. A biostimulant refers to any substance or microorganism applied to plants with the purpose of enhancing nutrient availability, abiotic stress tolerance and/or crop quality traits, regardless of its inherent nutrient content (e.g. mycorrhizal inoculants, beneficial bacteria, humic acids, etc.). There are a wide range of natural and synthesized biostimulants that have been used in landscape applications with varied success. It should be noted that some biostimulant products are species or plant specific. All biostimulants should be used according to the instructions provided by the Supplier.
5. Fertilizers and biostimulants shall be employed according to the intended use and application of the site, the type of growing media and the characteristics of planted vegetation. Inorganic fertilizers used for tree and shrub plantings should contain a minimum of 30-50% slow-release or water insoluble nitrogen.
6. The use of fertilizers and biostimulants should only be undertaken in consultation with a Qualified Professional, to ensure that the ecological integrity of the site is maintained.

5.11 Growing Media Criteria Tables

Growing media criteria tables outline the required ranges for the various biological, chemical and physical properties of growing media. The current Standard presents five distinct tables that characterize growing media requirements according to the intended use and application of the site. Table A describes the types of growing media as they relate to level of maintenance envisioned for the landscape.

Table B corresponds lawn areas, where it is generally recommended that growing media follow guidelines for imported topsoil/ growing media to accommodate the higher sand requirement. Table C corresponds to Planted areas in various contexts, whereby any of imported growing media, stockpiled topsoil, in-place soil restoration and protected topsoil guidelines may be applied. to maximize efficiency and minimize cost of growing media at larger scales. Table D is designed for use in over structure and green roof media applications, including but not limited to container planters, extensive, semi-intensive and intensive green roof systems. Finally, Table E should be used to identify the required properties and features of low impact development growing media.

Testing Standards:

Testing methods for evaluating final growing media and soil amendments

- ASTM C33 / C33M-16e1- Standard Specification for Concrete Aggregates
- ASTM D422 - Standard Test Method for Particle-Size Analysis of Soil
- ASTM D7928- Standard Test Method for Particle-Size Distribution (Gradation) of Fine-Grained Soils Using the Sedimentation (Hydrometer) Analysis (silt and clay fraction)
- ASTM F1632- Standard Test Method for Particle Size Analysis and Sand Shape Grading of Golf Course Putting Green and Sports Field Rootzone Mix
- ASTM D2974-14 - Standard Test Methods for Moisture, Ash, and Organic Matter of Peat and Other Organic Soils
- ASTM F1647-11 - Standard Test Methods for Organic Matter Content of Athletic Field Rootzone Mixes
- ASTM D4972-19- Standard Test Methods for pH of Soils
- TMECC- Test Method for the Examination of Composting and Compost (TMECC)
- Due to laboratory influences for nutrient and electrical conductivity methods, no standardized testing is included in this section. Testing methods for all nutrient and electrical conductivity analysis shall be included in the growing media report.

Table A. Level of Maintenance

Level 1 "Well-Groomed" Areas:			
Applications:	Low Traffic Lawn Areas, Trees & Large Shrubs	High Traffic Lawn Areas	Planting Areas
	LEVEL 1 Areas: Intensive, high standard of maintenance is anticipated. Irrigation is necessary in all Level 1 Areas and areas that are "on-slab" or under cover. The textural classification for these growing media by the Canadian system of soil classification is "sand" to "loamy sand". Plant selection, irrigation requirements and maintenance intensity should consistently respond to the exceptional nature of the growing medium.		
Level 2 "Groomed" and Level 3 "Moderate" Areas:			
Applications:	All Lawn and Planting Areas		
	LEVEL 2 and 3 Areas: Routine, high to moderate standard of maintenance is anticipated. Automatic irrigation is recommended; however, such areas can be adequately irrigated through consistent use of manual irrigation equipment. The textural classification for these growing media by the Canadian system of soil classification is "loamy sand" to "sandy loam". These growing media accommodate a wide selection of plants; they create a balance between good drainage and water retention and are suited to moderate, normal maintenance practices.		
Level 4 "Open Space/Play", Level 5 "Background & Natural" and Level 6 "Service & Industrial" Areas:			
Applications:	All Lawn and Planting Areas		
	LEVELS 4, 5, and 6 Areas: High standard of maintenance is not anticipated nor required. Irrigation may be provided, but more frequently watering is completed only for establishment. The textural classification for this growing medium by the Canadian system of soil classification is "sandy loam" to "loam". These soils provide a high-quality growing media, albeit with reduced percolation and resistance to compaction. These may be imported soils; however existing soils may meet these requirements, or it may be possible to amend them to meet the requirements. Plant selection shall respond to the limitations of the growing medium and to modest maintenance expectations. If growing media must be imported to augment existing site topsoil (due to insufficient volumes on site or damage to on-site topsoil by construction activities), the imported growing medium should be similar to the on-site soil and should be mixed with it. Different soil types should not be layered.		
Level 7 "Restoration and Level 8 "Aquatic" Areas:			
NOTE: Growing Medium details for Types restoration and aquatic are not available for this edition. Special requirements for these types should be specified in the contract documents.			

Table B1. Lawn Areas – South Coast of British Columbia

Applications / Level of Maintenance:	Low traffic Lawn	High Traffic Lawn	All Lawn Areas	All Lawn Areas
	Level 1 Maintenance / Well Groomed		Level 2 &3 Maintenance / Groomed	Level 4,5 & 6 Maintenance – Open Space / Natural Areas
Texture: **Coarse Gravel:** >19mm and <40mm	% of Dry Weight of Total Growing Med			
	0 – 1%			0 – 3%
All Gravel: > 2mm and <40mm	0 – 5%			0 – 10%
	% of Dry Weight of Growing Medium Excluding Gravel			
Sand: •Larger than 0.05mm •Smaller than 2mm	50 – 70%	70 – 90%	70 – 90%	30 – 70%
Silt: •Larger than 0.002mm •Smaller than 0.05mm	10 – 25%	5 – 15%	0 – 15%	15 – 50%
Clay: •Smaller than .002mm	0 – 20%	0 – 20%	0 – 15%	15 – 30%
Clay and Silt Combined	Maximum 25%	Maximum 25%	Maximum 25%	Maximum 60%
Organic Content: (by dry weight)	3-10%	3-5%	3-5%	2-10%
Drainage:	Percolation shall be such that no standing water is visible 60 minutes after at least 10 minutes of moderate to heavy rain or irrigation, or as otherwise specified.			
Acidity (pH)	6.0-7.0	6.0-7.0	6.0-7.0	6.0-7.0
EC dS/m (salinity)	< 3.0	< 3.0	< 3.0	< 3.0
Phosphorus (p) (ppm)	20 - 250	20 - 250	20 - 250	20 - 250
Potassium (K) (ppm)	50 - 1000	50 - 1000	50 - 1000	50 - 1000
Magnesium (Mg) (ppm)	100 – 300	100 – 300	100 – 300	100 – 300
Sodium (Na) (ppm)				
Nitrogen (N) (% by weight)	0.2 % - 0.6%	0.2 % - 0.6%	0.2 % - 0.6%	0.2 % - 0.6%
Carbon/Nitrogen Ratio	< 40:1	< 40:1	< 40:1	< 40:1

Table B2. Lawn Areas – Northern British Columbia and Prairies and Northern Territories

Applications / Level of Maintenance:	Low traffic Lawn	High Traffic Lawn	All Lawn Areas	All Lawn Areas
	Level 1 Maintenance / Well Groomed		Level 2 &3 Maintenance / Groomed	Level 4,5 & 6 Maintenance – Open Space / Natural Areas
Texture:	% of Dry Weight of Total Growing Med			
Coarse Gravel: >19mm and <40mm	0 – 1%			0 – 3%
All Gravel: > 2mm and <40mm	0 – 5%			0 – 10%
	% of Dry Weight of Growing Medium Excluding Gravel			
Sand: •Larger than 0.05mm •Smaller than 2mm	60 – 70%	60 –70 %	40 – 60%	40 – 60%
Silt: •Larger than 0.002mm •Smaller than 0.05mm	0 – 20%	0 – 20%	15 – 50%	15 – 50%
Clay: •Smaller than .002mm	0 – 20%	0 – 20%	15 – 30%	15 – 30%
Clay and Silt Combined	Maximum 40%	Maximum 40%	Maximum 60%	Maximum 60%
Organic Content: (by dry weight)	6 - 8%	6 - 8%	4 – 10%	4 – 10%
Drainage:	Percolation shall be such that no standing water is visible 60 minutes after at least 10 minutes of moderate to heavy rain or irrigation, or as otherwise specified.			
Acidity (pH)	6.0-8.0	6.0-8.0	6.0-8.0	6.0-8.0
EC dS/m (salinity)	< 2.0	< 2.0	< 2.0	< 2.0
Phosphorus (p) (ppm)	20 – 60	20 – 60	20 – 60	20 – 60
Potassium (K) (ppm)	130 – 500	130 – 500	130 – 500	130 – 500
Magnesium (Mg) (ppm)	100 – 300	100 – 300	100 – 300	100 – 300
Sodium (Na) (ppm)				
Nitrogen (N) (% by weight)	0.2 % - 0.6%	0.2 % - 0.6%	0.2 % - 0.6%	0.2 % - 0.6%
Carbon/Nitrogen Ratio	< 40:1	< 40:1	< 40:1	< 40:1

Table B3. Lawn Areas – Central Canada

Applications / Level of Maintenance:	Low traffic Lawn	High Traffic Lawn	All Lawn Areas	All Lawn Areas
	Level 1 Maintenance / Well Groomed		Level 2 &3 Maintenance / Groomed	Level 4,5 & 6 Maintenance – Open Space / Natural Areas
Texture: **Coarse Gravel:** >19mm and <40mm	% of Dry Weight of Total Growing Med			
	0 – 1%			0 – 3%
All Gravel: > 2mm and <40mm	0 – 5%			0 – 10%
	% of Dry Weight of Growing Medium Excluding Gravel			
Sand: •Larger than 0.05mm •Smaller than 2mm	65 – 75%	75 – 90%	65 – 75%	40 – 50%
Silt: •Larger than 0.002mm •Smaller than 0.05mm	13 – 30%	7 -22%	13 – 30%	13 – 30%
Clay: •Smaller than .002mm	3 – 15%	3 – 15%	3 – 15%	3 – 15%
Clay and Silt Combined	18 – 40%	18 – 40%	18 – 40%	18 – 40%
Organic Content: (by dry weight)	3-10%	3-10%	3-10%	3-10%
Drainage:	Percolation shall be such that no standing water is visible 60 minutes after at least 10 minutes of moderate to heavy rain or irrigation, or as otherwise specified.			
Acidity (pH)	6.0-8.0	6.0-8.0	6.0-8.0	6.0-8.0
EC dS/m (salinity)	< 2.0	< 2.0	< 2.0	< 2.0
Phosphorus (p)	10 – 60	10 – 60	10 – 60	10 – 60
Potassium (K)	80 – 250	80 – 250	80 – 250	80 – 250
Magnesium (Mg)	100 – 300	100 – 300	100 – 300	100 – 300
Sodium (Na)				
Nitrogen (%)	0.2 % - 0.6%	0.2 % - 0.6%	0.2 % - 0.6%	0.2 % - 0.6%
Carbon/Nitrogen	< 40:1	< 40:1	< 40:1	< 40:1

Table B4. Lawn Areas – Atlantic Canada

Applications / Level of Maintenance:	Low traffic Lawn	High Traffic Lawn	All Lawn Areas	All Lawn Areas
	Level 1 Maintenance / Well Groomed		Level 2 &3 Maintenance / Groomed	Level 4,5 & 6 Maintenance – Open Space / Natural Areas
Texture:	% of Dry Weight of Total Growing Med			
Coarse Gravel: >19mm and <40mm	0 – 1%			0 – 3%
All Gravel: > 2mm and <40mm	0 – 5%			0 – 10%
	% of Dry Weight of Growing Medium Excluding Gravel			
Sand: •Larger than 0.05mm •Smaller than 2mm	50 – 70%	70 – 90%	70 – 90%	30 – 70%
Silt: •Larger than 0.002mm •Smaller than 0.05mm	10 – 25%	5 – 15%	0 – 15%	15 – 50%
Clay: •Smaller than .002mm	0 – 20%	0 – 20%	0 – 15%	15 – 30%
Clay and Silt Combined	Maximum 25%	Maximum 25%	Maximum 25%	Maximum 60%
Organic Content: (by dry weight)	3-10%	3-5%	3-5%	2-10%
Drainage:	Percolation shall be such that no standing water is visible 60 minutes after at least 10 minutes of moderate to heavy rain or irrigation, or as otherwise specified.			
Acidity (pH)	6.0-7.0	6.0-7.0	6.0-7.0	6.0-7.0
EC dS/m (salinity)	< 3.0	< 3.0	< 3.0	< 3.0
Phosphorus (p) (ppm)	20 - 250	20 - 250	20 - 250	20 - 250
Potassium (K) (ppm)	50 - 1000	50 - 1000	50 - 1000	50 - 1000
Magnesium (Mg) (ppm)	100 – 300	100 – 300	100 – 300	100 – 300
Sodium (Na) (ppm)				
Nitrogen (N) (% by weight)	0.2 % - 0.6%	0.2 % - 0.6%	0.2 % - 0.6%	0.2 % - 0.6%
Carbon/Nitrogen Ratio	< 40:1	< 40:1	< 40:1	< 40:1

Table C1. Planted Areas – South Coast of British Columbia

Note 1: "On-slab" areas should be treated as LEVEL 1 areas, with corresponding increase in sand content and decrease in silts and clays.
Note 2: Trees and large shrub areas may also use lawn growing medium.

Applications / Level of Maintenance:	All Planted Areas Level 1 Maintenance / High	All Planted Areas Level 2 Maintenance / Medium	All Planted Areas Level 3 / Level 4 / Level 5 / Level 6 – Open Space / Natural Areas
Texture: **Coarse Gravel:** •Larger than 19mm •Smaller than 40mm	% of Dry Weight of Total Growing Med 0 – 1%		0 – 3%
All Gravel: •Larger than 2mm •Smaller than 40mm	0 – 5%		0 – 10%
Sand: •Larger than 0.05mm •Smaller than 2mm	% of Dry Weight of Growing Medium Excluding Gravel 50 – 70%	50 – 70%	30 – 70%
Silt: •Larger than 0.002mm •Smaller than 0.05mm	10 – 25%	10 – 25%	15 - 50%
Clay: •Smaller than .002mm	0 – 20%	0 – 25%	15 – 30%
Clay and Silt Combined	Maximum 25%	Maximum 25%	Maximum 60%
Organic Content: (by dry weight)	10-20%	10-20%	5-20%
Drainage:	Percolation shall be such that no standing water is visible 60 minutes after at least 10 minutes of moderate to heavy rain or irrigation, or as otherwise specified.		
Acidity (pH)	4.5-6.5	4.5-6.5	4.5-7.0
EC dS/m (salinity)	< 3.0	< 3.0	< 3.0
Phosphorus (p) (ppm)	20 - 250	20 - 250	20 - 250
Potassium (K) (ppm)	50 - 1000	50 - 1000	50 - 1000
Magnesium (Mg) (ppm)	100 – 300	100 – 300	100 – 300
Sodium (Na) (ppm)			
Nitrogen (N) (% by weight)	0.2 % - 0.6%	0.2 % - 0.6%	0.2 % - 0.6%
Carbon/Nitrogen Ratio	< 40:1	< 40:1	< 40:1

Table C2. Planted Areas – Northern British Columbia and Prairies and Northern Territories

Note 1: "On-slab" areas should be treated as LEVEL 1 areas, with corresponding increase in sand content and decrease in silts and clays.
Note 2: Trees and large shrub areas may also use lawn growing medium.

Applications / Level of Maintenance:	All Planted Areas Level 1 Maintenance / High	All Planted Areas Level 2 Maintenance / Medium	All Planted Areas Level 3 / Level 4 / Level 5 / Level 6 – Open Space / Natural Areas
Texture:	% of Dry Weight of Total Growing Med		
Coarse Gravel: •Larger than 19mm •Smaller than 40mm	0 – 1%		0 – 3%
All Gravel: •Larger than 2mm •Smaller than 40mm	0 – 5%		0 – 10%
Sand:	% of Dry Weight of Growing Medium Excluding Gravel		
•Larger than 0.05mm •Smaller than 2mm	50 – 70%	50 – 70%	35 – 60%
Silt: •Larger than 0.002mm •Smaller than 0.05mm	10 – 25%	10 – 25%	15 - 50%
Clay: •Smaller than .002mm	0 – 25%	0 – 25%	15 – 30%
Clay and Silt Combined	Maximum 50%	Maximum 50%	Maximum 65%
Organic Content: (by dry weight)	10-15%	10-15%	4-10%
Drainage:	Percolation shall be such that no standing water is visible 60 minutes after at least 10 minutes of moderate to heavy rain or irrigation, or as otherwise specified.		
Acidity (pH)	6.0-8.0	6.0-8.0	6.0-8.0
EC dS/m (salinity)	<4	<4	<2
Phosphorus (p) (ppm)	20 – 60	20 – 60	20 – 60
Potassium (K) (ppm)	130 – 500	130 – 500	130 – 500
Magnesium (Mg) (ppm)	100 – 300	100 – 300	100 – 300
Sodium (Na) (ppm)			
Nitrogen (N) (% by weight)	0.2 % - 0.6%	0.2 % - 0.6%	0.2 % - 0.6%
Carbon/Nitrogen Ratio	0.2 % - 0.6%	0.2 % - 0.6%	0.2 % - 0.6%

Table C3. Planted Areas – Central Canada

Note 1: "On-slab" areas should be treated as LEVEL 1 areas, with corresponding increase in sand content and decrease in silts and clays.
Note 2: Trees and large shrub areas may also use lawn growing medium.

Applications / Level of Maintenance:	All Planted Areas Level 1 Maintenance / High	All Planted Areas Level 2 Maintenance / Medium	All Planted Areas Level 3 / Level 4 / Level 5 / Level 6 – Open Space / Natural Areas
Texture: **Coarse Gravel:** •Larger than 19mm •Smaller than 40mm	% of Dry Weight of Total Growing Med 0 – 1%		0 – 3%
All Gravel: •Larger than 2mm •Smaller than 40mm	0 – 5%		5 – 10%
Sand: •Larger than 0.05mm •Smaller than 2mm	% of Dry Weight of Growing Medium Excluding Gravel 50 – 75%	50 – 75%	40 – 50%
Silt: •Larger than 0.002mm •Smaller than 0.05mm	20 – 40% (Total SSC will sum 100%)	20 – 40% (Total SSC will sum 100%)	15 - 50% (Total SSC will sum 100%)
Clay: •Smaller than .002mm	5 – 20%	5 – 25%	15 – 30%
Clay and Silt Combined	Maximum 25%	Maximum 25%	18 – 40%
Organic Content: (by dry weight)	4-6%	4-6%	2.5 - 5%
Drainage:	Percolation shall be such that no standing water is visible 60 minutes after at least 10 minutes of moderate to heavy rain or irrigation, or as otherwise specified.		
Acidity (pH)	6.0-8.0	6.0-8.0	6.0-8.0
EC dS/m (salinity)	<1.5 mmhos/cm	<1.5 mmhos/cm	<1.5 mmhos/cm
Phosphorus (p) (ppm)	10 – 60	10 – 60	10 – 60
Potassium (K) (ppm)	80 – 250	80 – 250	80 – 250
Magnesium (Mg) (ppm)	100 – 300	100 – 300	100 – 300
Sodium (Na) (ppm)			
Nitrogen (N) (% by weight)	0.2 % - 0.6%	0.2 % - 0.6%	0.2 % - 0.6%
Carbon/Nitrogen Ratio	0.2 % - 0.6%	0.2 % - 0.6%	0.2 % - 0.6%

Table C4. Planted Areas – Atlantic Canada

Note 1: "On-slab" areas should be treated as LEVEL 1 areas, with corresponding increase in sand content and decrease in silts and clays.
Note 2: Trees and large shrub areas may also use lawn growing medium.

Applications / Level of Maintenance:	All Planted Areas Level 1 Maintenance / High	All Planted Areas Level 2 Maintenance / Medium	All Planted Areas Level 3 / Level 4 / Level 5 / Level 6 – Open Space / Natural Areas
Texture:	% of Dry Weight of Total Growing Med		
Coarse Gravel: •Larger than 19mm •Smaller than 40mm	0 – 1%		0 – 3%
All Gravel: •Larger than 2mm •Smaller than 40mm	0 – 5%		0 – 10%
5 **Sand:**	% of Dry Weight of Growing Medium Excluding Gravel		
•Larger than 0.05mm •Smaller than 2mm	50 – 70%	50 – 70%	30 – 70%
Silt: •Larger than 0.002mm •Smaller than 0.05mm	10 – 25%	10 – 25%	15 - 50%
Clay: •Smaller than .002mm	0 – 20%	0 – 25%	15 – 30%
Clay and Silt Combined	Maximum 25%	Maximum 25%	Maximum 60%
Organic Content: (by dry weight)	10-20%	10-20%	5-20%
Drainage:	Percolation shall be such that no standing water is visible 60 minutes after at least 10 minutes of moderate to heavy rain or irrigation, or as otherwise specified.		
Acidity (pH)	4.5-6.5	4.5-6.5	4.5-7.0
EC dS/m (salinity)	< 3.0	< 3.0	< 3.0
Phosphorus (p) (ppm)	20 - 250	20 - 250	20 - 250
Potassium (K) (ppm)	50 - 1000	50 - 1000	50 - 1000
Magnesium (Mg) (ppm)	100 – 300	100 – 300	100 – 300
Sodium (Na) (ppm)			
Nitrogen (N) (% by weight)	0.2 % - 0.6%	0.2 % - 0.6%	0.2 % - 0.6%
Carbon/Nitrogen Ratio	< 40:1	< 40:1	< 40:1

Table D. Green Roof Media

Overview of the biological, chemical, and physical properties that shall be met by growing media to support healthy plant establishment and growth in green roof applications.

Parameter	Extensive	Semi-Intensive	Intensive
Proportion of fine components (≤ 0.063mm [Sieve No. 230]) (dry mass %)	≤ 10	≤ 15	≤ 20
Proportion of gravel (> 4mm [Sieve No. No. 5]) (dry mass %)	≤ 75	≤ 50	≤ 40
Maximum water-holding capacity (volume %)	20 - 65	35 - 65	45 - 65
Air-filled porosity (at max water-holding capacity (%))	≥ 10	≥ 10	≥ 10
Water permeability (saturated hydraulic conductivity (mm/hour))	>36	>36	>18
pH	6.0 - 8.5	6.0 - 8.5	6.0 - 8.5
Electrical Conductivity (soluble salt (mmhos/cm))	≤ 3.5	≤ 3.5	≤ 3.5
Organic Matter (g/L)	≤ 60	≤ 85	≤ 110

Testing methods for evaluating final growing media and soil amendments

- ASTM C33 / C33M-16e1- Standard Specification for Concrete Aggregates
- ASTM D422 - Standard Test Method for Particle-Size Analysis of Soil
- ASTM D2974-14 - Standard Test Methods for Moisture, Ash, and Organic Matter of Peat and Other Organic Soils
- ASTM E2399/E2399M-19 - Standard Test Method for Maximum Media Density for Dead Load Analysis of Vegetative (Green) Roof Systems
- ASTM D4972-19- Standard Test Methods for pH of Soils. Material not screened
- TMECC- Test Method for the Examination of Composting and Compost (TMECC)
- Due to laboratory influences for nutrient and electrical conductivity methods, no standardized testing is included in this section. Testing methods for all nutrient and electrical conductivity analysis shall be included in the growing media report.

Table E. Biofiltration Growing Media

Overview biological, chemical and physical properties that shall be met by the growing media for rainwater management while supporting healthy plant establishment.

Parameter	Very High Infiltration	High Infiltration	Moderate Infiltration
Proportion of Gravel Components (2.0 [Sieve No. 4] -4.75 [Sieve No. 10] mm) (dry mass %)	<10%	<10%	<10%
Sand Particle Size (dry mass %)	85-90%	75-85	65-75
Clay Particle Size (dry mass %)	<10%	3-12%	5-15%
Organic Matter (dry mass %)	3-5%	3-10%	3-10%
Saturated Hydraulic Conductivity (mm/hr)	75-300	50-250	25-100
pH	6.0-7.8	6.0-7.8	6.0-7.8
Electrical Conductivity (soluble salt (mmhos/cm))	<2.5	<2.5	<2.5
Available Phosphorus (ppm)	10-40	10-40	10-40

Testing methods for evaluating final growing media and soil amendments

- ASTM C33 / C33M-16e1- Standard Specification for Concrete Aggregates
- ASTM D422 - Standard Test Method for Particle-Size Analysis of Soil
- ASTM D7928- Standard Test Method for Particle-Size Distribution (Gradation) of Fine-Grained Soils Using the Sedimentation (Hydrometer) Analysis (silt and clay fraction)
- ASTM F1632- Standard Test Method for Particle Size Analysis and Sand Shape Grading of Golf Course Putting Green and Sports Field Rootzone Mix
- ASTM D2974-14 - Standard Test Methods for Moisture, Ash, and Organic Matter of Peat and Other Organic Soils
- ASTM F1647-11 - Standard Test Methods for Organic Matter Content of Athletic Field Rootzone Mixes
- ASTM D4972-19- Standard Test Methods for pH of Soils
- TMECC- Test Method for the Examination of Composting and Compost (TMECC)
- Due to laboratory influences for nutrient and electrical conductivity methods, no standardized testing is included in this section. Testing methods for all nutrient and electrical conductivity analysis shall be included in the growing media report.

Table F. Recommended Depths for Growing Media

Landscape Scenario	Recommended Minimum Depth (mm)																		
	100	150	200	250	300	350	400	450	500	550	600	650	700	750	800	850	900	950	1000
At Grade Landscape Areas																			
Low-traffic lawn (non-irrigated)		■	■	■	■														
Low-traffic lawn (Irrigated)		■	■																
High-traffic Lawn		■	■																
Ground Cover Areas						■	■	■	■										
Shrub Areas								■	■	■	■								
Trees											■	■	■	■	■	■	■	■	■
Over Structure Landscape Areas																			
Lawn Areas					■	■	■												
Ground Cover Areas								■	■	■	■								
Shrub Areas								■	■	■	■								
Trees														■	■	■	■	■	■
Low Impact Development Features																			
Engineered Soil - Trees																	■	■	■
Biofiltration								■	■	■	■	■	■	■	■	■	■		