Maine Society of Landscape Architects

Maine Landscape and Nursery Association

Maine Arborist Association

Specifications Update Project 2013

Planting and Grassing Sections

Plant Installation Details

MSLA
Maine Society of Landscape Architects

MELNA
Maine Landscape & Nursery Association

MAINE ARBORIST ASSOCIATION

Foreword

Over twenty years ago, a group of landscape industry professionals - landscape architects, designers, nurserymen, and contractors - came together to solve a growing issue in the industry. An increasing number of conflicts were arising in the field between specifier/designer and installer in landscape designs. The group found that the wisdom of designer and installer was not always shared, nor did it reflect current science and technology. In response, the group took on the task of reviewing the prevailing specifications and details for planting and grassing of the time, and revising them in model form to better reflect current industry standards and best practices.

Fast forward to the present and to a discussion between members of the Maine Section of the American Society of Landscape Architects (MSLA) and the Maine Landscape and Nursery Association (MELNA) in late 2008, and the recognition that times had changed since the efforts in the late 1980s. Maybe a revisiting of the previous work was in order?

Preface

The information presented herein is the result of that initial discussion and the ensuing years of research and revision. The specifications for planting and grassing are presented in Construction Specifications Institute (CSI) format, as it was decided that this is what is typically encountered in most projects. Other formats – federal, state DOT, etc. – were considered, as were adaptations made by individual offices. The overall goal was to align the most common specifications platform with current best industry practice. It is recognized that other formats exist, and that specifications will necessarily be tailored by the designer/specifier to the needs and requirements of individual clients, projects, and formats as needed. The details presented are "typical", again recognizing that project-based modification may be required. What these model specifications and details give, however, is the basis for creation and modification of individuals' own basis and understanding of contemporary design and installation practices.

As the study group tackled each aspect of the specifications and details, it strove to achieve consensus based upon the considerable collective wisdom and experience. The following concordance to the specifications includes discussion relative to individual subjects that are of particular note, highlighting areas of installation and design that are especially pertinent to current practice. It is the intent of this group to disseminate this information through the parent organizations to practitioners in Maine. It will also be sent to CSI per agreement, as well as related municipal and state level professionals.

Acknowledgements

I became aware of, and briefly participated in, that first "spec summit" back in the late 1980's. Keith French, ASLA (retired) with whom I worked, was involved as was the landscape architect for Lucas Tree, and others whose names I have since forgotten. In the fall of 2008, Mark Pendergast, with whom I was involved in a number of projects, and I were discussing current "hot topics" in the landscape industry. We recalled the efforts of the late 80's, and thought that now would be a good time to dust those old spec's off and bring them up to date, as there was a need to realign the design and installation components of the industry. On behalf of MSLA, I contacted then MELNA president Gretchen Richards about the possibility of another collaborative effort. The communication was warmly and positively received, notice went out to the two organizations inviting participation of interested individuals, and the first meeting of the task force was held at the offices of SMRT in Portland on December 11, 2008. The Maine Arborist Association (MAA) also participated and was well represented. The initial goals of the group were to:

- Develop an understanding of current design and installation detailing and specification norms
- Define and understand areas of conflict and commonality
- Develop solutions / resolution to areas of conflict
- Review and edit current specifications (CSI, latest edition suggested) and details
- Define potential new areas of interest for review and recommendations (ex: irrigation, urban street tree, manufactured soil)
- Establish distribution methodology of finished product to organization memberships and others (ex: municipalities for use in technical standards)

In hindsight, the ambitious schedule identified summer 2009 as the completion date. In reality, the complexity of the subject matter; the thoroughness of the group's research, discussion, and review; and the juggling of members' hectic schedules; led to a somewhat later conclusion. However, we believe the result was worth the wait, and hope that the professional discourse will continue as the industry practices evolve.

Our first meeting was attended by the following individuals.

- Jake Pierson (MELNA)
- Mark Pendergast (MELNA)
- Amy Bell Segal (MSLA)
- Charlotte Maloney (MSLA)
- Jeff Tarling (MELNA)(MAA)
- Tom Hoerth (MELNA)(MAA)
- Shelley Brunelle (MSLA)
- Tom Emery (MSLA)
- Barry Hosmer (MSLA)
- Andy Whitman (MELNA)
- Mark Johnson (MSLA)

Participation ebbed and flowed, with different persons contributing at different times. These most notably included:

- Anne Murphy (MELNA)
- Jesse O'Brien (MELNA)
- Elizabeth Listowich (MELNA)

For those I've omitted my sincerest apologies. For those who persevered till the final culmination of this project, my sincerest thanks.

Mark G. Johnson, ASLA
Maine Registered Landscape Architect

Discussion of the Specifications and Details

The following highlights elements of the specifications and details that were of particular interest to the group and include changes and evolution in practice, or larger project-related matters. Topics are grouped by part heading within each section and, though not exhaustive, reflect the consensus and direction of the task force.

A recurring topic throughout was that of communication. The group recognized that project delivery methods will vary, but appropriate and sufficient transfer of information between owner, designer/specifier, and contractor is critical not only in the bidding and construction phase, but in pre-design and post-construction. The designer can learn from the installer, and vice versa; and these lines of communication should transcend individual projects. Designers rely on installers for practical input about plant culture, latest cultivars and pest issues, and planting trends. Installers should rely on designers for critical project information, and an understanding of the overarching design goals and objectives that influence a project and its schedule. Though not always possible, early communication can help create a collaborative relation that will benefit the project and the players.

Section 032900 – PLANTS

Part 1 – General

1. Maintenance: The responsibility for and importance of proper maintenance is critical. This falls on the contractor prior to final acceptance and on the owner after final acceptance and during the warranty period. The contractor should provide information to the owner relative to general and special maintenance requirements of the landscape installation so that proper care can be procured. At this point it is the responsibility of the owner to provide sufficient care and maintenance, without which, warranty claims may be invalid. The task force felt that this item exemplifies the need for and importance of cross-discipline communication throughout the design and construction process, and beyond.

2. Soil Testing: Historically, testing of topsoil has been relegated to the general planting specifications and required as a submittal prior to construction and after bidding. This creates a gray area for the contractor pricing a project because the nature and amount of soil amendments is not known until after the contract for installation is

awarded. The task force recommends that testing be accomplished for on-site material during the geotechnical investigation (pre-design) phase of a project, and that the test results be included as information supplied to bidders. In this way, all can determine appropriate amendment amounts and include in the pricing. Additional refinement of testing of off-site soils has been included.

3. Planting Seasons and Conditions: The task force concluded that the practice of stipulating planting windows and time frames was generally not adhered to and largely ignored. Appropriate installation may occur at differing times depending upon locality, soils, weather conditions, etc. Project schedule requirements must be balanced with the good practice and judgment of the contractor, who must warranty the final product.

Part – 2: Products

1. Plants: The task force placed emphasis on obtaining plants from local nursery sources whenever possible, and to the greatest extent practicable, from within the project's climatic zone. Bare-root and container stock are specifically included.

2. Soil Amendments - general: The listing of organic and inorganic soil amendments in typical specifications has been revised to reflect current practice and environmental sensitivities. This part also specifically relates use of any amendment to soil testing results

3. Soil Amendments – specific:

    a. Mychorrizal Fungi: The benefits of the use of mychorrizal fungi have been documented for both typical landscape planting and land reclamation. The task force recognized its importance in new installation and reinvigoration of existing plantings, noting that its use is prevalent in the industry, adds nominal cost, and helps reduce warranty replacement.

b. Compost: The task force engaged University of Maine resources in refining requirements for compost composition and testing.

4. Soils: The inclusion and differentiation of the variety of soils that may be utilized in a given project recognizes the differing conditions that the designer/specifier may encounter. The native soil structure may be left largely intact in some areas, and may be drastically altered through significant grading operations. What is left in many instances is a subgrade that is 'C horizon' or below, upon which many times a thin layer of topsoil is placed, with the expectation that landscape planting will thrive. Similarly, in large paved conditions such as parking and roadway development where planting areas are placed, special attention is required in both the detailing and specification of the planting zone to insure proper plant support and growth. The designer/specifier may need to address these conditions on other plans (grading, layout, etc.) and related specifications sections. Included in this section is the definition of topsoil, compost manufactured topsoil, plant bed media, and skeletal/structural soil. Further types are identified and undefined as they will be more project-specific. These include container plant mix and lightweight planting soil.

Part 3 – Execution

1. Plant Bed Preparation and Excavation: As discussed above, the requirement for appropriate soil volume to support and maintain plant growth is emphasized.

2. Planting - general: In general for all types of plants, major emphasis is placed on the identification of the root flare and the proper relation of it to surrounding finished grade.

3. Planting – specific:

a. Tree support: Reflecting a long-running industry discussion, use of tree support, whether by guying, staking, or root ball stabilization, is called for only when necessary due to special conditions or requirements.

b. Tree wrap: Tree wrap is eliminated due to lack of benefit and corresponding practice.

c. Mulch: Nominal mulch depths are specified as is proper relation of mulch to plant stem. NOTE: Though falling under the category of continued maintenance practice, it is recognized that excessive amounts of mulch are used in many instances (the “volcano effect”). This practice is to be discouraged as it detracts from the health of the plant and is wasteful of material.

d. Weed-control Barrier: Except for use in extensive areas to be mulched but unplanted, use of weed-control barrier is not recommended as it can prevent or slow water penetration into planting beds, and more often than not becomes exposed and unsightly.

Section 329200 – TURF AND GRASSES

Part 1 – General: This section mirrors to great extent the revisions to Part 1 in the Planting specification.

1. Proper reference to and definition of turf grass in accordance with industry standards is made throughout the specification.

2. Conditions concerning use of sod are better and more accurately defined.

3. Planting Season: The preferred time of planting for grass seed is defined as late summer through early fall, the latter being preferred. Wetland seed, however, is best planted in the spring. Sod installation is as specified for plants.

Part 2 – Products

1. Seed and sod:

    a. Acceptable purity, germination, and weed seed percentages are revised.

    b. Species selection was recognized by the task force as being highly variable, much as is a planting design for a specific project. It is suggested that the designer/specifier research and develop mix designs for both general and specific applications as needed with the assistance of knowledgeable and qualified turf grass suppliers and personnel.

2. Amendments and Soils: Revisions and additions to 329300 PLANTS similarly apply.

Part 3 – Execution

1. Preparation: Over-compaction is perhaps one of the biggest detriments to proper turf grass (and plant) establishment and survival. Emphasis

here is placed on proper preparation of subgrade and installation of planting media.

2. Hydroseeding: Revisions to this section recognize the prevailing use of pre-manufactured mixes and emphasizes adherence to their makers' requirements. Maintenance of appropriate moisture is further emphasized as being a critical component in seed establishment.

Details

Installation details are provided illustrating standard techniques for tree, shrub, and perennial/groundcover planting. Differing slope conditions are shown, as are tree stabilization methods, when required. The details reflect general industry practice and are consistent with these specifications. Project-specific or special installation details will be the responsibility of the designer/specifier.

Conclusion

It is intended that the use of these specifications and details by the individual designer/specifier is to be by way of guidance and information in their own professional practice and application. The information presented herein represents the combined understanding of the current state of the landscape industry in Maine of the individuals participating and does not necessarily reflect that of all participating organizations' membership. These practices will continue to evolve as do the related professions. As such, it is the responsibility of the designer/specifier to use this information appropriately.

329200 TURF AND GRASSES

SECTION 329200 – TURFGRASSES

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and Division 01 Specifications Sections, apply to this Section

1.2 SUMMARY

A. Section Includes:
   1. Seeding.
   2. Sodding.

B. DESCRIPTION OF WORK

   1. Provide all materials and equipment, and do all work required to complete the loaming, seeding and sodding including furnishings and placing topsoil, as indicated on the Drawings and as specified.

C. RELATED WORK

   1. Examine Contract Documents for requirements that affect work of this Section. Other Specification Sections that directly relate to work of this Section include, but are not limited to:

      a. Section 312000 – EARTH MOVING.

1.3 DEFINITIONS

A. Compaction: A loss of soil aggregates; destroyed aeration pore spaces; crushed or collapsed pore spaces; and, undergone extensive resorting and packing of soil particles.

B. Duff Layer: The surface layer of native topsoil that is composed of mostly decayed leaves, twigs, and detritus.

C. Finish Grade: Elevation of finished surface of planting soil.

D. Manufactured Topsoil: Soil produced off-site by homogeneously blending mineral soils or sand with stabilized organic soil amendments to produce topsoil or planting soil.

E. Pesticide: A substance or mixture intended for preventing, destroying, repelling, or mitigating a pest. This includes insecticides, miticides, herbicides, fungicides, rodenticides, and

molluscicides. It also includes substances or mixtures intended for use as a plant regulator, defoliant, or desiccant.

F. Pests: Living organisms that occur where they are not desired or that cause damage to plants, animals, or people. These include insects, mites, grubs, mollusks (snails and slugs), rodents (gophers, moles, and mice), unwanted plants (weeds), fungi, bacteria, and viruses.

G. Planting Soil: Standardized topsoil; existing, native surface topsoil; existing, in-place surface soil; imported topsoil; or manufactured topsoil that is modified with soil amendments and perhaps fertilizers to produce a soil mixture best for plant growth.

H. Subgrade: Surface or elevation of subsoil remaining after excavation is complete, or top surface of a fill or backfill before planting soil is placed.

I. Subsoil: All soil beneath the topsoil layer of the soil profile, and typified by the lack of organic matter and soil organisms.

J. Surface Soil: Whatever soil is present at the top layer of the existing soil profile at the Project site. In undisturbed areas, the surface soil is typically topsoil, but in disturbed areas such as urban environments, the surface soil can be subsoil.

K. Turfgrass: A contiguous community of grass plants that have the ability to withstand mowing and reasonable foot traffic.

1.4 REFERENCES

A. Comply with applicable requirements of the following standards. Where these standards conflict with other specified requirements, the most restrictive requirements shall govern.

1. American Society for Testing and Materials (ASTM)

C 136 Sieve Analysis of Fine and Coarse Aggregates

E 11 Wire-Cloth Sieves for Testing Purposes

1.5 SUBMITTALS

A. Samples: The following samples shall be submitted:

Material	Quantity (lb.)
Topsoil	1
Composted Soil Admixture	1
Fertilizer	1

B. Manufacturer's Product Data: Manufacturer's product data shall be submitted for the following materials if to be used on the project:

Aluminum sulfate
Fertilizer

Lime

C. Certificates: Labels from the manufacturer's container certifying that the product meets the specified requirements shall be submitted for the following materials:

Grass seed mix (each)	Commercial fertilizer
Ground limestone	Seed mix for sod

D. Gradation and laboratory analysis: Gradation of granular materials shall be determined in accordance with ASTM C 136. Sieves for determining material gradation shall be as described in ASTM E 11. Test results that meet the specified requirements shall be submitted for the following materials:

Topsoil without Admixture
Topsoil with Admixtures

1.6 QUALITY ASSURANCE

A. Installer's Field Supervision: Require Installer to maintain an experienced full-time supervisor on Project Site when work is in progress.

1. Pesticide Applicator: State licensed, commercial.

B. Soil Analysis:

1. Unless otherwise provided, the Contractor shall engage an independent testing agency, experienced in the testing of agricultural soils and acceptable to the Landscape Architect, to perform the following tests and analyses:

Material	Tests and Analysis Required
Soils	Mechanical analysis of soil indicating the percent passing by weight of the following sieve sizes: 1 in., 1/2 in., No. 4, No. 10, No. 100, and No. 200. Determination of pH, organic content, and nutrient content. Recommendations shall be made by the testing agency as to the type and quantity of soil additives required to bring pH, organic content, and nutrient content to satisfactory levels for planting and grassing.
Organic Amendments	Determination of moisture absorption capacity, organic matter content, and pH.

2. Report presence of problem salts, minerals, or heavy metals; if present, provide additional recommendations for corrective action.

3. Gradation of granular materials shall be determined in accordance with ASTM C 136. Sieves for determining material gradation shall be as described in ASTM E 11.

C. Turfgrass:

1. The Contractor shall provide quality, genus, species, and variety of turfgrass indicated.

2. No changes or substitutions may be made without prior approval by the Landscape Architect, and municipal authority, if applicable.

D. Owner's Inspection And Testing

Work may be subject to inspection at any time by the Landscape Architect. The Owner reserves the right to engage an independent testing laboratory in accordance with requirements of Section 140000 – QUALITY CONTROL to analyze and test materials used in the construction of the work. Where directed by the Landscape Architect, the testing laboratory will make material analyses and will report to the Landscape Architect whether materials conform to the requirements of this specification.

1. Cost of tests and material analyses made by the testing laboratory will be borne by the Owner when they indicate compliance with the specification, and by the Contractor when they indicate non-compliance.

2. Testing equipment will be provided by and tests performed by the testing laboratory. Upon request by the Landscape Architect or Owner, the Contractor shall provide such auxiliary personnel and services needed to accomplish the testing work and to repair damage caused thereto by the permanent work.

E. Contractor's Inspection And Testing

1. Testing, analyses, and inspection required by the Contractor for his own information or guidance shall be at his own expense.

2. Materials shall not be used in construction until test results have been reviewed by the Landscape Architect.

1.7 DELIVERY, STORAGE, AND HANDLING

A. Seed and Other Packaged Materials:

1. Deliver packaged materials in original, unopened containers showing weight, certified analysis, name and address of manufacturer, and indication of conformance with state and federal laws, as applicable.

2. Deliver fertilizer in sealed waterproof bags, printed with manufacturer’s name, weight, and guaranteed analysis.

B. Sod: Turfgrass sod is a living, perishable product. Generally, all sod should be unrolled within 24 to 30 hours from time of harvest. During periods of 85 F degree (29 C) or higher, additional efforts must be made to reduce the amount of time between harvest and unrolling. Protect sod from breakage and drying.

1. Harvesting Sod:

    a. Sod shall not be harvested at the nursery or approved source until ready to transport sod to the site of the work or acceptable storage location.

    b. Before harvesting, sod shall be mowed at a uniform height of 2 in. (50 mm) or as required.

    c. Cut sod to consistent width and length as specified.

2. Transportation of Sod:

    a. Sod transported to the Project in open vehicles shall be covered with tarpaulins or other suitable covers securely fastened to the body of the vehicle to prevent injury. Closed vehicles shall be adequately ventilated to prevent overheating of the sod.

    b. Evidence of inadequate protection following the digging, carelessness while in transit, or improper handling or storage, shall be cause for rejection.

    c. Sod shall be kept moist, fresh, and protected at all times. Such protection shall encompass the entire period during which the sod is in transit, being handled, or is in temporary storage.

    d. Upon arrival at the temporary storage location or the site of the work, sod material shall be inspected for proper shipping procedures. Should the grass reach the permanent wilt point, the Landscape Architect will reject the sod. When sod has been rejected, the Contractor shall at once remove it from the area of the work and replace it with acceptable material.

    e. Unless otherwise authorized by the Landscape Architect, the Contractor shall notify the Landscape Architect at least two working days in advance of the anticipated delivery date of sod material. Certificate of Inspection when required shall accompany each shipment.

3. Handling and Storage of Sod:

    a. Sod material shall be handled with extreme care to avoid breaking or tearing strips.

    b. Sod shall not be stored for longer than 24 hours prior to installation unless approved by the Landscape Architect. Sod shall be stored in a compact group and shall be kept moist. Sod shall be prevented from freezing.

    c. Sod that has been damaged by poor handling or improper storage will be rejected by the Landscape Architect.

1.8 PLANTING SEASON AND CONDITIONS

A. Planting season for seeding shall be as follows:

Item	Planting Period
Seed Mix	Late summer, early fall preferred
Wetland Seed Mix	Spring preferred; increase rates /straw mulch per mfr. recommendations

B. Planting season for sod shall be all season, except on frozen soil.

C. Planting shall only be performed when weather and soil conditions are suitable for planting the material specified in accordance with locally accepted practice.

1.9 MAINTENANCE

A. Turfgrass shall be maintained by the Contractor until Substantial Completion, as described in Part 3 of this Section.

B. Following Substantial Completion, maintenance of turfgrass shall become the Owner's responsibility with the following provisions.

1. The Contractor shall provide Owner with written recommended maintenance program at time of Substantial Completion.

2. The Contractor may make as many periodic inspections as necessary during the guarantee period, at no additional cost to the Owner, to inspect the condition of all plant materials. Submit written report of each inspection to the Landscape Architect and Owner outlining corrective measures required to keep the guarantee valid.

1.10 ACCEPTANCE

A. Acceptance:

1. The Landscape Architect will inspect all work for Substantial Completion upon written request of the Contractor. The request shall be received at least ten calendar days before the anticipated date of inspection.

2. Acceptance of material by the Landscape Architect will be for general conformance to specified requirements, and shall not relieve the Contractor of responsibility for full conformance to the Contract Documents.

3. Upon satisfactory completion and re-inspection of all repairs or renewals necessary in the judgment of the Landscape Architect, the Landscape Architect will recommend to the Owner that the work of this Section be accepted.

B. Sod and seed areas will be accepted when in compliance with all the following conditions:

1. Roots are thoroughly knit to the soil;

2. Absence of visible joints (sodded areas);

3. All areas show a uniform stand of specified grass in healthy condition, individual bare spots of under 72 square inches or multiple bare spots not in excess of 1 percent of the area.

4. At least 60 days have elapsed since the completion of work under this Section, or as approved by the Landscape Architect.

5. A minimum amount of weeds may be acceptable, commensurate with the intended use.

PART 2 - PRODUCTS

2.1 SEED

A. Seed: Fresh, clean, dry, new-crop seed with clear percentages of the pure live seed (PLS) and bulk seed present.

B. Turfgrass: It shall be standard grade seed of the most recent season's crop, with 0.5 percent or less weed seed, 1.75 percetnt or less crop seed by weight, and minimum 95 percent purity with minimum 85 percent germination. Seed shall be dry and free of mold. Seed shall meet the following requirements.

C. Turf Grass Seed Species: Provide as follows:

1. Full Sun: <**Insert species**>.

2. Partial Shade: <**Insert species**>.

3. Shade: <**Insert species**>.
4. Turf Grass Seed Mix: Proprietary seed mix as follows:
   a. Products: Subject to compliance with requirements, [provide the following] [provide one of the following] [available products that may be incorporated into the Work include, but are not limited to, the following]:
      1) <Insert manufacturer's name; product name or designation>.

2.2 TURFGRASS SOD

A. Turfgrass Sod: [**Certified**] [**Approved**] [**Number 1 Quality/Premium, including limitations on thatch, weeds, diseases, nematodes, and insects**], complying with "Specifications for Turfgrass Sod Materials" in Turfgrass Producers International's (TPI) "Guideline Specifications to Turfgrass Sodding." Furnish viable sod of uniform density, color, and texture, strongly rooted, and capable of vigorous growth and development when planted.

B. Turfgrass Species: Sod shall be comprised of grass species as follows:

1. Full Sun: Proportioned by weight as follows: <**Insert species**>.

2. Sun and Partial Shade: Proportioned by weight as follows: <**Insert species**>.

3. Shade: Proportioned by weight as follows: <**Insert species**>.

C. Sod shall be nursery grown on cultivated mineral agricultural soils. Sod shall have been mowed regularly and carefully, and otherwise maintained from planting to harvest.

D. Thickness of Cut: Sod shall be machine cut at a uniform soil thickness of a 5/8 inch (16 mm), plus or minus a ¼ inch (6 mm), at the time of cutting. Measurement for thickness shall exclude top growth and thatch.

E. Section Size: Individual pieces of sod shall be cut to the supplier's standard width and length. Maximum allowable deviation from standard widths and lengths shall be plus or minus a ½ inch (12 mm) on width, and plus or minus 5 percent on length. Broken strips and torn and uneven ends will not be acceptable.

F. Strength of Sod Strips: A standard section of sod, 6 feet (2 m) in length, shall be strong enough to support its own weight and retain its size and shape during installation.

G. Moisture Content: Sod shall not be harvested or transplanted when moisture content (excessively dry or wet) may adversely affect its survival.

H. Time Limitations: Sod shall be harvested, delivered, and transplanted within 24 to 30 hours from time of harvest unless a suitable preservation method is approved prior to delivery or as weather conditions warrant. Sod not transplanted within this period shall be inspected and approved by the Landscape Architect prior to its installation.

I. Diseases, Nematodes, and Insects: Sod shall not exhibit symptoms of diseases, nematodes, or soil-borne insects.

J. Weeds: A minimum amount of weeds may be acceptable, commensurate with the intended use.

2.3 INORGANIC SOIL AMENDMENTS

A. Lime: ASTM C602, agricultural liming material containing a minimum of 80 percent calcium carbonate equivalent, by weight. Class T is more finely ground and quicker acting but dustier than Class O.

B. Sulfur: Granular, biodegradable, and containing a minimum of 90 percent sulfur.

C. Iron Sulfate: Granulated ferrous sulfate containing a minimum of 20 percent iron and 10 percent sulfur.

D. Aluminum Sulfate: Commercial grade, unadulterated.

E. Perlite: Horticultural perlite, soil amendment grade.

F. Agricultural Gypsum: Minimum 90 percent calcium sulfate, finely ground with 90 percent passing through No. 50 (0.30-mm) sieve.

G. Sand: Clean, washed, natural or manufactured angular grains, free of toxic materials.

2.4 ORGANIC SOIL AMENDMENTS

A. Compost: An organic substance produced by the biological and biochemical decomposition of source separated organic materials that may include leaves and lawn trimmings, food or industrial residuals, and/or municipal biosolids. The product shall not contain levels of substances toxic to plants and shall be reasonably free (< 1 percent by dry weight) of man-made foreign matter. It shall be well-composted, stable, and substantially weed-free organic matter, pH range of 5.5 to 8 percent, moisture content 35 to 55 percent by weight; soluble salt content of <3 mmhos/cm or <3 decisiemens/m and free of substances toxic to plantings; and as follows:

1. The compost stock must mature for a minimum of 90 days. During this time, the compost stock shall achieve thermophilic temperatures (175 to 180 degrees F, 79 to 82 degrees C) for 15 days; multiple turnings may be required for the entire stockpile. A Solvita test may be requested to determine the maturity and stability of the compost.

2. Frozen or muddy compost shall be unacceptable for use.

B. Sphagnum Peat: Partially decomposed sphagnum peat moss, finely divided or of granular texture, with a pH range of 3.4 to 4.8.

C. Muck Peat: Partially decomposed moss peat, native peat, or reed-sedge peat, finely divided or of granular texture, with a pH range of 6 to 7.5, and having a water-absorbing capacity of 1100 to 2000 percent. Peat is an acceptable alternative to composted soil admixtures to increase organic content. Additional lime in the pelletized form shall be provided to readjust the pH.

D. Wood Derivatives: Decomposed, nitrogen-treated sawdust, ground bark, or wood waste; of uniform texture and free of chips, stones, sticks, soil, or toxic materials.

E. Manure: Well-rotted, unleached, stable cattle manure containing not more than 25 percent by volume of straw, sawdust, or other bedding materials; free of toxic substances, stones, sticks, soil, weed seed, and material harmful to plant growth.

F. Mycorrhizal Fungi: Dry, organic, granular root stimulant/inoculant containing at least 5300 spores per pound (0.45 kg) of vesicular-arbuscular mycorrhizal fungi and 95 million spores per pound (0.45 kg) of ectomycorrhizal fungi, 33 percent hydrogel, and a maximum of 5.5 percent inert material.
   1. Mycorrhizal fungi amendment shall be manufactured by one of the following, or approved equivalent:
      a) Roots
      b) Plant Health Care
      c) Mycorrhizal Applications of Oregon

2.5 FERTILIZERS

A. Commercial Fertilizer: Commercial-grade complete fertilizer of neutral character, consisting of fast- and slow-release nitrogen. Nitrogen (N), Phosphorus (P) and Potassium (K) in amounts recommended in soil test results.

B. Slow-Release Fertilizer: Granular or pelleted fertilizer consisting of 50 percent water-insoluble nitrogen, phosphorus, and potassium in amounts recommended in soil test results.

2.6 PLANTING MEDIA

A. Topsoil, whether stripped from site or supplied from off-site, shall be a sandy loam or loam soil as defined by the USDA Soil Conservation Service, Soil Classification System, and shall have the following mechanical analysis:

Textural Class	% of Total Weight	Average %
Sand (0.05-2.0 mm dia. range)	45 to 75	60
Silt (0.002-0.05 mm dia. range)	15 to 35	25
Clay (less than 0.002 m dia. range)	5 to 25	15

1. 95 percent of topsoil shall pass a .07 inch (2.0 mm) sieve.
2. Topsoil shall be free of stones 1 in (2.5 cm) in longest dimension, earth clods, plant parts, and debris. All topsoil shall be screened using a 3/8 inch (9.5 mm) screen.
3. Organic matter content shall be an average of 8 percent of total dry weight with a minimum of any sample being 6 percent.
4. Topsoil shall have a pH value range of 6.0 to 6.5.
    A. If planting soil mixture does not fall within the required pH range, limestone or aluminum sulfate shall be added to bring the pH within the specified limit.
    B. If pH is below desired level add ground limestone. If pH is above desired level add aluminum sulfate.

B. Compost Manufactured Topsoil: Uniform mixture of compost and base soil to achieve the compost manufactured topsoil product consisting of the following ingredients:

1. Compost: See above, Section 2.4, A.
2. Base soil: Topsoil and/or other soils (clay, silt, sand sand, sandy loam, or loamy sand in texture according to USDA soil classification. It shall be free of stones, clods, plant parts, weeds, and other debris >2 inches (50 mm) in any dimension. It shall not contain levels of substances that shall inhibit or be harmful to plant growth.

    a. Product Parameters:

Parameter	Compost	Base Soil	Compost Manufactured

			Topsoil
pH	6.0-8.5	5.0-8.0	6.0-7.8
% Organic Matter	<40%	0-5%	6-20%
Particle Size	<1" (25 mm)	<2" (50 mm), USDA Class: sand, sandy loam, loamy sand	<2" (50 mm), USDA Class: sand, sandy loam, loamy sand
Salts/conductivity	Varies; must be reported	<2mmhos/cm after handling, placement & rainfall	<2mmhos/cm after handling, placement & rainfall
Carbon: Nitrogen Ratio	15-25:1	N/A	N/A

2.7 WATER

A. Water shall be suitable for irrigation and free from ingredients harmful to seeded or sodded areas.

2.8 MULCHES

A. Straw Mulch: Provide air-dry, clean, mildew- and seed-free, salt hay or threshed straw of wheat, rye, oats, or barley.

B. Hay Mulch: Provide air-dry, clean, mildew- and seed-free, salt hay or threshed straw of wheat, rye, oats, or barley.

C. Sphagnum Peat Mulch: Partially decomposed sphagnum peat moss, finely divided or of granular texture, and with a pH range of 3.4 to 4.8.

C. Muck Peat Mulch: Partially decomposed moss peat, native peat, or reed-sedge peat, finely divided or of granular texture, with a pH range of 6 to 7.5, and having a water-absorbing capacity of 1100 to 2000 percent.

D. Compost Mulch: Well-composted, stable, and weed-free organic matter 50 to 60 percent of dry weight; pH range of 5.5 to 8; moisture content 35 to 55 percent by weight; 100 percent passing through 1-inch (25-mm) sieve; soluble salt content of [**2 to 5**] <**Insert range or value**> decisiemens/m; not exceeding 0.5 percent inert contaminants and free of substances toxic to plantings.

E. Fiber Mulch: Biodegradable, dyed-wood, cellulose-fiber mulch; nontoxic and free of plant-growth or germination inhibitors; with a maximum moisture content of 15 percent; and a pH range of 4.5 to 6.5.

2.9 CHEMICAL PRODUCTS

A. General: Pesticides, herbicides, fungicides, bactericides or any other chemical compounds shall be registered and approved by EPA, acceptable to authorities having jurisdiction, and of type recommended by manufacturer for each specific problem and as required for Project conditions and application. Do not use restricted pesticides unless a licensed and authorized applicator is present. Also applications will only be done with permission in writing by authorities having jurisdiction if applicable.

1. Pre-Emergent Herbicide (Selective and Non-Selective): Effective for controlling the germination or growth of weeds within planted areas at the soil level directly below the mulch layer.

2. Post-Emergent Herbicide (Selective and Non-Selective): Effective for controlling weed growth that has already germinated.

3. Fungicide: Shall be zinc ethylene bisdithiocarbonate (Zineb), or equal, appled at manufacturer's suggested rates.

PART 3 - EXECUTION

3.1 PREPARATION OF SUBGRADE

A. Subgrade shall be examined to ensure that rough grading and all other subsurface work in lawn areas and other areas to be seeded is done prior to start of finish grading.

B. Existing subgrade shall be loosened or scarified to a minimum depth of 8 inches (20 cm), or as required to alleviate excessive soil compaction, prior to spreading topsoil. Subgrade shall be brought to true and uniform grade, and shall be cleared of stones greater than 2 inches (5 cm), sticks, and other extraneous material.

3.2 PREPARATION OF TOPSOIL

A. Topsoil shall not be spread until it is possible to follow immediately or within 24 hours with seeding or sodding operations. If topsoil is spread prior to this time it shall be cultivated to loosen soil prior to seeding or sodding.

B. Topsoil shall not be placed when subgrade or topsoil material are frozen, excessively wet, or excessively dry.

C. Topsoil shall be spread in a uniform layer, to a thickness, which will compact to the depth required to bring final lawn and grass surfaces to required elevation. Unless otherwise indicated minimum depth of topsoil shall be 6 inches (15 cm) after compaction.

D. Surfaces shall be graded and smoothes, eliminating all sharp breaks by rounding, scraping off bumps and ridges, and filling in holes and cuts.

3.3 FINISH GRADING

A. Final surface of topsoil immediately before seeding shall be within ± 1/2 inch (13 mm) of required elevation, with no ruts, mounds, ridges, or other faults, and no pockets or low spots in which water can collect. Stones, roots, and other debris greater than 1 in. in any dimension, which are visible at the surface, shall be removed and the resulting holes filled with topsoil, leaving a uniform planar surface.

B. Finish grade surface with a drag or rake. Round out all breaks in grade, smooth down all lumps and ridges; fill in all holes and crevices. Rolling with a light roller is acceptable, if the surface is scarified afterward.

C. In the event of settlement, the Contractor shall readjust the work to required finished grade.

3.4 SEED APPLICATION

A. Seed shall be broadcast by means of an approved mechanical seeder, to give a uniform application at the following rates:

Seed Application Rate	lb./1,000 square feet (kg./sq. m.)
[Specifier to insert seed types and rates]	

B. Seed shall be applied in two equal applications for uniform coverage; direction of travel of spreader for second pass shall be perpendicular to that of the first pass. Seeding shall not be done when it is raining or snowing, or when wind velocity exceeds 5 miles per hour. (8 km/h)

C. Following seeding the area shall be lightly raked to incorporate seed with top 1/8 to 1/4 inch (3 mm to 6 mm) of soil. Area shall then be fine graded. Stones and other debris greater than 1 in. in any dimension which are visible on surface shall be removed. Surface shall be rolled with a hand roller having a weight of 60 to 90 pounds per foot (27 to 40 kg) of width, and a minimum diameter of 2 feet (0.6 m)

D. Mulch seeded areas to prevent erosion and to protect seed from hot or dry weather or drying winds.

E. Following seeding, raking and rolling, entire area shall be watered. Initial watering shall continue until water has reached a depth of 2 inches (50 mm) over entire seeded surface, at a rate which will not dislodge the seed. Watering shall be repeated thereafter as frequently as required to prevent drying of the surface, until the grass is established. Watering methods and apparatus which may cause erosion of the surface shall not be permitted.

3.5 SODDING

A. Edges of the sodded areas shall be smooth, and all sodded areas shall conform to the design cross sections and grade. At edges adjacent to curbs, paved areas, etc., top surface of earth in sod shall be 1/2 inch (12 mm) below adjacent hard surface.

B. Sod shall be placed and all sodding operations completed within 36 hours of harvesting. Do not lay sod if dormant or if ground is frozen or muddy.

C. On slopes 3 H:1 V or steeper, sod shall be placed perpendicular to the slope fastened in place with approved methods, spaced at not less than 1 pin per square foot.

D. Surface of completed sodded area shall be smooth. Sod shall be laid edge-to-edge, with tight-butted, staggered joints. Sod shall be carefully placed to insure that it is neither stretched or overlapped. Immediately after laying sod shall be pressed firmly into contact with sod bed by tamping or rolling, to eliminate air pockets. Following compaction, topsoil shall be used to fill all cracks, and excess soil shall be worked into grass with rakes or other suitable equipment. Sod shall not be smothered with excess fill soil.

E. Immediately after sodding operations have been completed, entire surface shall be rolled with a roller or other approved equipment weighing 100 to 160 pounds per foot (45 to 72 kg) of roller.

F. Saturate sod with fine water spray within two hours of planting, or sooner as weather conditions warrant. During first week after planting, water daily or more frequently as necessary to maintain moist soil to a minimum depth of 2 inches (50 mm) below sod.

3.6 HYDROSEEDING

A. Seeding may be done with the hydraulic spray method where approved. It shall be done with a commercial machine designed for the hydraulic application of seed mix in a slurry. The seed and additional material shall be mixed with sufficient water in the tank of the machine. The slurry shall be thoroughly and constantly agitated, so the materials are uniformly mixed and suspended in the water at all times until tank is emptied. The seed slurry will be uniformly distributed over the designated area to be seeded.

B. Application rates used shall conform with the manufacturer's labels for the materials used in the slurry and as soil tests dictate.

C. Hydroseeding on slopes shall conform with the manufacturer's labels for the materials used in the slurry and as soil tests dictate.

D. During the first two to three weeks or until uniform grass catch, water daily or more frequently, as necessary, to maintain moist soil to a minimum depth of 2 inches (50 mm).

E. Erosion control material, such as netting or bonded fiber matrix, shall be used when the slope or water movements dictates.

3.7 APPLICATION OF FERTILIZER AND AMENDMENTS

A. Fertilizer and conditioners shall be applied according to the Turfgrass Best Management Practices.

B. Fertilizer and supplemental conditioners shall be applied according to the type, rate, and timing

recommended by the test reports from a qualified soil-testing laboratory. and in accordance with applicable industry standards.

C. Mixing with topsoil:

1. Fertilizer and conditioners shall be spread over the entire areas designated at the recommended application rates.

2. Materials shall be uniformly and thoroughly mixed into the top 4 in. of topsoil by disking, rototilling, or other approved method.

3.8 MAINTENANCE

A. Except as otherwise specified below, maintenance shall include all operations required to produce an established lawn, including but not limited to: Fertilizing, resodding, mowing, weeding, watering, or reseeding.

B. Maintenance of seeded areas shall begin upon completion of seeding and shall continue until full turf establishment and final acceptance of the lawn or seeded area.

C. Maintenance of sodded areas shall begin upon completion of sodding and shall continue until final acceptance.

D. First mowing of seeded areas shall be done when average height of grass is 3 to 5 inches (37 to 87 mm), removing no more than 1/3 of grass-leaf growth. Repeat mowing to maintain height appropriate for species without cutting more than 1/3 of grass height.

E. If lawn or grass is installed in the fall and maintenance is required to continue into spring months, lawn and grass shall receive an application of amendments and fertilizer in the spring in accordance with industry standards for new lawn establishment. Amendments and fertilizer shall be spread in a uniform layer over the entire lawn surface, as specified herein.

END OF SECTION 329200

329300 PLANTS

SECTION 329300 - PLANTS

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and Division 01 Specifications Sections, apply to this Section.

1.2 SUMMARY

A. Section Includes:

1. The provision and installation of all plant materials and products specified, including all supervision, labor, equipment and materials necessary to complete the project.

2. General maintenance of stored and installed materials until Acceptance.

3. Provision of Landscaping Warranty.

B. Description of Work:

1. Provide all materials and equipment, and do all work required to transplant existing trees and shrubs, and to install new plants, as indicated on the Drawings and as specified.

C. Related Sections:

1. Examine Contract Documents for requirements that affect work of this Section. Other Specification Sections that directly relate to work of this Section include, but are not limited to:

a. Section 015639 – TEMPORARY TREE AND PLANT PROTECTION

b. Section 311000 – SITE CLEARING

c. Section 312000 – EARTH MOVING

d. Section 329200 – TURF AND GRASSES

1.3 REFERENCES

A. Comply with applicable requirements of the following standards. Where these standards conflict with other specified requirements, the most restrictive requirements shall govern.

1. American National Standards Institute, Inc. (ANSI):

Z60.1 American Standard for Nursery Stock - 2004
(Sponsor: American Nursery & Landscape Association)

2. American Society for Testing and Materials (ASTM):

C 136 Sieve Analysis of Fine and Coarse Aggregates
E 11 Wire-Cloth Sieves for Testing Purposes

3. American Wood Preservers' Association (AWPA):

C2 Lumber, Timbers, Bridge Ties and Mine Ties – Preservative Treatment By Pressure Processes

4. National Arborist Association, 3537 Stratford Rd., Wantagh, NY 11793 (NAA):

Ref. 1 Transplanting of Trees and Shrubs in the Northeastern and North Central United States

5. Hortus Third, A Concise Dictionary of Plants Cultivated in the United States and Canada, Cornell University, L.H. Bailey Hortorium, MacMillian Publishing Co., New York, NY.

6. Manual of Woody Landscape Plants: Their Identification, Ornamental Characteristics, Culture, Propagation and Uses, Michael A. Dirr, Stipes Publishing Company, Champaign, Illinois, 1975, Revised 1998.

7. "A Field Guide: Standards for Urban Forestry Data Collection." 2010. By the USDA Forest Service, ISA and the IUFRO (International Union of Forest Research Organizations.

1.4 DEFINITIONS

A. Backfill: The earth used to replace or the act of replacing earth in an excavation.

B. Compaction: A loss of soil aggregates; destroyed aeration pore spaces; crushed or collapsed pore spaces; and, undergone extensive resorting and packing of soil particles.

C. Duff Layer: The surface layer of native topsoil that is composed of mostly decayed leaves, twigs, and detritus.

D. Finish Grade: Elevation of finished surface of planting soil.

E. Manufactured Topsoil: Soil produced off-site by homogeneously blending mineral soils or sand with stabilized organic soil amendments to produce topsoil or planting soil.

F. Planting Media: Standardized topsoil; existing, native surface topsoil; existing, in-place surface soil; imported topsoil; or manufactured topsoil that is modified with soil amendments and perhaps fertilizers to produce a soil mixture best for plant growth.

G. Root Flare: Also called "trunk flare." The area at the base of the plant's stem or trunk where the stem or trunk broadens to form roots; the area of transition between the root system and the stem or trunk.

H. Subgrade: Surface or elevation of subsoil remaining after excavation is complete, or the top surface of a fill or backfill before planting soil is placed.

I. Subsoil: All soil beneath the topsoil layer of the soil profile, and typified by the lack of organic matter and soil organisms.

J. Surface Soil: Soil that is present at the top layer of the existing soil profile at the Project site. In undisturbed areas, the surface soil is typically topsoil; but in disturbed areas such as urban environments, the surface soil can be subsoil.

1.5 SUBMITTALS

A. Product certificates: Labels from the manufacturer's container or manufacturer's cutsheets certifying that the product meets the specified requirements shall be submitted for the following materials:

Anti-desiccant
Chemical Products
Erosion Control Fabric
Fertilizers
Filter Fabric
Inorganic Soil Amendments
Mycorrhizal Fungi
Organic Soil Amendments
Root Control Barrier
Structural Soil
Weed Control Barrier

B. Test Reports: Test reports from an approved testing agency indicating compliance with the specifications shall be submitted for:

Compost
Manufactured soil
Manure
Mulch
Planter Soil
Planting Media
Topsoil
Any other materials designated by the Landscape Architect.

C. Samples* of the following:
Mulch
Compost
Landscape edging w/ finish as specified
Planting Media
Planter soil mix
Root ball stabilization materials

*Bulk materials in quantities sufficient to demonstrate range of color, texture, particle size, etc.

D. List of Plant Materials: Species to be installed, noting any discrepancies with Drawings. This list does NOT imply permission for substitutions unless approved in writing by Landscape Architect.

E. Maintenance Instructions: Recommended procedures to be established by Owner for maintenance of plants during a calendar year.

1.6 QUALITY ASSURANCE

A. Installer's Field Supervision: Require Installer to maintain an experienced full-time supervisor on Project Site when work is in progress.

B. Soil Analysis:

1. The Contractor shall engage an independent testing agency, experienced in the testing of agricultural soils and acceptable to the Landscape Architect, to perform the following tests and analyses:

Material	Tests and Analysis Required
Soils	Mechanical analysis of soil indicating the percent passing by weight of the following sieve sizes: 1 in., 1/2 in., No. 4, No. 10, No. 100, and No. 200. Determination of pH, organic content, and nutrient content. Recommendations shall be made by the testing agency as to the type and quantity of soil additives required to bring pH, organic content, and nutrient content to satisfactory levels for planting.
Organic Amendments	Determination of moisture absorption capacity, organic matter content, and pH.

2. Report presence of problem salts, minerals, or heavy metals; if present, provide additional recommendations for corrective action.

3. A Solvita test shall be performed to determine the maturity and stability of the compost.

4. Gradation of granular materials shall be determined in accordance with ASTM C 136. Sieves for determining material gradation shall be as described in ASTM E 11.

C. Soil Drainage:

1. Test drainage of adverse soils in three to five plant pit locations chosen by the Landscape Architect. Pits shall be excavated to a size suitable for a large tree, completely filled with water and observed to determine the length of time the soils take to completely drain. Landscape Architect shall then be notified of the time it takes for the pits to drain completely. Planting operations shall not proceed until Landscape Architect has reviewed drainage test results.

D. Plants:

1. The Contractor shall provide quality, size, genus, species, and variety of plants indicated, complying with applicable requirements in ANSI Z60.1.

2. The Contractor shall inspect all nursery materials to determine that the materials meet the requirements of this Section. Submit List of Plant Materials to be installed indicating

discrepancies with Drawings. No changes or substitutions may be made without prior approval by the Landscape Architect, and municipal authority, if applicable.

3. When requested by the Landscape Architect, the Contractor shall submit the names and locations of nurseries proposed as sources of acceptable plant material.

4. Proposed materials shall be flagged at the nurseries by the Contractor prior to viewing by the Landscape Architect, when requested by the Landscape Architect.

5. When requested by the Landscape Architect, deliver photographs of plant material or representative samples of plants.

6. Schedule time with the Landscape Architect for viewing plant material at the source(s). Time spent at the nursery shall occur prior to the anticipated delivery time.

7. Viewing and/or sealing of plant materials by the Landscape Architect at the nursery does not preclude the Landscape Architect's right to reject material at the site of planting.

8. Identification of plant names shall be as listed in Hortus Third or M. Dirr's Manual of Woody Landscape Plants.

9. All plants shall be delivered to site with identifying tags that shall not be removed until Substantial Completion acceptance.

E. Owner's Inspection And Testing:

Work may be subject to inspection at any time by the Landscape Architect. The Owner reserves the right to engage an independent testing laboratory in accordance with requirements of Section 140000 – QUALITY CONTROL to analyze and test materials used in the construction of the work. Where directed by the Landscape Architect, the testing laboratory will make material analyses and will report to the Landscape Architect whether materials conform to the requirements of this specification.

1. Cost of tests and material analyses made by the testing laboratory will be borne by the Owner when they indicate compliance with the specification and by the Contractor when they indicate non-compliance.

2. Testing equipment will be provided by and tests performed by the testing laboratory. Upon request by the Landscape Architect or Owner, the Contractor shall provide such auxiliary personnel and services needed to accomplish the testing work and to repair damage caused thereto by the permanent work.

F. Contractor's Inspection And Testing:

1. Testing, analyses, and inspection required by the Contractor for his own information or guidance shall be at his own expense.

2. Materials shall not be used in construction until the test results have been reviewed by the Landscape Architect.

1.7 DELIVERY, STORAGE, AND HANDLING

A. Do not prune trees and shrubs before delivery. Protect bark, branches, and root systems from sun scald, drying, wind burn, sweating, whipping, and other handling and tying damage.

B. Digging Plant Material: Plants shall not be dug at the nursery or approved source until the Contractor is ready to transport them from their original locations to the site of the work or acceptable storage location.

C. Handling of Plant Materials: Exercise care in handling plant materials to avoid damage or stress. Handle planting stock by root ball or container. Do not bend or bind-tie trees or shrubs in such a manner as to destroy their natural shape. Provide protective covering of plants during shipping and delivery. Do not drop plants during delivery and handling.

D. Deliver bare-root stock plants freshly dug. Immediately after digging up bare-root stock, pack root system in wet straw, hay, or other suitable material to keep root system moist until planting.

E. Deliver plants after preparations for planting have been completed, and install immediately.

F. Plants that are not planted immediately shall be protected as follows:

1. If planting is delayed more than six hours after delivery, set plants and trees in shade, protect from weather and mechanical damage, and keep roots moist. Plants shall not be allowed to dry out or freeze.

2. Bareroot plants shall be installed on the same day of delivery or placed in storage until installed. Injury and desiccation of plants on-site shall be prevented.

3. Earth balls shall be kept intact and moist.

4. Store bulbs, corms, and tubers in a dry place at 60° to 65°F (16° to 18°C) until planting.

5. Both the duration and method of storage of plant materials shall be subject to the approval of the Landscape Architect.

6. Extended storage at site: Plants shall then be protected and kept moist by "heeling-in" the roots or by placing the plant in a cool moist storage building. The "heeling-in" procedure shall require the plants to be separated and the roots heeled in a suitable moist soil. If plants are stored in a building, the roots shall be covered with suitable moist mulch.

G. In certain situations, and depending on plant species, apply anti-desiccant to trees and shrubs as needed to protect plant material.

H. The following shall be cause for rejection of materials by the Landscape Contractor or Landscape Architect:

1. Evidence of inadequate protection following digging, carelessness while in transit, or improper handling or storage, shall be cause for rejection.

2. Upon arrival at the temporary storage location or the site of the work, plants shall be inspected for proper shipping procedures. Should the roots be dried out, large branches be broken, balls of earth broken or loosened, or areas of bark be torn, the Landscape Architect will reject the injured plant.

3. When a plant has been rejected, remove it from the area of the work and replace it with one of the required size and quality.

1.8 PLANTING SEASONS AND CONDITIONS

A. Planting shall only be performed when weather and soil conditions are suitable for planting the material specified in accordance with locally accepted practice.

B. No planting shall occur if said activity results in permanent compaction of soil.

1.9 MAINTENANCE

A. Plant material shall be maintained by the Contractor until Substantial Completion, as described in Part 3 of this Section.

B. Following Substantial Completion until the completion of the warranty period and Final Acceptance, maintenance of the plant material shall become the Owner's responsibility. Provide instructions and service as follows.

1. The Contractor shall provide the Owner with written recommended maintenance program at time of Substantial Completion.

2. The Contractor may make as many periodic inspections as necessary during the guarantee period, at no additional cost to the Owner, to inspect the condition of all plant materials. Submit written report of each inspection to the Landscape Architect and Owner outlining corrective measures required to keep the guarantee valid.

1.10 ACCEPTANCE

A. The Landscape Architect will inspect all work for Substantial Completion upon written notice of completion. The request shall be received at least ten calendar days before the anticipated date of inspection.

B. Acceptance of plant material by the Landscape Architect will be for general conformance to specified size, character, and quality, and shall not diminish responsibility for full conformance to the Contract Documents.

C. Upon satisfactory completion and re-inspection of all repairs or renewals necessary in the judgment of the Landscape Architect, the Landscape Architect will recommend to the Owner that acceptance of the work of this Section be given.

D. Acceptance in Part

1. The work may be accepted in parts when it is deemed to be in the Owner's best interest to do so, and when permission is given to the Contractor in writing to complete the work in parts.

2. Acceptance and use of such areas by the Owner shall not waive any other provisions of this Contract.

1.11 WARRANTY

A. Plants shall be guaranteed for a period of one year after the date of Acceptance by the Owner and Landscape Architect.

1. When the work is accepted in parts, the guarantee periods shall extend from each of the partial acceptances to the terminal date of the last guarantee period. Thus, all guarantee periods terminate at one time.

B. Plants shall be healthy, free of pests and disease, and in flourishing condition at the end of the guarantee period. Plants shall be free of dead and dying branches and branch tips, and shall bear foliage of normal density, size, and color.

C. Replace dead plants and all plants not in a vigorous, thriving condition, as determined by the Landscape Architect during and at the end of the guarantee period, without cost to the Owner, as soon as weather conditions permit and within the specified planting period.

1. Replacements shall closely match adjacent specimens of the same species. Replacements shall be subject to all requirements stated in this Specification.

2. Make all necessary repairs due to plant replacements. Such repairs shall be done at no extra cost to the Owner.

3. The guarantee of all replacement plants shall extend for an additional one-year period from the date of their acceptance after replacement.

D. Guarantee does not cover defects resulting from abuse, lack of adequate maintenance, or neglect by Owner, or incidents that are beyond Contractor's control.

E. At the end of the guarantee period, and no less than five days prior to final inspection, staking and guying materials shall be removed from the site.

1.12 FINAL INSPECTION AND FINAL ACCEPTANCE

A. At the end of the guarantee period, the Landscape Architect will, upon written notice of end of guarantee period, inspect the work for Final Acceptance. Request shall be received at least ten calendar days before the anticipated date for Final Inspection.

B. Upon completion and re-inspection of full repairs or replacements necessary in the judgment of the Landscape Architect. At that time, the Landscape Architect will recommend to the Owner that Final Acceptance of the Work of this Section be given.

PART 2 - PRODUCTS

2.1 PLANT MATERIAL

A. Except as otherwise specified, form, size, and grade of plant materials shall conform to ANSI Z60.1.

B. Furnish trees and shrubs with root balls measured from top of root ball, which shall begin at root flare according to ANSI Z60.1. Root flare shall be visible before planting. Plants shall have, at a minimum, an acceptable form typical of species.

C. The Landscape Architect will be the final arbiter of plant form acceptability.

1. Trunk(s), Canes and Branches:

a. Well-formed and sturdy with a straight, distinct leader where this is characteristic of species.
b. Branching plentiful and uniformly distributed to form a well-balanced plant.
c. Trees with leaders that are damaged, crooked, or crossed shall be rejected.
d. Trees with multiple leaders shall be rejected, unless form is typical for the species or specifically indicated in the Drawings.
e. Multiple leaders with narrow crotches (included bark) shall not be acceptable.
f. Scars shall be free of rot and not exceed 1/4 the diameter of the wood beneath in greatest dimension unless completely healed (except pruning scars).
g. Pruning scars clean cut leaving little or no protrusion from the trunk or branch.
h. Graft union completely healed.
i. No mechanical or pest damage.
j. No excessive succulence or suckering atypical of species.

2. Foliage:

a. Densely supplied with healthy, vigorous leaves of normal size, shape, color, and texture (except shrubs moved bare-root or deciduous shrubs when dormant).
b. No chlorosis.
c. Minimally perceptible pest or mechanical damage, affecting no more than 5 percent of foliage.

3. Root System:

a. Plants shall have a well-developed fibrous root system.
b. Sturdily established in container, but shall not be excessively root bound except plants deliberately grown root bound to produce a dwarf plant.
c. No stem girdling roots.
d. No weeds.

D. Plants shall be healthy and vigorous, free of disease, insect pests and their eggs and larvae.

E. Plants shall be free of physical damage such as scrapes, broken or split branches, large scars, bark abrasions, sunscalds, fresh limb cuts, disfiguring knots, or other defects.

F. Plants shall not be pruned for form (if needed to improve aesthetic appearance and/or growth habit) until Substantial Completion Acceptance.

G. Plants shall meet the sizes indicated on the Plant List or Schedule. Plants larger or smaller than specified may be used only if accepted by the Landscape Architect.

H. To the greatest extent practicable, plant material shall be obtained from sources located in similar climatic zones to the Project site.

I. Plants indicated as "B&B" shall be balled and burlapped.

1. Unless otherwise permitted by the Landscape Architect, plants shall be nursery grown.

2. Nursery grown plants shall be freshly dug or heeled-in. No plants from cold storage will be accepted unless permitted by the Landscape Architect.

J. Container stock, where specified or approved by Landscape Architect, shall meet the standards of ANSI Z60.1 and the following:

1. Container stock shall have a heavy fibrous root system that has been developed by proper cultural treatment, transplanting, and root pruning.

2. Container stock shall be sturdy, healthy and sufficiently vigorous to ensure plant growth.

K. Herbaceous Plants: Including, but not limited to, annuals, biennials, perennials, wetland or water plants, bulbs, tubers, and corms: Provide healthy, disease-free plants of species and variety shown or listed, with well-established root systems or well-formed root forms. Provide only plants that are acclimated to outdoor conditions before delivery.

L. Bareroot stock, where specified or approved by Landscape Architect, shall meet the standards of ANSI Z60.1 and the following:

1. Bareroot stock shall have a heavy fibrous root system that has been developed by proper cultural treatment, transplanting, and root pruning.

2. Bareroot stock shall be sturdy, healthy and sufficiently vigorous to ensure plant growth.

2.2 INORGANIC SOIL AMENDMENTS

A. Lime: ASTM C602, agricultural liming material containing a minimum of 80 percent calcium carbonate equivalent, by weight. Class T is more finely ground and quicker acting but dustier than Class O.

B. Sulfur: Granular, biodegradable, and containing a minimum of 90 percent sulfur.

C. Iron Sulfate: Granulated ferrous sulfate containing a minimum of 20 percent iron and 10 percent sulfur.

D. Aluminum Sulfate: Commercial grade, unadulterated.

E. Perlite: Horticultural perlite, soil amendment grade.

F. Agricultural Gypsum: Minimum 90 percent calcium sulfate, finely ground with 90 percent passing through No. 50 (0.30-mm) sieve.

G. Sand: Clean, washed, natural or manufactured angular grains, free of toxic materials.

H. Diatomaceous Earth: Calcined, 90 percent silica, with approximately 140 percent water absorption capacity by weight.

2.3 ORGANIC SOIL AMENDMENTS

A. Compost: Well-composted, stable, and substantially weed-free organic matter, pH range of 5.5 to 8; moisture content 35 to 55 percent by weight; soluble salt content of <3 mmhos/cm or <3 decisiemens/m and free of substances toxic to plantings; and as follows:

1. The compost stock must mature for a minimum of 90 days. During this time, the compost stock shall achieve thermophilic temperatures (175° to 180°F, 79° to 82°C) for 15 days; multiple turnings may be required for the entire stockpile. A Solvita test may be requested to determine the maturity and stability of the compost.

2. Frozen or muddy compost shall be unacceptable for use.

B. Manure: Well-rotted, unleached, stable or cattle manure containing not more than 25 percent by volume of straw, sawdust, or other bedding materials; free of toxic substances, stones, sticks, soil, weed seed, debris, and material harmful to plant growth.

C. Mycorrhizal Fungi: Dry, organic, granular root stimulant/inoculant containing at least 5300 spores per pound (0.45 kg) of vesicular-arbuscular mycorrhizal fungi and 95 million spores per pound (0.45 kg) of ectomycorrhizal fungi, 33 percent hydrogel, and a maximum of 5.5 percent inert material.

1. Mycorrhizal fungi amendment shall be manufactured by one of the following, or approved equivalent:
   a. Roots
   b. Plant Health Care
   c. Mycorrhizal Applications of Oregon

D. Hydrogel: Shall be water absorbant crystals or granules manufactured by one of the following, or approved equal: Plant Health Care, Terra-Sorb, Viterra Gelscape.

2.4 FERTILIZERS

A. Commercial Fertilizer: Commercial-grade complete fertilizer of neutral character, consisting of fast- and slow-release nitrogen, 50 percent derived from natural organic sources of urea formaldehyde. Nitrogen (N), Phosphorus (P) and Potassium (K) in amounts recommended in soil test results.

B. Controlled-release fertilizer:

1. Slow-Release Fertilizer: Granular or pelleted fertilizer consisting of 50 percent water-insoluble nitrogen, phosphorus, and potassium of equal proportions.

2. Planting Tablets: Tightly compressed chip type, long-lasting, slow-release, commercial-grade planting fertilizer in tablet form. Tablets shall break down with soil bacteria, converting nutrients into a form that can be absorbed by plant roots. Nutrient composition: nitrogen, phosphorous, potassium and micronutrients.

3. Controlled-release fertilizer shall be equal to the following:

Product	Manufacturer
Osmocote	Scotts Miracle-Gro Company
Agriform 20-10-5	Sierra Chemical Co.
Planting Tablets	Milpitas, CA 95035
EZY-Grow Fertilizer Packet	EZY-Grow - Landscape Specialties

2.5 PLANTING MEDIA

A. Topsoil

1. Topsoil shall be obtained from a previously established stockpile on the site, to the extent that suitable material is available. Additional topsoil required shall be obtained from off-site sources.

2. Topsoil, whether stripped from site or supplied from off-site, shall be a sandy loam as defined by the USDA Soil Conservation Service, Soil Classification System, and shall have the following mechanical analysis:

Textural Class	% of Total Weight	Average %
Sand (0.05-2.0 mm dia. range)	45 to 75	60
Silt (0.002-0.05 mm dia. range)	15 to 35	25
Clay (less than 0.002 mm dia. range)	5 to 25	15

a. 95 percent of topsoil shall pass a No. 8 (2.0 mm) sieve.
b. Topsoil shall be free of stones >1 inch (25 mm) in longest dimension, earth clods or clay, plant parts, weeds, debris, and other extraneous materials harmful to plant growth.
c. Organic matter content shall be 4 to 12 percent of total dry weight.
d. Range of pH: 5.5 to 7.

B. Compost Manufactured Topsoil: Uniform mixture of compost and base soil to achieve the compost manufactured topsoil product consisting of the following ingredients:

1. Compost: An organic substance produced by the biological and biochemical decomposition of source separated organic materials that may include leaves and lawn trimmings, food or industrial residuals, and/or municipal biosolids. The product shall not contain levels of substances toxic to plants and shall be reasonably free (< 1 percent by

dry weight) of man-made foreign matter. Compost shall meet USEPA 40 CFR Part 503 standards for Class A, Exceptional Quality compost, as well as all applicable state standards for its intended use.

2. Base soil: Topsoil and/or other soils (clay, silt, sand sand, sandy loam, or loamy sand in texture according to USDA soil classification. It shall be free of stones, clods, plant parts, weeds, and other debris >2 inches (50 mm) in any dimension. It shall not contain levels of substances that shall inhibit or be harmful to plant growth.

3. Product Parameters:

Parameter	Compost	Base Soil	Compost Manufactured Topsoil
pH	6.0-8.5	5.0-8.0	6.0-7.8
% Organic Matter	<40%	0-5%	6-20%
Particle Size	<1" (25 mm)	<2" (50 mm), USDA Class: sand, sandy loam, loamy sand	<2" (50 mm), USDA Class: sand, sandy loam, loamy sand
Salts/conductivity	Varies; must be reported	<2mmhos/cm after handling, placement & rainfall	<2mmhos/cm after handling, placement & rainfall
Carbon: Nitrogen Ratio	15-25:1	N/A	N/A

C. Plant bed media: Verify site conditions and suitability of native surface topsoil to produce viable planting soil. Modify and fertilize soil types to create acceptable planting media for specific site conditions, plant species, and proposed use in accordance with soil test reports. <**Select applicable options below**>

1. Plant bed media for largely unchanged site conditions, reusing on-site topsoil: Existing, native surface topsoil formed under natural conditions with the duff layer retained during excavation process and retained in-place or stockpiled on site. Supplement with standardized topsoil or imported topsoil if quantities are insufficient. Mix native topsoil with loose compost in the following quantities to produce plant bed media: Ratio of loose compost to topsoil by volume: [**1:4**] [**1:3**] [**1:2**] <**Insert ratio**>.

2. Plant bed media using imported topsoil from off-site sources if existing surface soil is not of suitable quality or quantity. Obtain topsoil from naturally well-drained construction or mining sites with topsoil at least 4 inches (100 mm) deep; do not obtain from agricultural land, bogs or marshes. Mix imported topsoil with loose compost in the following quantities to produce plant bed media: Ratio of loose compost to topsoil by volume: [**1:4**] [**1:3**] [**1:2**] <**Insert ratio**>.

3. Plant bed media using standardized topsoil: ASTM D 5268 topsoil, with pH range of 5.5 to 7, and minimum 6 percent organic material content. Mix ASTM D 5268 topsoil with loose compost in the following quantities to produce plant bed media: Ratio of loose compost to topsoil by volume: [**1:4**] [**1:3**] [**1:2**] <**Insert ratio**>.

D. Skeletal or Structural Soil: Patented and licensed, CU-Structural Soil™ or CU-Soil™ as developed by Cornell University and distributed by Amereq, Inc. licensed producers.

E. Container Plant Mix: Project specific. Designer to specify.

F. Lightweight Planting Soil: Project specific. Designer to specify.

2.6 WATER

A. Water shall be suitable for irrigation and free from ingredients harmful to seeded or sodded areas.

2.7 WEED-CONTROL BARRIERS

A. Weed control barriers are not recommended for planted areas as the materials prevent or slow water penetration required for plant growth. They may be beneficial for largely unplanted, mulched areas.

B. Nonwoven Geotextile Filter Fabric: Polypropylene or polyester fabric, 3 oz./sq. yd. (101g/sq.m) minimum.

C. Composite Fabric: Woven, needle-punched polypropylene substrate bonded to a nonwoven polypropylene fabric, 4.8 oz./sq. yd. (162g/sq.m).

2.8 MULCHES

A. Organic Mulch: Mulch shall be 100 percent [**fine-shredded pine or other softwood bark]** [**Pine straw**] [**Salt hay or threshed straw**] [**Pine needles**] <**Insert mulch type**>, of uniform size and free from rot, leaves, twigs, debris, stones, or any material harmful to plant growth. Bark shall have been shredded and stockpiled no less than two months and no more than two years before use. **<delete last sentence if not bark mulch>**

B. Compost Mulch: Well-composted, stable, and weed-free organic matter, pH range of 5.5 to 8; moisture content 35 to 55 percent by weight; 100 percent passing through 1-inch (25-mm) sieve; soluble salt content less than 3 decisiemens/m or 3 mmhos/cm as measured for soil mixture electrical conductivity; not exceed 0.5 percent inert contaminants and free of substances toxic to plantings. Product must be cured for a minimum of 90 days and produce minimal heat or odor to be considered a stable, mature product suitable for use with plants.

C. Stone (Mineral) Mulch: **[Rounded riverbed gravel or smooth-faced stone] [Crushed stone or gravel] [Marble chips] [Granite chips][expanded shale]** <**Insert stone type**>.

1. Size Range: [**1-1/2 inches (38 mm) maximum, 3/4 inch (19 mm) minimum**] [**3/4 inch (19 mm) maximum, 1/4 inch (6.4 mm) minimum**] <**Insert size range**>.

2. Color: [**Uniform tan-beige color range acceptable to Landscape Architect**] [**Readily available natural gravel color range**] <**Insert color**>.

2.9 CHEMICAL PRODUCTS

A. General: Pesticides, herbicides, fungicides, bactericides or any other chemical compounds shall be registered and approved by EPA, acceptable to authorities having jurisdiction, and of type recommended by manufacturer for each specific problem and as required for Project conditions and application. Do not use restricted pesticides unless authorized in writing by authorities having jurisdiction.

1. Pre-Emergent Herbicide (Selective and Non-Selective): Effective for controlling the germination or growth of weeds within planted areas at the soil level directly below the mulch layer.

2. Post-Emergent Herbicide (Selective and Non-Selective): Effective for controlling weed growth that has already germinated.

3. Anti-desiccant: Shall be an emulsion specifically manufactured for plant protection which provides a protective film over plant surfaces which is permeable enough to permit transpiration. Anti-desiccant shall be delivered in manufacturer's sealed containers and shall contain manufacturer's printed instructions for use. Anti-desiccant shall be Wilt-Pruf as manufactured by Wilt-Pruf Products, Inc. P.O. Box 469 Essex, CT 06426, or approved equal.

4. Fungicide: Shall be zinc ethylene bisdithiocarbonate (Zineb), or equal, appled at manufacturer’s suggested rates.

5. Chemical Root Control Barrier: Chemical compounds or fabric impregnated with growth-regulating chemicals designed to modify root growth. Manufacturers shall be Plant Health Care or Typar Biobarrier, or approved equal.

2.10 FILTER FABRIC OR SOIL SEPARATION FABRIC

A. Nonwoven geotextile made of polypropylene, polyolefin, or polyester fibers, or combination, 101 g/sq. m (3 oz./sq. yd.) minimum, Mirafi 140-N, or approved equal.

2.11 TREE SUPPORT MATERIALS

A. Install tree support materials only when conditions warrant. See Part 3. Rootball stabilization is preferred method.

B. Rootball Stabilization Materials:

1. At-grade or below-grade stabilization systems to secure each new tree planting by its rootball; sized per manufacturer’s written recommendations unless otherwise indicated. Provide one of the following products, or approved equal:
   a. Tomahawk Tree Stabilizers by Border Concepts, Inc.
   b. Duckbill Rootball Fixing System by Foresight Products, LLC
   c. Tree Staples by Tree Staple, Inc.

C. Wood Stakes: For trees under 10 feet (3.05 m) in height, straight, sound, rough sawn lumber not less than 2 x 2 inch (50 mm x 50 mm), if square, or 2-1/2 inch (62 mm) diameter, if round. Wire for staking shall be 12-gauge steel.

D. Wire for Guying: Galvanized steel 1 x 19 preformed 3/16 inch (4.76 mm) diameter.

E. Turnbuckles: Galvanized steel fitted with locking eyebolts.

F. Deadman: Sound, rough sawn lumber 2 x 4 inch (50 mm x 100 mm) triangular galvanized steel plates, or other material approved by the Landscape Architect.

G. Hose: High quality braided rubber hose, 3/4 inch (19 mm) diameter and suitable length, black in color.

H. Polyethylene tie strapping may be used with 2 x 2 inch (50 mm x 50 mm) wood stakes.

2.12 ROOT CONTROL BARRIER (PHYSICAL)

A. Black, molded, modular panels manufactured with 50 percent recycled polyethylene plastic with ultraviolet inhibitors, 85 mils (2.2 mm) thick, with vertical root deflecting ribs protruding ½ inch (12 mm) to 3/4 inch (19 mm) out from panel, and each panel 24 inches (610 mm) wide by **[18 inches (450 mm)][24 inches (610 mm)][36 inches (900 mm)][48 inches (1210 mm)]** in depth. **<Insert measurement>.** Integrated zipper joining system for panel to panel connection.

2.13 LANDSCAPE EDGING

A. Wood: Western Red Cedar, Eastern White Cedar or pressure-treated Southern Yellow Pine with stakes of same type, 1 x 2 inch (25 mm x 50 mm) nominal by 18 inches (450 mm) long, with galvanized nails for anchoring the edging.

B. Steel: Standard commercial steel edging, rolled edge, fabricated in sections of standard lengths, with loops stamped from or welded to face of sections to receive stakes.

1. Provide products by one of the following manufacturers, subject to compliance with requirements, or approved equal:
   a. Sure-Loc Edging Corporation
   b. The J.D. Russell Company
   c. Collier Metal Specialties, Inc.
   d. Border Concepts, Inc.
   e. Ryerson Steel

2. Edging Size: **[3/16 inch (4.8 mm) wide by 4 inches (100 mm) deep] [1/4 inch (6.4 mm) wide by 5 inches (125 mm) deep][1/4 inch (6.4 mm) wide by 4 inches (100 mm) deep][1/8 inch (3.2 mm) wide by 4 inches (100 mm) deep][1/8 inches (3.2 mm) wide by 6 inches (150 mm) deep][0.1 inch (2.5 mm) wide by 4 inches (100 mm) deep] <insert dimensions>**

3. Stakes: Tapered steel, minimum of **[12 inches (300 mm)][15 inches (380 mm)] long. <Insert length>**

4. Accessories: Standard tapered ends, corners, and splicers.

5. Finish: **[Standard paint][Zinc coated][Unfinished].**

6. Paint color: **[Black][Green][Brown][Other].**

C. Aluminum: Standard-profile extruded aluminum edging, ASTM B 221 or ASTM B 221M, Alloy 6063-T6, fabricated in standard lengths of interlocking sections with loops stamped from face of sections to receive stakes.

1. Provide products by one of the following manufacturers, subject to compliance with requirements, or approved equal:
   a. Sure-Loc Edging Corporation
   b. The J.D. Russell Company
   c. Permaloc corporation
   d. Curv-Rite, Inc.

2. Edging Size: **[3/16 inch (4.8 mm) wide by 5 1/2 inches (140 mm) deep] [3/16 inch (4.8 mm) wide by 4 inches (100 mm) deep] [1/8 inches (3.2 mm) wide by 5 1/2 inches (140 mm) deep][1/8 inch (3.2 mm) wide by 4 inches (100 mm) deep]]<insert dimensions>**

3. Stakes: Aluminum, ASTM B 221 or ASTM B-221M, Alloy 6061-T6, 1 1/2 inches (38 mm) wide by 12 inches (300 mm) long.

4. Finish: **[Standard paint][Powdercoated][Mill – natural]{Black anodized].**

5. Paint color: **[Black][Green][Brown].**

D. Plastic: Standard-black polyethylene or vinyl edging **[V-lipped bottom][horizontally grooved]**, extruded in standard lengths, with 9 inch (225 mm) **[steel angle][plastic]** stakes.

1. Provide products by one of the following manufacturers, subject to compliance with requirements, or approved equal:
   a. Valley View Industries
   b. Oly-Ola Edgings, Inc.

2. Edging Size: **[0.1 inch (2.5 mm) wide by 5 inches (125 mm) deep][0.07 inch (1.8 mm) wide by 5 inches (125 mm) deep].<insert dimensions>**

3. Top profile: [**straight] [round]**.

4. Accessories: Manufacturer’s standard alignment clips or plugs.

PART 3 - EXECUTION

3.1 APPROVAL OF EXISTING CONDITIONS

A. Prior to commencing installation, the Contractor shall be responsible for immediately notifying the Landscape Architect if any existing site or job conditions are observed which would negatively affect the character of the finished work, its future performance, or that would in any way be to the detriment of job progress and completion. If unobservable, substandard or unacceptable conditions are encountered during the course of work, the Contractor shall alert the Landscape Architect.

3.2 PLANT BED PREPARATION

A. Loosen subgrade of planting areas to a minimum depth of [**4 inches (100 mm)**] [**6 inches (150 mm)**] [**8 inches (200 mm)**] [**12 inches (300 mm)**] <Insert depth>. Remove stones larger than [**1 inch (25 mm)**] [**1-1/2 inches (38 mm)**] [**2 inches (50 mm)**] <Insert size> in any dimension and sticks, roots, rubbish, and other extraneous matter and legally dispose of them off Owner's property.

1. Spread on rough grade, a thoroughly blended planting media consisting of a combination of compost, topsoil, inorganic soil amendments and fertilizer, as recommended by soil test results.

2. Spread planting media to a depth of [**4 inches (100 mm)**] [**6 inches (150 mm)**] [**8 inches (200 mm)**] [**12 inches (300 mm)**] <**Insert depth**> but not less than required to meet finish grades after natural settlement.

a. Do not spread if planting media or subgrade is frozen, muddy, or excessively wet.

b. Finish grade (below mulch, after settling) for planted areas shall be 3½ inches (87 mm) below adjacent pavement surfaces.

c. Finish grade after settling for seeded areas shall be ½ inch (12 mm) below adjacent pavement surfaces and 1 inch (25 mm) for sodded areas.

B. Finish Grading: Grade planting areas to a smooth, uniform surface plane with loose, uniformly fine texture. Roll and rake, remove ridges, and fill depressions to meet finish grades. Restore planting areas if eroded or disturbed after finish grading.

C. Application of Mychorrhizal Fungi, if specified: Broadcast dry product uniformly over prepared soil at the application rate suggested by the manufacturer. Mychorrhizal fungi shall not be used on herbaceous materials or in compacted soils.

3.3 LAYOUT OF PLANTING AREAS

A. Protect structures, utilities, sidewalks, pavements, other facilities, work by others, grassed areas, and existing plants from damage caused by planting operations. All damage caused by

the Contractor or his work shall be the responsibility of the Contractor to repair or rectify at no additional cost to the Owner.

B. Lay out individual tree and shrub locations and areas for multiple or mass plantings. Stake locations, outline plant bed areas, adjust locations when requested, and obtain Landscape Architect's acceptance of layout before excavating or planting. Make subsequent adjustments as required.

3.4 EXCAVATION FOR TREES AND SHRUBS

A. Planting Pits and Trenches: Excavate circular planting pits with tapered sides. Excavations with vertical sides are not acceptable. Trim perimeter of bottom leaving center area of bottom raised slightly to support root ball and assist in drainage away from center. Do not further disturb base. Ensure that root ball will sit on undisturbed base soil to prevent settling. Scarify sides of planting pit sheared or smoothed during excavation.

1. Excavate two times as wide as ball diameter.

2. Excavate at least 12 inches (300 mm) wider than root spread and deep enough to accommodate vertical roots for bare-root stock.

3. Do not excavate deeper than depth of the root ball, measured from the root flare to the bottom of the root ball.

B. Subsoil and topsoil removed from excavations [**may**] [**may not**] be used as planting media.

3.5 WOODY PLANT INSTALLATION

A. Before planting, verify that root flare is visible at top of root ball according to ANSI Z60.1. **Remove excess soil from root ball to expose root flare as necessary.**

B. Remove injured roots by cutting cleanly; do not break.

C. Remove only dead, dying, or damaged branches. Pruning intent and procedure shall be reviewed with the Landscape Architect before proceeding.

D. Set stock plumb and in center of planting pit or trench with root flare a maximum of 2 inches (50 mm) above adjacent finish grades.

1. Use planting media as specified in Part 2 for backfill.

2. Add fertilizer and soil amendments in accordance with soil test recommendations and per manufacturers' recommendations.

3. If specified, add mycorrhizal fungi per manufacturer's recommendations if not incorporated during plant bed preparation.

4. Add water absorbent crystals or granules to backfill at rates recommended by the product manufacturer.

5. Balled and Burlapped Plants: After placing some backfill around root ball to stabilize plant, carefully cut and remove burlap, rope, wire baskets, and ties from at least the top 1/3 of root balls and as much as possible without comprising the integrity of the root ball. Non-biodegradable wrappings and ties shall be totally removed from root ball and plant pit.

6. Container-Grown Plants: Carefully remove root ball from container without damaging root ball or plant.

7. Fabric Bag-Grown Stock: Carefully remove root ball from fabric bag without damaging root ball or plant.

8. Backfill around root ball in layers, tamping to settle soil and eliminate voids and air pockets. When plant pit is approximately one-half filled, water thoroughly before placing remainder of backfill. Repeat watering until no more water is absorbed.

9. Continue backfilling process. Form water saucer around perimeter of plant pits of trees and large shrubs. Water again after placing and tamping final layer of soil.

E. Bare-Root Stock: Set and support bare-root stock in center of planting pit or trench with root a maximum of 2 inches (50 mm) above adjacent finish grade.

1. Use planting media as specified in Part 2 for backfill.

2. Add fertilizer and soil amendments in accordance with soil test recommendations and per manufacturers' recommendations.

3. If specified, add mycorrhizal fungi per manufacturer's recommendations if not incorporated during plant bed preparation.

4. Spread roots without tangling or turning toward surface, and carefully work backfill around roots by hand. Puddle with water until backfill layers are completely saturated. Plumb before backfilling, and maintain plumb while working backfill around roots and placing layers above roots.

5. Continue backfilling process. Water again after placing and tamping final layer of soil.

F. When planting on slopes, set the plant so the root flare on the uphill side is flush with the surrounding soil on the slope; the edge of the root ball on the downhill side will be above the surrounding soil. Apply enough soil to cover the downhill side of the root ball.

3.6 GROUND COVER AND HERBACEOUS PLANTS INSTALLATION

A. Use planting media as specified in Part 2 for backfill.

B. Excavate and place planting media to a depth of 18 inches (450 mm). Add fertilizer and soil amendments as recommended by soils test, and per manufacturers' recommendations.

C. If specified, add mycorrhizal fungi per manufacturer's recommendations if not incorporated during plant bed preparation.

   a. Work soil around roots to eliminate air pockets and leave a slight saucer indentation around plants to hold water.

D. Water thoroughly after planting, taking care not to cover plant crowns with wet soil.

3.7 TRANSPLANTING – GENERAL

A. Condition: Deciduous trees 4-inch (100 mm) caliper and larger shall be moved by boxing, be balled and burlapped, or with a tree spade during dormant periods. Deciduous trees smaller than 4-inch caliper (100 mm) shall be moved balled and burlapped, or moved with a tree spade during dormant periods. The size of the tree spade shall be no less than 11 inches (275 mm) diameter per inch (25 mm) of tree caliper.

B. Digging, Wrapping, and Handling: Plants shall be dug and prepared for moving in a manner that will not cause damage to branches, shape, root system, and development during storage.

C. Balled and Burlapped Plants: Balls shall be firmly wrapped with burlap or approved cloth substitute. No balled plant will be acceptable if the ball is cracked or broken, or if the stem is loose in the ball, either before or during transplanting. Balled plants shall be lifted and handled from the bottom of the ball. Protect ball and deliver to the relocation site, plant immediately, and water thoroughly. Ball sizes shall be as recommended in ANSI Z60.1.

D. Bare Root Plants: Plants shall be dug and prepared in such a manner as to provide optimum root mass. Material shall be dormant when dug and root systems shall be kept covered and moist at all times. Upon delivery to relocation site, plant immediately, and water thoroughly. Root spread shall be as recommended in ANSI Z60.1.

3.8 TRANSPLANTING WITH MECHANICAL TREE SPADE

A. Dig hole for tree with same sized equipment as will dig the plant material and transport it to site.

B. Thoroughly mix a slurry mix of the following in the tree pit:*

Material	Quantity*
Planting media	5 cu. ft. (0.14 cu. m.) as specified in Part 2 for backfill
Fertilizer	Per soil test recommendation and standard nursery practices for tree caliper
Water	Enough to fill bottom third of tree pit

* Quantities listed are for 66-inch (1.67 m) tree spade. For larger or smaller units, quantities shall be adjusted accordingly.

C. Prior to digging the plant material, all lower branches shall be tied up so that the machine will not damage any limbs during digging.

D. Tree trunk shall be centered in the unit prior to digging.

E. After digging plant material, and prior to transporting, tie tree limbs down and protect tree from drying out during transport. Trees shall be protected by anti-desiccant spray and/or a plastic or fabric cover.

F. Position tree in hole as directed by Landscape Architect or Owner and remove tree spade.

G. Immediately after removal of tree spade, the tree shall be watered completely; all air gaps in slurry mixture shall be filled by working a spade handle or other tool around the entire perimeter of the ball.

3.9 APPLICATION OF FERTILIZER

A. Provide supplements at application rates as recommended by soil test reports from a qualified soil-testing laboratory.

B. Fertilizer shall be applied when planting pits are backfilled two-thirds full. Fertilizer application shall be of the type, rate, and timing recommended by the testing agency for each plant type and in accordance with ANSI A300 (Part 2) standards for application.

C. Slow-release fertilizer:

1. Fertilization schedule for trees and shrubs using slow release 4-ounce (118 ml) packet system shall be per manufacturer's recommendations.

2. Fertilizer packets shall be placed 6 to 8 inches (150 to 200 mm) deep below top of planting soil around root balls of plants. Packets shall be spaced evenly depending on the number of packets required.

3.10 MULCHING

A. For unplanted areas with large mulched areas, install weed-control barriers before mulching according to manufacturer's written instructions. Completely cover area to be mulched, overlapping edges a minimum of [**6 inches (150 mm)**] [**12 inches (300 mm)**] and secure seams with galvanized pins.

B. Mulch surfaces of plant beds, plant water saucers, and other areas indicated.

1. Trees and Shrubs in Grassed Areas: Create mulched rings 3 inches (75 mm) in depth to encompass plant pits, water saucers, and tree support systems (if applicable). Do not place mulch within 3 inches (75 mm) of trunks or stems. A continuous, linear mulched area shall be formed if plants are closely spaced to avoid grassed strips less than 2 feet (600 mm) wide or scallops of grass that are difficult to maintain.

2. [**Organic Mulch**] [**and**] [**Mineral Mulch**] in Planting Areas: Apply mulch to [**3 inches (75 mm)**] [**2 inches (50 mm)**] <**Insert dimension**> in depth throughout planting area extending to bedline indicated in Drawings, and at least 12 inches (300 mm) beyond edge of individual plant pit or trench. Do not place mulch within 3 inches (75 mm) of trunks

or stems. Finished surface of settled mulch shall be ½ -1 inches (6-12 mm) below adjacent pavement or curb surfaces and flush with adjacent grassed areas.

3.11 CHEMICAL APPLICATIONS

A. In areas designated for plantings, remedial and preventative measures shall be taken well in advance of planting to eliminate competitive weed growth, to provide a weed-free and safe, non-toxic media for planting and as a finished landscape product.

B. If necessary, a systemic post-emergent herbicide shall be applied to existing and emergent weeds in prepared planting beds.

C. Pre-emergent herbicides are recommended for preventative use in areas not seeded.

3.12 FILTER FABRIC OR SOIL SEPARATION FABRIC

A. Soil separation fabric shall be installed where indicated on the Drawings. Unless otherwise indicated on the Drawings, soil separation fabric shall be overlapped 6 inches (150 mm) along all edges.

3.13 TREE SUPPORT

A. Trees shall not be staked or guyed except when absolutely necessary or under special conditions that warrant precautions be taken. Examples of special conditions that may pose a risk to public safety if trees were unsecured or unsupported include, and are not limited to:

1. High winds
2. Exceptional size and value
3. Steep slope locations (on slopes exceeding 3 Horizontal:1 Vertical)
4. High vandalism areas

B. When warranted, each tree shall be staked, guyed, or stabilized immediately following planting and in accordance with ANSI A300 (Part 3) standards for guying.

C. Root stabilization is preferred method, installed per manufacturer’s instructions.

D. Plants shall stand plumb after staking, guying, or stabilizing.

E. Above-ground support systems shall be removed after one year if tree root system is established.

F. Duckbill Tree Support Systems and Duckbill Root Ball Fixing Systems shall be installed in strict conformance with manufacturer's published installation instructions.

3.14 ROOT CONTROL BARRIER (PHYSICAL)

A. Install in accordance with manufacturer’s instructions in areas indicated in the Drawings.

B. Do not install root barrier surrounding the root ball of tree.

3.15 LANDSCAPE EDGING

A. Wood Edging: Install edging where indicated in the Drawings**. [Mitre cut joints and connections at a 45° angle.] <Delete>** Fasten each cut joint or connection with two galvanized nails. Anchor with wood stakes spaced up to 36 inches (900 mm) apart, driven at least 1 inch (25 mm) below top elevation of edging. Use two galvanized nails per stake to fasten edging, of a length needed to penetrate through edging and stake. Pre-drill stakes if needed to avoid splitting. Stakes that crack or split during the installation process shall be replaced.

B. Steel or Aluminum Edging: Install steel edging where indicated according to manufacturer's written instructions, driven below top elevation of edging.

C. Plastic Edging: Install plastic edging where indicated according to manufacturer's written instructions, driven through upper base grooves or V-lip of edging.

3.16 MAINTENANCE OF PLANTINGS

A. Maintenance shall begin immediately after each plant is planted and shall continue until Substantial Completion Acceptance. The Contractor shall provide water for irrigation if none is available on site.

B. Note: Extend maintenance beyond Substantial Completion or Final Acceptance of Project if necessary to meet above requirements. Landscape Architect may withhold funds from Substantial and Final Completion payments as necessary to assure proper performance of maintenance operations.

C. Maintenance required:

1. Maintain plantings by pruning, cultivating, watering, weeding, fertilizing, mulching, restoring water saucers, resetting to proper grade or vertical position, and performing other operations as required to establish healthy, viable plantings.

2. Planting areas shall be kept free of weeds, grass, and other undesired vegetative growth.

3. Fill in as necessary soil subsidence that may occur because of settling or other processes. Replace mulch materials damaged or lost in areas of settling. Do not place mulch within 3 inches (75 mm) of trunks or stems. A continuous, linear mulched area shall be maintained between closely spaced plants to avoid grassed strips less than 2 feet (600 mm) wide or scallops of grass that are difficult to maintain.

4. Apply treatments as required to keep plant materials, planted areas, and soils free of pests and pathogens or disease. Use practices to minimize the use of chemicals and pesticides and reduce hazards.

5. Apply pesticides and other chemical products and biological control agents in accordance with authorities having jurisdiction and manufacturer's written recommendations.

Coordinate applications with Owner's operations and others in proximity to the Work. Notify Owner before each application is performed.

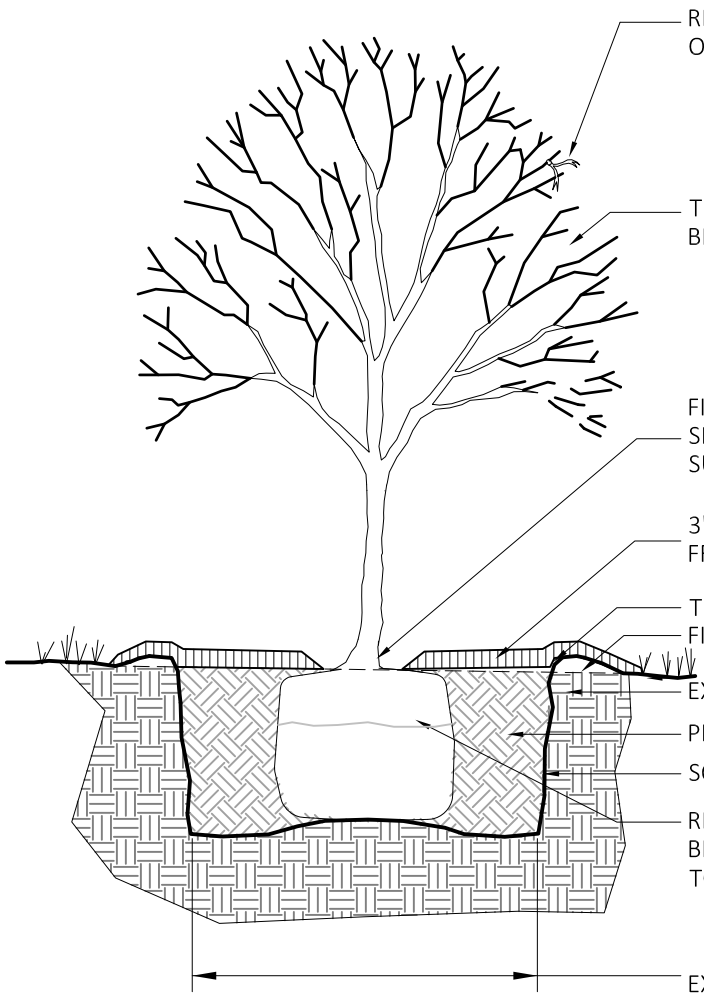
6. Protect plants from damage due to landscape operations and operations of other contractors and trades. Maintain protection during installation and maintenance periods. Treat, repair, or replace damaged plantings without additional cost to the Owner.

7. Prune, thin, and shape woody materials according to standard professional horticultural and arboricultural practices and in accordance with ANSI A300 (Part 3) Pruning Standards. Unless otherwise indicated by Landscape Architect, do not cut tree leaders; remove only injured, dying, or dead branches from trees and shrubs. Prune to retain natural character.

8. Pruning shall be done with clean, sharp tools. Cuts shall be made at branch collars, leaving no stubs. No tree paint shall be used.

END OF SECTION 329300

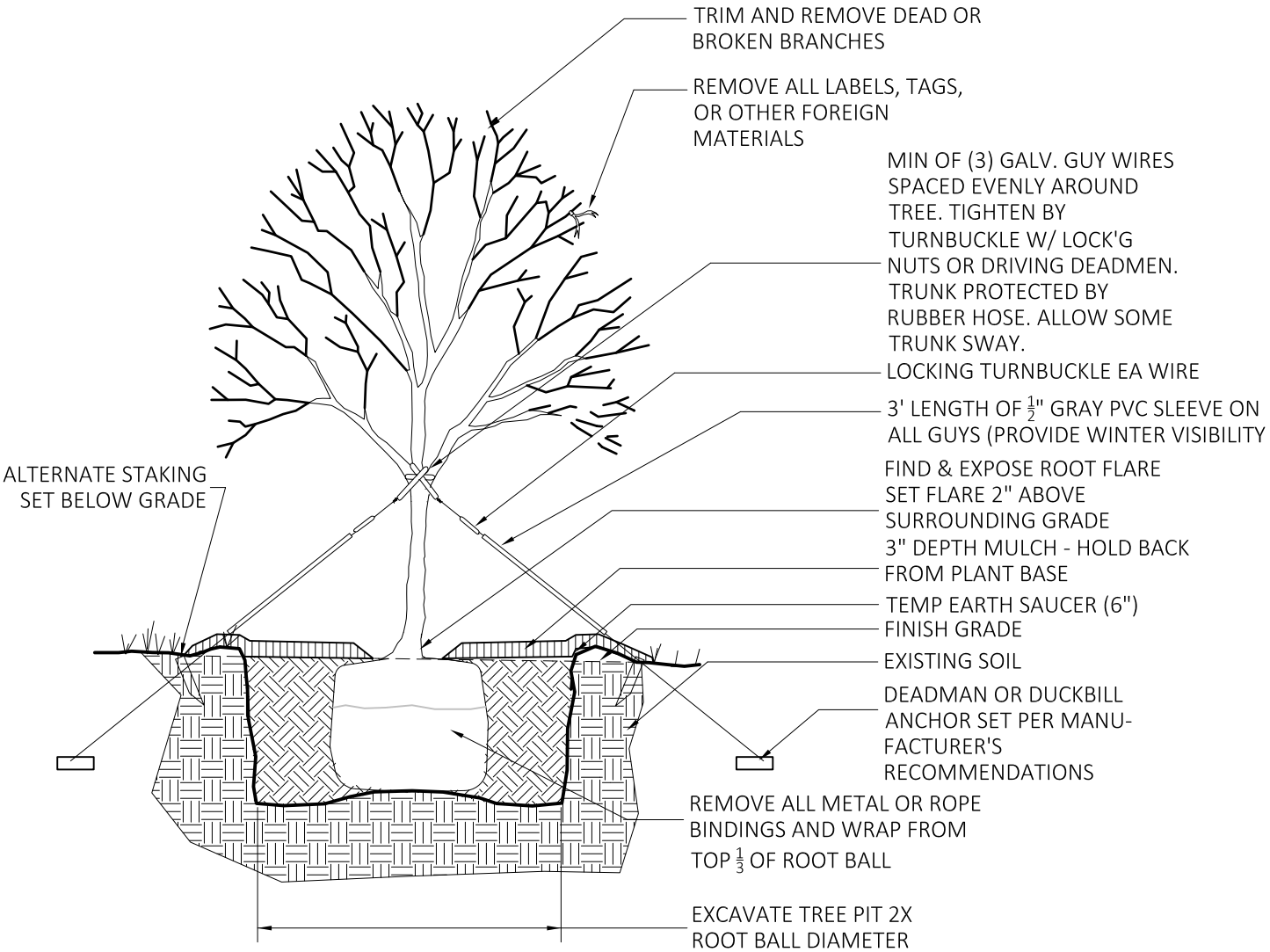
DETAILS



NOTE
1. TREE TO BE SET PLUMB
2. SECURE TREE AS MAY BE REQUIRED ACCORDING TO TREE SIZE, LOCATION AND WIND/ WEATHER CONDITIONS
3. IF USING ROOTBALL STABILIZATION, FOLLOW MANUFACTURER'S RECOMMENDATIONS

TREE PLANTING DETAIL

NOT TO SCALE



TREE PLANTING & GUYING DETAIL

NOT TO SCALE

NOTE
1. TREE TO BE SET PLUMB
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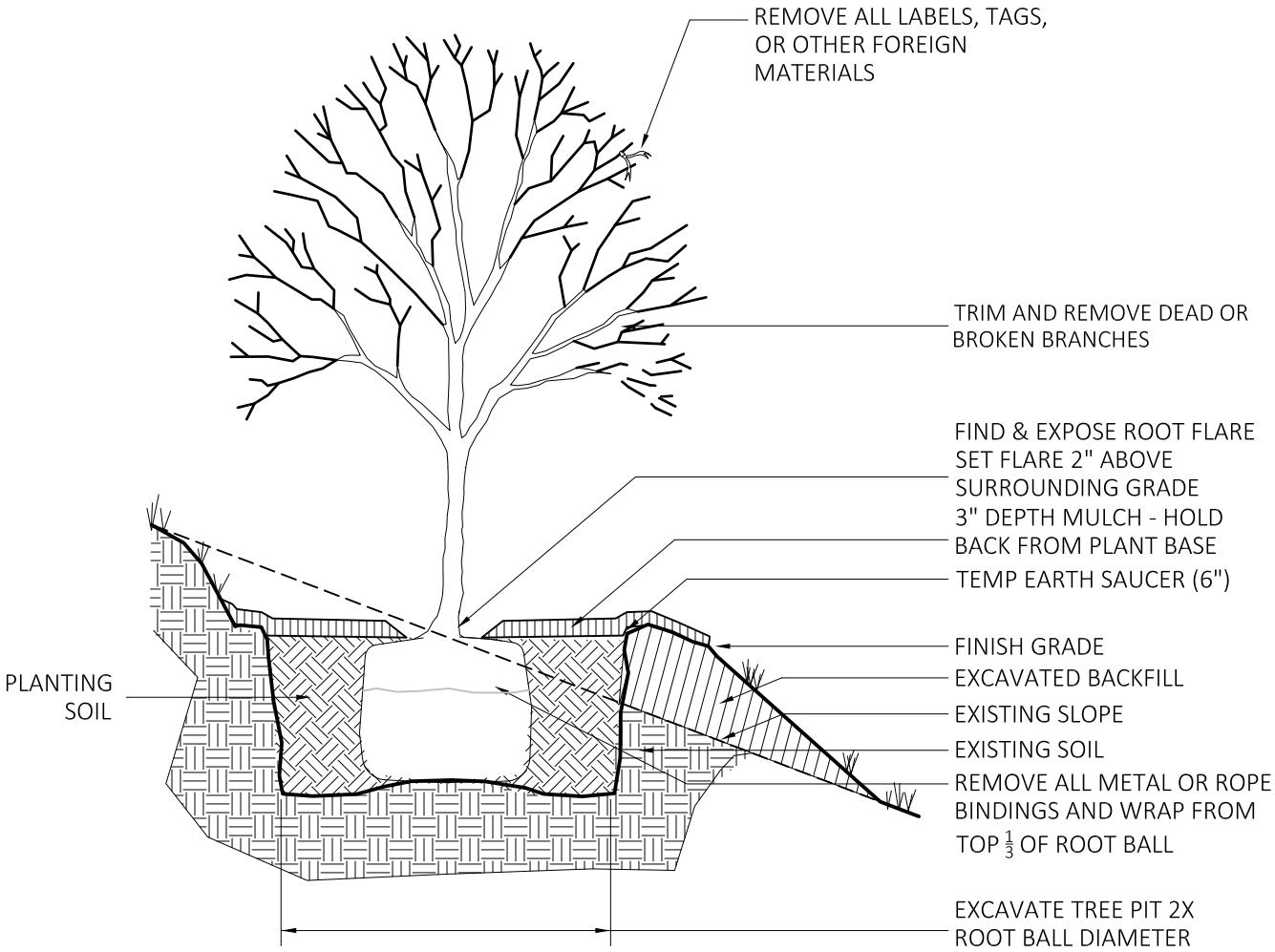
3. IF USING ROOTBALL STABILIZATION, FOLLOW MANUFACTURER'S RECOMMENDATIONS



NOTE
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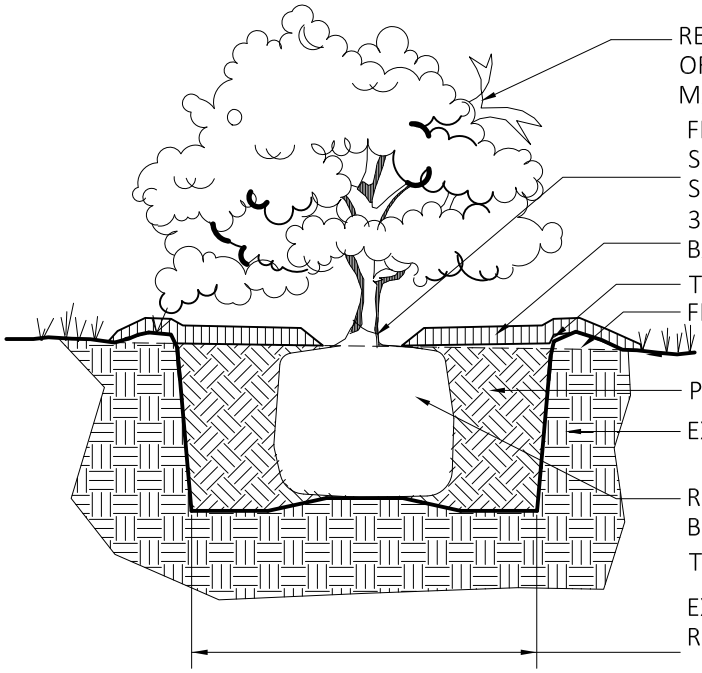
TREE PLANTING ON SLOPE DETAIL

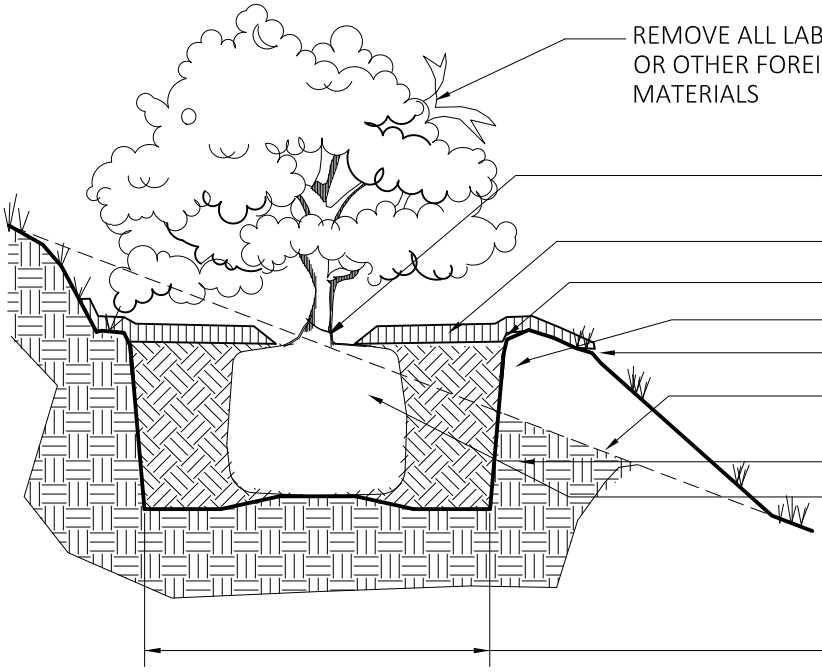
NOT TO SCALE



NOTE
1. SHRUB TO BE SET PLUMB
2. SECURE SHRUB AS MAY BE REQUIRED ACCORDING TO SIZE, LOCATION AND WIND/ WEATHER CONDITIONS
3. IF USING ROOTBALL STABILIZATION, FOLLOW MANUFACTURER'S RECOMMENDATIONS

SHRUB PLANTING DETAIL

NOT TO SCALE



NOTE
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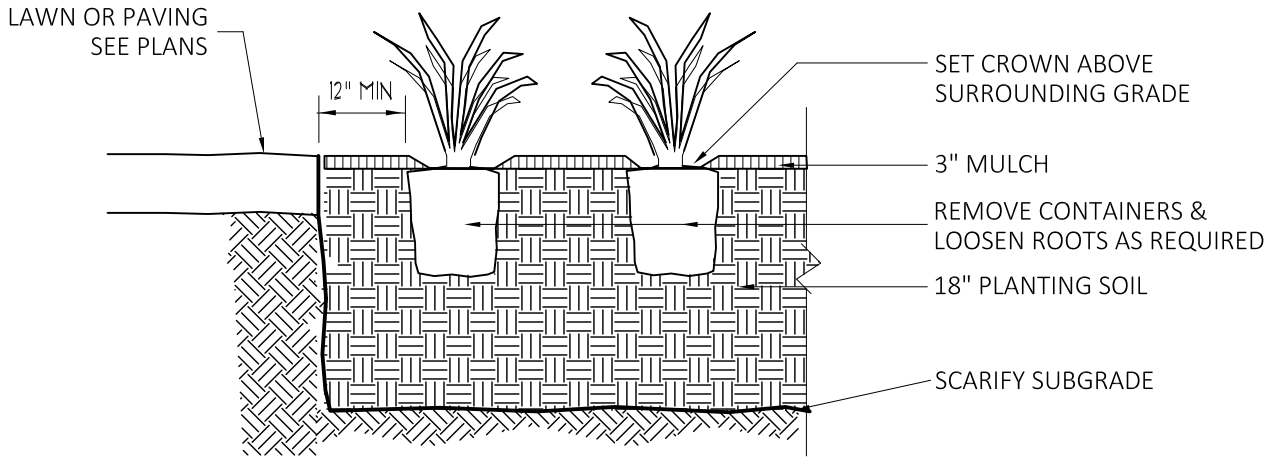
SHRUB PLANTING ON SLOPE DETAIL

NOT TO SCALE



PERENNIAL PLANTING DETAIL

NOT TO SCALE