**SECTION 212 – LANDSCAPING**

**DESCRIPTION**

***ADD THE FOLLOWING TO THIS SUBSECTION:***

**212.01.01 GENERAL**

***DELETE THIS SUBSECTION IN ITS ENTIRETY AND REPLACE WITH the FOLLOWING***

a. All plant material shall be under warranty and maintenance for one year from the substantial completion date.

b. This work shall consist of furnishing and planting trees and installing tree accessories where shown on the drawings or as established by the ENGINEER, all in accordance with specifications and accepted horticultural practices. This work also consists of furnishing and installing decomposed granite and decorative rocks.

***ADD THE FOLLOWING TO THIS SECTION:***

**212.01.02 SUMMARY**

A. The section includes trees, soil amendments, initial maintenance of landscape materials, and accessories required for a complete installation.

**212.01.03 REFERENCES**

1. The materials used shall be those prescribed for the several items which constitute the finished work and shall conform to the applicable requirements of Sections 201 Clearing and Grubbing, Section 203 Excavation and Embankment, Section 207 Structure Backfill of the Clark County Uniform Standard Specifications, American Nursery Association (ANA) Guidelines, and Federal Specifications: O-F-241 – Fertilizers, Mixed, Commercial.
2. The following specifications and standards of the organizations and documents listed in below form a part of the specification to the extent required by the references thereto. In the event that the requirements of the following referenced standards and specifications conflict with this specification section, the requirements of this specification shall prevail. In the event that the requirements of any of the following referenced standards and specifications conflict with each other the more stringent requirement shall prevail or as determined by the Owners Representative.
   * + 1. State of California, Department of Food and Agriculture, Regulations for Nursery Inspections, Rules and Grading.
       2. ANSI Z60.1 American Standard for Nursery Stock, most current edition.
       3. ANSI A 300 – Standard Practices for Tree, Shrub and other Woody Plant Maintenance, most current edition and parts.
       4. Arizona Nursery Association - Container Grown Tree Guide
       5. Interpretation of plant names and descriptions shall reference the following documents. Where the names or plant descriptions disagree between the several documents, the most current document shall prevail.
          1. USDA – The Germplasm Resources Information Network ([GRIN](http://www.ars-grin.gov/npgs/aboutgrin.html)) <http://www.ars-grin.gov/npgs/searchgrin.html>
          2. Manual of Woody Landscape Plants; Michael Dirr; Stipes Publishing, Champaign, Illinois; Most Current Edition.
          3. The New Sunset Western Garden Book, Oxmoor House, most current edition.
       6. Pruning practices shall conform to recommendations “Structural Pruning: A Guide For The Green Industry” most current edition; published by Urban Tree Foundation, Visalia, California.
       7. Glossary of Arboricultural Terms, International Society of Arboriculture, Champaign IL, most current edition.

**212.01.04 QUALITY ASSURANCE**

1. Regulatory Requirements, Codes, and Standards: Comply with appropriate regulatory agencies for fertilizer and herbicide composition.
2. Source Quality Control:
   * + 1. Ship landscape materials with certificates of inspection required by governing authorities. Comply with regulations applicable to landscape materials.
       2. Do not make substitutions. If specified landscape material is not obtainable, submit proof of non-availability to the ENGINEER, together with proposal for use of equivalent material.
       3. Analysis and Standards: Package standard products with manufacturer's certified analysis. For other materials, provide analysis by recognized laboratory made in accordance with methods established by the Association of Official Agriculture Chemists, wherever applicable.
       4. Topsoil: Before delivery of topsoil, furnish the ENGINEER with written statement giving location from which topsoil is to be obtained and an agricultural analysis of the topsoil to be used.
       5. Trees: Provide trees of quantity, size, genus, species, and variety shown and scheduled for landscape work and complying with recommendations and requirements of ANSI Z60.1 American Standard for Nursery Stock. Provide healthy, vigorous stock, grown in recognized nursery in accordance with good horticultural practice and free of disease, insects, eggs, larvae, and defects such as knots, sun scald, injuries, abrasions, or disfigurement.
       6. Label at least ten percent of trees of each variety with a securely attached waterproof tag bearing legible designation of botanical and common name.
          1. Where formal arrangements or consecutive order of trees are shown, select stock for uniform height and spread, and label with number to assure symmetry in planting.
       7. Inspection:
          1. Trees: The ENGINEER may inspect trees either at place of growth or at site before planting, for compliance with requirements for genus, species, variety, size, and quality. The ENGINEER retains right to further inspect trees for size and condition of balls and root systems, insects, injuries and latent defects, and to reject unsatisfactory or defective material at any time during progress of work. Remove rejected trees immediately from project site.
3. Installer Qualifications: The installer shall be a firm having at least 5 years of successful experience of a scope similar to that required for the work, including the handling and planting of large specimen trees in urban areas. The same firm shall install planting soil (where applicable) and plant material.
   * + 1. The bidders list for work under this section shall be approved by the Owner’s Representative.
       2. Installer Field Supervision: When any planting work is in progress, installer shall maintain, on site, a full-time supervisor who can communicate in English with the Owner’s Representative. Field supervisor shall have a minimum of five years’ experience as a field supervisor installing plants and trees of the quality and scale of the proposed project.
       3. Provide submittal prior to work for firm installer qualifications and Installer Field Supervisor qualifications. Submit references of past projects and employee training certifications to support that the Contractor meets all of the above installer qualifications and applicable licensures.
4. Sole Source Responsibility: Subcontract landscape work to a single firm specializing in landscape work, licensed in the state in which work is to be performed.
5. Nursery: Firm specializing in growing and cultivating plants with minimum 5 years documented experience.
6. Tree Installer: Firm specializing in installing and planting the plants with minimum 5 years documented experience approved by nursery.
7. Coordinate with installation of underground sprinkler system piping and watering heads.

**212.01.05 SUBMITTALS**

A. The CONTRACTOR shall submit, within ten (10) calendar days after receipt of Notice to Proceed, material and equipment submittals, including manufacturer’s name and address, specific trade names, catalog and model numbers, illustrations and descriptive material, clearly marked as to proposed items for approval by the ENGINEER.

B. Approval of the submittals shall be the CONTRACTOR’S authorization to order the required material. There will be no deviation from the approved submittals without the written authorization of the ENGINEER.

C. Plant and Material Certifications:

* + - 1. Certificates of inspection required by governmental authorities.
      2. Plant growers’ certificates: Submit plant growers’ certificates for all plants indicating that each meets the requirements of the specification, including the requirements of tree quality, to the Owner’s Representative for approval. Provide submittal eight weeks before the installation of plants.
      3. Manufacturer's or vendor's certified analysis for soil amendments and fertilizer materials.
      4. Label data substantiating that trees comply with specified requirements.

1. Planting Schedule: Proposed planting schedule, indicating dates for each type of landscape work during normal seasons for such work in area of site. Correlate with specified maintenance periods to provide maintenance from date of substantial completion. Once accepted, revise dates only as approved in writing, after documentation, of reasons for delays.
2. Maintenance Instructions: Typewritten instructions recommending procedures, to be approved by the ENGINEER for maintenance of landscape work for one year. Submit prior to start of required maintenance period.
3. For materials used on the project which cannot be visually verified, submit copies of all invoices or receipts. These include, but are not limited to, backfill mix material, fertilizer, fertilizer tablets, mulches, soil stabilizers, water holding agents, herbicides, etc. All invoices or receipts must list the item, quantity, job location, date and the supplier.
4. Agricultural Soil Analysis: CONTRACTOR is to obtain an agricultural soil analysis of both the import and the on-site soil from a lab specializing in agricultural soil analysis, analyzing the items in the units specified in 212.02.01. The analysis is to recommend specific soil amendments and fertilizer applications. Submit the results to the ENGINEER for review and approval. The soil mix noted on the plans will be changed or altered according to the recommendations of the soil lab and the instructions of the ENGINEER at no additional cost.
5. Warranty period site visit record: If there is no maintenance during the warranty period, after each site visit during the warranty period, by the Contractor, as required by this specification, submit a written record of the visit, including any problems, potential problems, and any recommended corrective action to the Owner’s Representative for approval.

**212.01.06 DELIVERY STORAGE AND HANDLING**

* + - 1. Packaged Materials: Deliver packaged materials in containers showing weight, analysis, and name of manufacturer. Protect materials from deterioration during delivery, and while stored at site. Adequately protect plants from drying out, exposure of roots to sun, wind or extremes of heat and cold temperatures. If planting is delayed more than 24 hours after delivery, set plants in a location protected from sun and wind. Provide adequate water to the root ball package during the shipping and storage period.
         1. All plant materials must be available for observation prior to planting.
         2. Using a soil moisture meter, periodically check the soil moisture in the root balls of all plants to assure that the plants are being adequately watered. Volumetric soil moisture shall be maintained above wilting point and below field capacity for the root ball substrate or soil.
      2. Trees and Shrubs: Do not prune prior to delivery unless otherwise approved by the ENGINEER. Do not bend or bind‑tie trees or shrubs in such manner as to damage bark, break branches, or destroy natural shape. Provide protective covering during delivery. Do not drop balled and burlapped stock during delivery.
      3. Deliver trees after preparations for planting have been completed and plant immediately. If planting is delayed more than 6 hours after delivery, set trees in shade, protect from weather and mechanical damage, and keep roots moist by covering with mulch, burlap or other acceptable means of retaining moisture.
      4. Protect soil from compaction during the delivery of plants to the planting locations, digging of planting holes and installing plants.
         1. Where possible deliver and plant trees that require the use of heavy mechanized equipment prior to final soil preparation and tilling. Where possible, restrict the driving lanes to one area instead of driving over and compacting a large area of soil.
         2. Till to a depth of 6 inches, all soil that has been driven over during the installation of plants.

**212.01.07 PROJECT CONDITIONS**

A. Utilities: Determine location of underground utilities and perform work in a manner which will avoid possible damage. Hand excavate, as required. Maintain grade stakes set by others until removal is mutually agreed upon by parties concerned.

* + 1. Excavation: When conditions detrimental to plant growth are encountered, such as rubble fill, adverse drainage conditions, or obstructions, notify the ENGINEER before planting.
    2. It is the responsibility of the Contractor to be aware of all surface and sub-surface conditions, and to notify the Owner’s Representative, in writing, of any circumstances that would negatively impact the health of plantings. Do not proceed with work until unsatisfactory conditions have been corrected.

1. Should subsurface drainage or soil conditions be encountered which would be detrimental to growth or survival of plant material, the Contractor shall notify the Owner’s Representative in writing, stating the conditions and submit a proposal covering cost of corrections. If the Contractor fails to notify the Owner’s Representative of such conditions, he/she shall remain responsible for plant material under the warranty clause of the specifications.
   * 1. It is the responsibility of the Contractor to be familiar with the local growing conditions, and if any specified plants will be in conflict with these conditions. Report any potential conflicts, in writing, to the Owner’s Representative.
     2. This specification requires that all Planting Soil and Irrigation (if applicable) work be completed and accepted prior to the installation of any plants.
2. Planting operations shall not begin until such time that the irrigation system is completely operational for the area(s) to be planted, and the irrigation system for that area has been preliminarily observed and approved by the Owner’s Representative.
3. If it is not desired or is impractical to have a fully functional irrigation system prior to plantings, all landscape shall be hand watered based on an agreed upon schedule with the Owner Representative.

**212.01.08 SEQUENCING AND SCHEDULING**

A. Planting Time: Proceed with, and complete landscape work as rapidly as portions of site become available, working within seasonal limitations for each kind of landscape work required.

* + - 1. Plant or install materials during normal planting seasons for each type of plant material required.
      2. Correlate planting with specified maintenance periods to provide maintenance from date of substantial completion.

1. The Contractor shall coordinate with all other work that may impact the completion of the work.
2. Prior to the start of work, prepare a detailed schedule of the work for coordination with the other trades.

**212.01.09 WARRANTY**

1. The Contractor agrees to replace defective work and defective plants. The Owner’s Representative shall make the final determination if plants meet these specifications or that plants are defective. Plant warranty shall begin on the date of Substantial Completion Acceptance and continue for the following periods, classified by plant type:
   1. Trees – 1 Year
   2. Shrubs – 1 Year
   3. Ground cover and perennial flower plants – 1 Years
2. All plants shall be warrantied to meet all the requirements for plant quality at installation in this specification. Defective plants shall be defined as plants not meeting these requirements. The Owner’s representative shall make the final determination that plants are defective.
3. Plants determined to be defective shall be removed immediately upon notification by the Owner’s Representative and replaced without cost to the Owner, as soon as weather conditions permit and within the specified planting period.
4. Any work required by this Specification or the Owner’s Representative during the progress of the work, to correct plant defects, shall not be considered as grounds to void any conditions of the warranty. In the event that the Contractor decides that such remediation work may compromise the future health of the plant, the plant or plants in question shall be rejected and replaced with plants that do not contain defects that require remediation or correction.
5. The Contractor is exempt from replacing, after Substantial Completion acceptance or issuance and during the warranty period, plants/trees that are removed by others, lost or damaged due to occupancy of project, lost or damaged by a third party, vandalism, or any natural disaster. Extreme weather that is typical in any given year is not considered a natural disaster including winds up to 60 mph.
6. Replacements shall closely match adjacent specimens of the same species. Replacements shall be subject to all requirements stated in this specification. Make all necessary repairs due to plant replacements. Such repairs shall be done at no extra cost to the Owner.
7. The warranty of all replacement plants shall extend for an additional one-year period from the date of their acceptance after replacement. In the event that a replacement plant is not acceptable during or at the end of the said extended warranty period, the Owner’s Representative may elect one more replacement items or credit for each item. These tertiary replacement items are not protected under a warranty period.
8. During and by the end of the warranty period, only remove all tree wrap, ties, and guying when agreed upon by the Owner’s Representative. All trees shall be staked or remain staked, until the Owner's Representative determines that staking can be removed.
9. End of Warranty Final Acceptance – Acceptance of plants at the end of the warranty period.
   1. At the end of the warranty period, the Owner’s Representative shall observe all warranted work, upon written request of the Contractor or scheduled by the Owner. The request shall be received at least ten calendar days before the anticipated date for final observation.
   2. End of Warranty Final Acceptance will be given only when all the requirements of the work under this specification and in specification sections Planting Soil and Irrigation have been met.

**212.01.10 MAINTENANCE SERVICE**

A. Maintain plant life for one year after the Date of Substantial Completion.

B. Maintenance to include (but not limited to):

* + - 1. Cultivation and weeding tree pits.
      2. Fertilizing trees every 90 days.
      3. Applying herbicides for weed control in accordance with manufacturer’s instructions
      4. Remedy damage resulting from use of herbicides.
      5. Remedy damage from use of insecticides.
      6. Irrigating sufficient to saturate root system.
      7. Pruning, including removal of dead or broken branches. Tree pruning shall conform to ISA Best Management Practices regarding tool selection and sterilization, tree structure and biology, pruning practices, branch removal and quality of workmanship and current ANSI A300 standards.
      8. Disease control.
      9. Maintaining wrapping, guys, and stakes. Repair or replace accessories when required.
      10. Advising the Owner to make any watering schedule changes the Contractor does not have control over.

**212.01.11 PRE-ACTIVITY MEETING**

1. Schedule a pre-activity meeting with the Owner’s Representative at least seven (7) days before beginning work to review any questions the Contractor may have regarding the work, administrative procedures during construction and project work schedule.

**MATERIALS**

**212.02.01 GENERAL**

***ADD THE FOLLOWING TO THIS SUBSECTION:***

1. Standards and measurement: Provide plants of quantity, size, genus, species, and variety or cultivars as shown and scheduled in contract documents.
   * + 1. All plants including the root ball dimensions or container size to trunk caliper ratio shall conform to ANSI Z60.1 “American Standard for Nursery Stock” latest edition, unless modified by provisions in this specification. When there is a conflict between this specification and ANSI Z60.1, this specification section shall be considered correct.
       2. Plants larger than specified may be used if acceptable to the Owner’s Representative. Use of such plants shall not increase the contract price. If larger plants are accepted the root ball size shall be in accordance with ANSI Z-60.1. Larger plants may not be acceptable if the resulting root ball cannot be fit into the required planting space.
       3. If a range of size is given, no plant shall be less than the minimum size and not less than 50 percent of the plants shall be as large as the maximum size specified. The measurements specified are the minimum and maximum size acceptable and are the measurements after pruning, where pruning is required.
2. Proper Identification: All trees shall be true to name as ordered or shown on planting plans and shall be labeled individually or in groups by genus, species, variety and cultivar.
3. Compliance: All trees shall comply with federal and state laws and regulations requiring observation for plant disease, pests, and weeds. Observation certificates required by law shall accompany each shipment of plants.
   * + 1. Clearance from the local county agricultural commissioner, if required, shall be obtained before planting trees originating outside the county in which they are to be planted.

**212.02.03 QUALITY OF PLANT MATERIALS**

***ADD THE FOLLOWING TO THIS SUBSECTION:***

1. General: Provide healthy stock, grown in a nursery and reasonably free of die-back, disease, insects, eggs, bores, and larvae. At the time of planting all plants shall have a root system, stem, and branch form that will not restrict normal growth, stability and health for the expected life of the plant.
2. Plant quality above the soil line – Plants shall be healthy with the color, shape, size and distribution of trunk, stems, branches, buds, and leaves normal to the plant type specified. Tree quality above the soil line shall comply with the project Crown Acceptance details and the following:
3. Crown: The form and density of the crown shall be typical for a young specimen of the species or cultivar pruned to a central and dominant leader. Crown specifications do not apply to plants that have been specifically trained in the nursery as topiary, espalier, multi-stem, clump, or unique selections such as contorted or weeping cultivars.
4. Leaves: The size, color, and appearance of leaves shall be typical for the time of year and stage of growth of the species or cultivar. Trees shall not show signs of prolonged moisture stress or over watering as indicated by wilted, shriveled, or dead leaves.
5. Branches: Shoot growth (length and diameter) throughout the crown should be appropriate for the age and size of the species or cultivar. Trees shall not have dead, diseased, broken, distorted, or otherwise injured branches.
6. Main branches shall be distributed along the central leader not clustered together. They shall form a balanced crown appropriate for the cultivar/species.
7. Branch diameter shall be no larger than two-thirds (one-half is preferred) the diameter of the central leader measured 1 inch above the branch union.
8. The attachment of the largest branches (scaffold branches) shall be free of included bark.
9. Trunk: The tree trunk shall be relatively straight, vertical, and free of wounds that penetrate to the wood (properly made pruning cuts, closed or not, are acceptable and are not considered wounds), sunburned areas, conks (fungal fruiting bodies), wood cracks, sap leakage, signs of boring insects, galls, cankers, girdling ties, or lesions (mechanical injury).
10. Temporary branches, unless otherwise specified, can be present along the lower trunk below the lowest main (scaffold) branch, particularly for trees less than 1 inch in caliper. These branches should be no greater than 3/8-inch diameter. Clear trunk should be no more than 40% of the total height of the tree.
11. Trees shall have one central leader. If the leader was headed, a new leader (with a live terminal bud) at least one-half the diameter of the pruning cut shall be present.
12. All trees are assumed to have one central leader trees unless a different form is specified in the plant list or drawings.
13. All graft unions, where applicable, shall be completely closed without visible sign of graft rejection. All grafts shall be visible above the soil line.
14. Trunk caliper and taper shall be sufficient so that the lower five feet of the trunk remains vertical without a stake. Auxiliary stake may be used to maintain a straight leader in the upper half of the tree.
15. Plant quality at or below the soil line: Plant roots shall be normal to the plant type specified. Root observations shall take place without impacting tree health. Root quality at or below the soil line shall comply with the project Root Acceptance details if shown on the plans and the following:
16. The roots shall be reasonably free of scrapes, broken or split wood.
17. The roots system shall be reasonably free of injury from biotic (e.g., insects and pathogens) and abiotic (e.g., herbicide toxicity and salt injury) agents. Wounds resulting from root pruning used to produce a high quality root system are not considered injuries.
18. A minimum of three structural roots reasonably distributed around the trunk (not clustered on one side) shall be found in each plant. Root distribution shall be uniform throughout the root ball, and growth shall be appropriate for the species. Plants with structural roots on only one side of the trunk (J roots) shall be rejected.
19. The root collar shall be within the upper 2 inches of the substrate/soil. Two structural roots shall reach the side of the root ball near the top surface of the root ball. The grower may request a modification to this requirement for species with roots that rapidly descend, provided that the grower removes all stem girdling roots above the structural roots across the top of the root ball.
20. The root system shall be reasonably free of stem girdling roots over the root collar or kinked roots from nursery production practices.
21. At time of observation and delivery, the root ball shall be moist throughout. Roots shall not show signs of excess soil moisture conditions as indicated by stunted, discolored, distorted, or dead roots.

**212.02.06 SUBSTITUTION OF PLANTS**

***ADD THE FOLLOWING TO THIS SUBSECTION:***

1. Submit all requests for substitutions of plant species, or size to the Owner’s Representative, for approval, prior to purchasing the proposed substitution. Request for substitution shall be accompanied with a list of nurseries contacted in the search for the required plant and a record of other attempts to locate the required material. Requests shall also include sources of plants found that may be of a smaller or larger size, or a different shape or habit than specified, or plants of the same genus and species but different cultivar origin, or which may otherwise not meet the requirements of the specifications, but which may be available for substitution.

**212.02.08 PLANTING SOIL**

***ADD THE FOLLOWING TO THIS SUBSECTION:***

1. Planting soil as used in this specification means the soil at the planting site, or imported as modified and defined in specification Section Planting Soil. If there is no Planting Soil specification, the term Planting Soil shall mean the soil at the planting site within the planting hole.

**212.02.10 MULCH**

***ADD THE FOLLOWING TO THIS SUBSECTION:***

1. Mulch shall be “Walk on” grade, coarse, ground, from tree and woody brush sources. The maximum size of individual pieces (largest 20% or less of volume) shall be approximately 1 to 3 inch in diameter and/or in length. Pieces larger than 3-inches or inconsistent with the overall appearance of wood mulch shall be removed.
   1. It is understood that mulch quality will vary significantly from supplier to supplier. The above requirements may be modified to conform to the source material from locally reliable suppliers as approved by the Owner’s Representative.
2. Submit supplier’s product specification data sheet and a three gallon sample for approval.

***ADD THE FOLLOWING TO THIS SECTION:***

**212.02.70 TOP SOIL**

A. Topsoil for landscape work is to be:

* + - 1. Sandy or Loamy Sand from well drained local sites
      2. Free from refuse, roots, heavy clay, stones larger than one-quarter inch in largest direction, gravel, sticks, brush, litter and other deleterious substances
      3. Less than ten percent clay content and more than 75 percent sand content
      4. Salinity – Ece no greater than four mmhos/cm
      5. Water holding capacity between 40 percent and 55 percent
      6. Boron – Less than one ppm
      7. pH – Less than 8.5

**212.02.71 soil amendments**

1. Fertilizer: FS O-F-241, Type I, Grade A; with fifty percent of the elements derived from organic sources; of proportion necessary to eliminate any deficiencies of topsoil as indicated in the soil analysis.

B. Organic soil conditioner: Gro-Power, Nutri-Mulch, Nevada Forest Products, Bio-Rem or Equal.

C. Soil Sulphur: In quantities necessary to eliminate any deficiencies of topsoil as indicated in the soil analysis.

D. Iron Sulfate: In quantities necessary to eliminate any deficiencies of topsoil as indicated in the soil analysis or as shown on the soil mix details.

E. Water: Clean, fresh and free of substances or matter which could inhibit vigorous growth of plants.

F. Herbicide: As needed.

G. Pesticide: As needed

**212.02.72 MISCELLANEOUS LANDSCAPE MATERIALS**

A. Anchors and Guys: Provide anchors and guys as shown on the drawings.

B. Decorative Rock Ground Cover: Hard, durable gravel, washed free of loam, sand, clay, and other foreign substances. Size, color and type as specified on the Plans.

**212.02.73 TREES**

1. All trees shall be single-trunk.

(NOTE TO SPEC WRITER – CLV PM to work with Brad Daseler, 4-inch caliper and 48” Box tree is standard but 3-inch caliper or 36-inch Box tree may be requested for project, alter B accordingly)

1. All trees shall be a minimum 4-inch caliper for 48” box trees and larger. If the contractor is unable to obtain 4-inch caliper trees that are acceptable to the Engineer, then minimum 3-inch caliper may be accepted by the Engineer if the trees are personally tagged and/or accepted via photograph of the specific trees to be provided. Accepted trees smaller than 4-inch caliper will be paid at a 25% reduction to the bid unit price. Section 104.02 of the Standard Specifications does not apply to the 25% reduction.
2. All trees shall have a trunk height of 5-feet measured from the root ball to the crotch.
3. The minimum canopy height shall be 7-feet from finished grade when installed and maintained for the duration of construction.
4. Quality: Provide trees of size, genus, species, and variety shown and scheduled for landscape work, grown in climatic conditions similar to those in locality of the work.

**212.02.74 SELECTION AND OBSERVATION OF PLANTS**

1. The Owner’s Representative may review all plants subject to approval of size, health, quality, character, etc. Review or approval of any plant during the process of selection, delivery, installation and establishment period shall not prevent that plant from later rejection in the event that the plant quality changes or previously existing defects become apparent that were not observed.
2. Plant Selection: The Owner’s Representative reserves the right to select and observe all plants at the nursery prior to delivery and to reject plants that do not meet any requirements as set forth in this specification. If a particular defect or substandard element can be corrected at the nursery, as determined by the Owner’s Representative, the agreed upon remedy may be applied by the nursery or the Contractor provided that the correction allows the plant to meet the requirements set forth in this specification. Any work to correct plant defects shall be at the contractor’s expense.
   * + 1. The Owner’s Representative may make invasive observation of the plant’s root system in the area of the root collar and the top of the root ball in general in order to determine that the plant meets the quality requirements for depth of the root collar and presence of roots above the root collar. Such observations will not harm the plant.
       2. Corrections are to be undertaken at the nursery prior to shipping.
3. The Contractor shall bear all cost related to any plant corrections.
4. All plants that are rejected shall be immediately removed from the site and acceptable replacement plants provided at no cost to the Owner.
5. The Contractor shall require the grower or re-wholesale supplier to permit the Owner’s Representative to observe the root system of all plants at the nursery or job site prior to planting including random removal of soil or substrate around the base of the plant. Observation may be as frequent and as extensive as needed to verify that the plants meet the requirements of the specifications.
6. For pre-purchased trees, each tree shall have a numbered seal applied by the Contractor. The seal shall be placed on a lateral branch on the north side of the tree. The seal shall be a tamper proof plastic seal bearing the Contractors name and a unique seven-digit number embossed on the seal.
   * + 1. Do not place seals on branches that are so large that there is not sufficient room for the branch growth over the period of the warranty.
7. The Owner’s Representative may choose to attach their seal to each plant, or a representative sample. Viewing and/or sealing of plants by the Owner’s Representative at the nursery does not preclude the Owner’s Representative’s right to reject material while on site. The Contractor is responsible for paying any cost for the Owner’s Representative to attach their seal to specific plants.
8. Where requested by the Owner’s Representative, submit current photographs of plants or representative samples of plants. Photographs shall be legible and clearly depict the plant specimen. Each submitted image shall contain a height reference, such as a measuring stick. The approval of plants by the Owner’s Representative via photograph does not preclude the Owner’s Representative's right to reject material while on site.

**212.02.75 ROOT BALL PACKAGE OPTIONS**

1. The following root ball packages are permitted. Specific root ball packages shall be required where indicated on the plant list or in this specification. Any type of root ball packages not specifically defined in this specification shall not be permitted.
2. Balled and burlapped plants:
   1. All balled and burlapped plants shall be field grown, and the root ball packaged in a burlap and twine and/or burlap and wire basket package.
   2. Plants shall be harvested with the following modifications to standard nursery practices.
      1. Prior to digging any tree that fails to meet the requirement for maximum soil and roots above the root collar, carefully remove the soil from the top of the root ball of each plant, using hand tools, water or an air spade, to locate the root collar and attain the soil depth over the structural roots as required. Remove all stem girdling roots above the root collar. Care must be exercised not to damage the surface of the root collar and the top of the structural roots.
      2. Trees shall be dug for a minimum of 4 weeks and a maximum of 52 weeks prior to shipping. Trees dug 4 to 52 weeks prior to shipping are defined as hardened-off. Digging is defined as cutting all roots and lifting the tree out of the ground and either moving it to a new location in the nursery or placing it back into the same hole. Tress that are stored out of the ground shall be placed in a holding area protected from extremes of wind and sun with the root ball protected by covering with mulch or straw and irrigated sufficiently to keep moisture in the root ball above wilt point and below saturation.
      3. Wire baskets may be used to support the root ball. The wire baskets shall be removed entirely prior to backfilling the tree.
      4. Twine and burlap used for wrapping the root ball package shall be natural, biodegradable material. If the burlap decomposes after digging the tree then the root ball shall be re-wrapped prior to shipping unless roots have grown to keep root ball intact during shipping.
3. Container (including above-ground fabric containers and boxes) plants:
   1. Container plants may be permitted only when indicated on the drawing, in this specification, or approved by the Owner’s Representative.
   2. Provided plants shall be established and well rooted in removable containers.
   3. Container class size, or wooden box size equivalent where applicable, shall conform to ANSI Z60.1 for container plants for each size and type of plant.

**212.02.76 PALMS**

1. Palms shall meet all the requirements of the Quality of Plant Material section, except as modified below or where the requirements are not appropriate to the specification of palms.
2. Defronding, tying, and hedging:
   1. In preparing palm trees for relocation, all dead fronds shall be removed.
   2. All remaining fronds above horizontal shall be lifted up and tied together around the crown in an upright position. Up to 2/3 of the oldest live fronds can be removed. Do not tie too tightly, bind or injure the bud. Jute binder twine shall be used in tying up the fronds; wire will not be permitted. Fronds shall be untied immediately after planting.
3. Digging the root ball:
   1. When digging out the root ball, no evacuation shall be done closer than 30” inches to the trunk at ground level and the excavation shall extend below the major root system to a minimum depth of 3.5 feet. The bottom of the root ball shall be cut off square and perpendicular to the trunk below the major root system.
4. The Contractor shall not free-fall, roll or abuse the tree or put a strain on the crown (bud area) at any time. A protective device shall be used around the trunk of the tree while lifting and relocating so as not to injure the bud, or scar or skin the trunk in any way.

NOTE TO SPEC WRITER: THE FOLLOWING TWO SECTIONS ARE ONLY FOR PROJECTS THAT INCLUDE SOIL CELLS

**212.02.77 STRUCTURAL SOIL CELL**

1. All structural soil cells will consist of an interconnected, skeletal matrix that provides void space for filling with soil media.
2. Structural Soil Cell Modules shall be engineered plastic modules designed to connect together to create a matrix, for use beneath pavements. Structural Soil Cell Modules shall be StrataVault, Silva Cell or approved equal. Strata Cell available through CityGreen, 888-999-3990, [info@citygreen.com](mailto:info@citygreen.com). Silva Cell available through Deeproot, 415-781-9700, hello@deeproot.com.
   1. 100% recycled Polypropylene (PP)
   2. No steel components-corrosion free
   3. Ultimate Load Strength 306 kpa (44.38 psi) minimum, verified by laboratory crush tests.
3. Aggregate Sub-base shall be clean aggregate 5-10 mm (0.2 - 0.4 inch) screening.
4. Heavy Grade Non-Woven Filter Fabric shall be Geocomposite 3030 or equal. Composite of a laid geogrid made of stretched, monolithic polypropylene (PP) flat bars with welded junctions and a mechanical bonded filter geotextile welded within the geogrid structure, used for reinforcement in many fields of civil engineering including road construction, landfill and hydraulic engineering.

|  |  |  |  |
| --- | --- | --- | --- |
| **Property** | **Test Method\*** | **Unit** | **30/30 Q1 151 GRK 3** |
| ***Geogrid*** | | | ***30/30 Q1*** |
| Raw material | - | - | Polypropylene (PP), white |
| Mass per unit area | EN ISO 9864 | g/m² | 200 |
| Max. tensile strength, md / cmd\*\* | EN ISO 10319 | kN/m | ≥ 30/ ≥ 30 |
| Elongation at nominal strength, md / cmd\*\* | EN ISO 10319 | % | ≤8 / ≤8 |
| Tensile strength at 2% elongation, md / cmd\*\* | EN ISO 10319 | kN/m | 12 / 12 |
| Tensile strength at 5% elongation, md / cmd\*\* | EN ISO 10319 | kN/m | 24 / 24 |
| Aperture size, md x cmd\*\* | - | mm x mm | Approx. 32 x 32 |
| Production specific elongation | - | % | O |
| ***Geotextile*** | | | ***151 GRK 3*** |
| Raw material | - | - | Polypropylene (PP), white |
| Mass per unit area | EN ISO 9864 | g/m² | ≥150 |
| Max. tensile strength, md / cmd\*\* | EN ISO 10319 | kN/m | 7.5 / 11.0 |
| Elongation at max. tensile strength, md / cmd\*\* | EN ISO 10319 | % | 40 / 30 |
| Puncture force | EN ISO 12236 | N | 1,670 |
| Displacement at static puncture strength | EN ISO 12236 | mm | 30 |
| Detector tested | - | - | Yes |
| Roll dimensions, width x length | - | m x m | 4.75 x 100 |

*\* based on, \*\* md = machine direction, cmd = cross machine direction*

1. Linear Barrier shall be Rootstop, DeepRoot, or approved equal. Linear barriers to be installed per plan. Vertical, integral ribs guide tree roots down into matrix beneath pavement.
   1. Continuous rolls to minimize joins and possible penetration.
   2. Widths to suit application and pavement depth
   3. 80mil thickness
   4. 100% High density Polyethylene. This resin meets FDA regulation 177.1520 for food packaging.
   5. Nominal physical properties:

|  |  |  |  |
| --- | --- | --- | --- |
| **PROPERTY\*** | **ASTM D** | **UNIT** | **VALUE** |
| Density | 1505 | g/cm³ | 0.952 |
| Melt Index | 1238 | g/10 min | 0.35 |
| ESCR,F₅₀ Condition B | 1693 | h | 50 |
| Tensile Yield Strength | 638 @ 50mm/min | MPa | 27 |
| Elongation at Break | 638 @ 50mm/min | % | ˃600 |
| Brittleness Temperature | 746 | °C | <-90 |
| Flexural Modulus | 790 | MPa | 1310 |
| Shore Hardness D | 2240 | - | 66 |
| Thermoforming\*\* Sheet sag |  | cm | 18-23 |
|  |  | h | ˃700 |

\* Physical properties reported herein were determined on compression molded specimens prepared in accordance with Procedure C of ASTM D 1928.

\*\* 0.61 x 1.22 x 3.2mm thick blank heated to forming temperature.

\*\*\* Test conditions: 296ml, 23g bottle, 10% fill, Orvus K Detergent.

1. Linear root/moisture barrier for use within or to line the main tree pit, where moisture or roots must be prevented from entering an external zone.
2. Granular base course shall consist of granular material meeting the standard below, or equivalent
   1. ASTM D1241-07, Type 1, Gradation B Standard Specification for Materials for Soil-Aggregate Sub base, Base, and Surface Courses.
      1. Type I mixtures shall consist of stone, gravel, or slag with natural or crushed sand and fine mineral particles passing a No. 200 sieve.

|  |  |
| --- | --- |
| Sieve | Percent Passing |
| 37.5mm (1.5”) | 100 |
| 25mm (1”) | 75-95 |
| 9.5mm (3/8”) | 40-75 |
| 4.75mm (No 4) | 30-60 |
| 2.0mm (No 10) | 20-45 |
| 425μm (No 40) | 15-30 |
| 75μm (No 200) | 5-15 |

**212.02.78 STRUCTURAL SOIL CELL soil composition**

1. Soil shall consist of fertile, friable soil of loamy character from local pits. Soil shall be free from deleterious substances such as road base, litter, refuse, toxic waste, stones larger than 1-inch in size, coarse sand, heavy or stiff clay, brush, sticks, grasses, roots, noxious weed seed, weeds, and other substances detrimental to plant, animal, and human health.
2. Planting soil must be derived from a combination of the following types of materials:
   1. Loamy soil with no more than 70% sand and 18% clay
   2. USDA Certified Organic biochar
   3. US Composting Council STA Program Approved compost
   4. Added minerals, nutrients or fertilizers following the specific job requirements
3. Topsoil shall contain materials that maintain that does not contribute to the contamination of crops, soil, or water by plant nutrients, pathogenic organisms, heavy metals, or residues of prohibited substances.
4. The quality characteristics of the planting soil must have the lab tested values shown in the following table unless written consent from the City of Las Vegas Urban Forester to accept soil with qualities outside following ranges:

|  |  |
| --- | --- |
| **Soil Characteristic** | **Planting Soil Requirement** |
| pH | 7.0-8.0 |
| Sodium | < 200ppm |
| Nitrogen | Min 50ppm |
| Phosphorus | Min 50ppm |
| Potassium | Min 50ppm |
| Calcium | Min 1,000ppm |
| Boron | < 1 ppm |
| Cation Exchange Capacity | 12-27 meq/100g |
| Soil Organic Matter-derived from biochar | 5-7% |
| Soil Organic Matter-derived from compost | 1-3% |
| Salinity/Electrical Conductivity | < 4 mmhos/cm |
|  |  |
| Physical contaminants – plastic, metal, rocks <1” | < .1% by volume |

**CONSTRUCTION**

1. **LAYOUT OF PLANTING**

***add the following to this subsection***

1. Layout individual tree locations and secure the ENGINEER’S acceptance before start of planting work.
2. When applicable, plant trees before other plants are installed.
3. It is understood plants are not precise objects and that minor adjustments in the layout will be required as the planting plan is constructed. These adjustments may not be apparent until some or all of the plants are installed. Make adjustments as required by the Owner’s Representative including relocating previously installed plants.
4. Coordinate the relocation of any irrigation lines, heads or the conduits of other utility lines that are in conflict with tree locations. Root balls shall not be altered to fit around lines. Notify the Owner’s Representative of any conflicts encountered.
5. **PREPARATION OF PLANTING AREAS**

***add the following to this subsection***

B. Excavate pits, beds, and trenches per drawings and details.

C. Dispose of excess subsoil removed from planting excavations.

D. Fill excavations for trees with water and allow water to percolate out prior to planting. If water does not percolate in 24 hours, a drainage chimney must be drilled as specified on the drawings.

1. **PLANTING**

***add the following to this subsection***

1. Planting of trees and shrubs shall be done in accordance with the following:
2. Install root barriers as indicated on drawings and details.
3. Place plants for best appearance
4. Set top of existing root-ball flush with or slightly above finish grade.
5. Set plants vertical unless otherwise specified
6. Remove wood boxes and non-biodegradable root containers.
7. Set plants in pits or beds, partially filled with prepared backfill mixture, at a minimum depth as indicated on drawings. Remove burlap, ropes, and wires from the root ball.
8. Saturate soil with water when the pit or bed is half full of topsoil and again when full.
9. Planting Season: Planting shall only be performed when weather and soil conditions are suitable for planting the materials specified in accordance with locally accepted practice. Install plants during the planting time as described below unless otherwise approved in writing by the Owner’s Representative. In the event that the Contractor request planting outside the dates of the planting season, approval of the request does not change the requirements of the warranty.
   1. Deciduous trees and shrubs – September 15 to April 15
   2. Evergreen trees and shrubs – September 15 to April 15
10. No planting shall take place during extremely hot, dry, windy or freezing weather:
    * + 1. Do not install plant life when ambient temperatures may drop below 35 degrees F or rise above 100 degrees F.
        2. Do not install plants when wind exceeds 25 mph.
11. Observe each plant after delivery and prior to installation for damage of any other characteristics that may cause rejection of the plant. Notify the Owner’s Representative of any condition observed.
12. No more plants shall be distributed about the planting bed area than can be planted and watered on the same day.
13. The root system of each plant, regardless of root ball package type, shall be observed by the Contractor, at the time of planting to confirm that the roots meet the requirements for plant root quality as specified herein. The Contractor shall undertake at the time of planting, all modifications to the root system required by the Owner’s Representative to meet these quality standards.
    1. Modifications, at the time of planting, to meet the specifications for the depth of the root collar and removal of stem girdling roots and circling roots may make the plant unstable or stress the plant to the point that the Owner’s Representative may choose to reject the plant rather than permitting the modification.
    2. Any modification required by the Owner’s Representative to make the root system conform to the plant quality standards outlined in these specifications, or other requirements related to the permitted root ball package, shall not be considered as grounds to modify or void the plant warranty.
    3. The resulting root ball may need additional staking and water after planting. The Owner’s Representative may reject the plant if the root modification process makes the tree unstable or if the tree is not healthy at the end of the warranty period. Such plants shall still be covered under the warranty
    4. The Contractor remains responsible to confirm that the grower has made all required root modifications noted during any nursery observations.
14. Container and Boxed Root Ball Shaving: The outer surfaces of ALL plants in containers and boxes, including the sides and bottom of the root ball shall be shaved to remove all circling, descending, and matted roots. Shaving shall be performed using saws, knives, sharp shovels or other suitable equipment that is capable of making clean cuts on the roots. Shaving shall remove a minimum of one inch of root mat or up to 2 inches as required to remove all root segments that are not growing reasonably radial to the trunk.
15. Excavation of the Planting Space: Excavate the planting hole into the Planting Soil to the depth of the root ball measured after any root ball modification made, and wide enough for working room around the root ball or to the size indicated on the drawing or as noted below:
    1. For trees and shrubs planted in soil areas that are NOT tilled or otherwise modified to a depth of at least 12 inches over a distance of more than 10 feet radius from each tree, or 5 feet radius from each shrub, the soil around the root ball shall be loosened as defined below or as indicated on the drawings.
       1. The area of loosening shall be a minimum of 3 times the diameter of the root ball at the surface sloping to 2 times the diameter of the root ball at the depth of the root ball.
       2. Loosening is defined as digging into the soil and turning the soil to reduce the compaction. The soil does not have to be removed from the hole, just dug, lifted and turned. Lifting and turning may be accomplished with a tracked mini excavator, hand shovels, or other approved standard process.
    2. If an auger is used to dig the initial planting hole, the soil around the auger hole shall be loosened as defined above for trees and shrubs planted in soil areas that are NOT tilled or otherwise modified.
    3. The measuring point for root ball depth shall be the average height of the outer edge of the root ball after any required root ball modification.
    4. If motorized equipment is used to deliver plants to the planting area over exposed planting beds, or used to loosen the soil or dig the planting holes, all soil that has been driven over shall be tilled to a depth of 6 inches.
16. For trees to be planted in prepared Planting Soil that is deeper than the root ball depth, compact the soil under the root ball using a mechanical tamper to assure a firm bedding for the root ball. If there is more than 12 inches of planting soil under the root ball excavate and tamp the planting soil in lifts not to exceed 12 inches.
17. Set top outer edge of the root ball at the average elevation of the proposed finish. Set the plant plumb and upright in the center of the planting hole. The tree graft, if applicable, shall be visible above the grade. Do not place soil on top of the root ball.
18. The Owner’s Representative may request that plants orientation be rotated when planted based on the form of the plant.
19. Backfill the space around the root ball with the same planting soil or existing soil that was excavated for the planting space. See Specification Section 212.02.08 Planting Soil, for requirements to modify the soil within the planting bed.
20. Brace root ball by tamping Planting Soil around the lower portion of the root ball. Place additional Planting Soil around base and sides of ball in six-inch (6") lifts. Lightly tamp each lift using foot pressure or hand tools to settle backfill, support the tree and eliminate voids. DO NOT over compact the backfill or use mechanical or pneumatic tamping equipment. Over compaction shall be defined as greater than 85% of maximum dry density, standard proctor or greater than 250 psi as measured by a cone penetrometer when the volumetric soil moisture is lower than field capacity.
    1. When the planting hole has been backfilled to three quarters of its depth, water shall be poured around the root ball and allowed to soak into the soil to settle the soil. Do not flood the planting space. If the soil is above field capacity, allow the soil to drain to below field capacity before finishing the planting. Air pockets shall be eliminated and backfill continued until the planting soil is brought to grade level.
21. Where indicated on the drawings, build a 4 inch high, level berm of Planting Soil around the outside of the root ball to retain water. Tamp the berm to reduce leaking and erosion of the saucer.
22. Thoroughly water the Planting Soil and root ball immediately after planting.
23. Remove all nursery plant identification tags and ribbons as per Owner’s Representative instructions. The Owner’s Representative’s seals are to remain on plants until the end of the warranty period.
24. Remove nursery stakes and other materials affixed to the trunk of the tree after planting.
25. **STAKING AND GUYING**

***DELETE THIS SUBSECTION IN ITS ENTIRETY AND REPLACE WITH the FOLLOWING***

1. All staking, guying, or anchoring shall take place immediately after planting, as indicated on the drawings and details. Do not stake or guy trees unless specifically required on the drawings or in the event that the Contractor feels that staking is the only alternative way to keep particular trees plumb.
   1. The Owner’s representative shall have the authority to require that trees are staked or to reject staking as an alternative way to stabilize the tree.
   2. Trees that require heavily modified root balls to meet the root quality standards may become unstable. The Owner’s Representative may choose to reject these trees rather than utilize staking to temporarily support the tree.
2. Tree guying to be flat woven polypropylene material, 3/4 inch wide, and 900 lb. break strength. Color to be Green. Product to be ArborTie manufactured by Deep Root Partners, L.P. or approved equal.
3. Stakes shall be lodge pole stakes free of knots, 3” minimum diameter and of lengths appropriate to the size of plant as required to adequately support the plant.
4. Trees that are guyed shall have their guys and stakes removed after one full growing season or at other times as required by the Owner’s Representative.
5. Tree guying shall utilize the tree staking and guying materials specified. Guying to be tied in such a manner as to create a minimum 12-inch loop to prevent girdling. Refer to manufacturer’s recommendations and the planting details for installation.
   1. Plants shall stand plumb after staking or guying
   2. Stakes shall be driven to sufficient depth to hold the tree rigid.

1. Submit manufacturer’s product data for approval.
2. **PRUNING**

***add the following to this subsection***

1. Prune plants as directed by the Owner’s Representative. Newly planted trees are required to be pruned twice annually during the warranty period of the trees, as required throughout the project, or as directed by the Owner. Only tree TCIA accredited tree contractors approved by the Owner’s Representative are permitted to perform tree pruning. Pruning trees shall follow recommendations in “Structural Pruning: A Guide For The Green Industry” published by Urban Tree Foundation, Visalia CA.
2. All pruning shall be performed by or under the supervision of an ISA Certified arborist experienced in structural tree pruning.
3. Except for plants specified as multi-stemmed or as otherwise instructed by the Owner’s Representative, preserve or create a central leader.
4. Pruning of large trees shall be done from a ladder or hydraulic lift to gain access to the top of the tree. Do not climb in newly planted trees. Do not use pole saws to prune trees. Small trees can be structurally pruned by laying them over before planting. Pruning may also be performed at the nursery prior to shipping.
5. Remove and replace excessively pruned or malformed stock resulting from improper pruning that occurred in the nursery or after.
6. Pruning shall be done with clean, sharp tools. Tools shall be cleaned with a 50/50 bleach/water solution.
7. No tree paint or sealants shall be used.
8. **WATERING**

***add the following to this subsection***

1. The Contractor shall be fully responsible to ensure that adequate water is provided to all plants from the point of installation until the date of Substantial Completion Acceptance. The Contractor shall adjust, program and inspect the automatic irrigation system to ensure proper water is provided. No plants shall be watered in excess of 6 days per week.
2. Hand water root balls of all plants to assure that the root balls have moisture above wilt point and below field capacity. Test the moisture content in each root ball and the soil outside the root ball to determine the water content.
3. **FERTILIZERS, AGRICULTURE MINERALS AND ADDITIVES**

***add the following to this subsection***

B. Before mixing, clean topsoil of roots, plants, sods, stones, clay lumps, and other extraneous materials over 1-1/2” inch diameter, and other materials harmful or toxic to plant growth.

C. Mix specified soil amendments and fertilizers with topsoil at rates specified. Delay mixing of fertilizer if planting will not follow placing of planting soil within a few days.

1. For pit and trench type backfill, mix planting soil prior to backfilling, and stockpile at site.
2. Do not apply any soluble fertilizer to plantings during the first year after transplanting unless soil test determines that fertilizer or other chemical additives is required. Apply chemical additives only upon the approval of the Owner’s Representative.
3. Controlled release fertilizers shall be applied according to the manufacturer’s instructions and standard horticulture practices.

***add the following to this section***

1. **SOIL MOISTURE**
2. Volumetric soil moisture level, in both the planting soil and the root balls of all plants, prior to, during and after planting shall be above permanent wilting point and below field capacity for each type of soil texture within the following ranges.

|  |  |  |
| --- | --- | --- |
| **Soil type** | **Permanent wilting point** | **Field capacity** |
| Sand, Loamy sand, Sandy loam | 5-8% | 12-18% |
| Loam, Sandy clay, Sandy clay loam | 14-25% | 27-36% |
| Clay loam, Silt loam | 11-22% | 31-36% |
| Silty clay, Silty clay loam | 22-27% | 38-41% |

1. Volumetric soil moisture shall be measured with a digital moisture meter. The meter shall be the Digital Soil Moisture Meter, DSMM500 by General Specialty Tools and Instruments, or approved equivalent.
2. The Contractor shall confirm the soil moisture levels with a moisture meter. If the moisture is too high, suspend planting operations until the soil moisture drains to below field capacity.
3. **ROOT BALL PACKAGES AND SPECIAL PLANTING REQUIREMENTS**
4. Balled and burlapped plants
   1. This specification assumes that most container plants have significant stem girdling and circling roots, and that the root collar is too low in the root ball.
   2. If the plant is shipped with a wire basket, remove the basket wires before the backfilling of the tree.
   3. Each root ball shall be kept intact except for any modifications required by the Owner’s Representative to make root package comply with the requirements set forth in this specification.
5. Container (includes boxed and above-ground fabric containers) plants
   1. This specification assumes that most container plants have significant stem girdling and circling roots, and that the root collar is too low in the root ball.
   2. Remove all roots and substrate above the root collar and the main structural roots according to root correction details so root system conforms to root observations detail.
   3. Using a hose, power washer or air excavation device, wash out the substrate from around the trunk and top of the remaining root ball and find and remove all stem girdling roots within the root ball above the top of the structural roots.
   4. Remove the bottom of the container or box. Perform root ball shaving on the bottom of the root ball.
   5. Remove the container or box.
   6. Perform root ball shaving.
6. **PALM PLANTING**

1. Palm trees shall be placed at grade making sure not to plant the tree any deeper in the ground than the palm trees originally stood.
2. The trees shall be placed with their vertical axis in a plumb position.
3. All backfill shall be thoroughly blended 50/50 native soil and washed concrete sand. Water-settle the back fill.
4. Do not cover root ball with mulch or topsoil.
5. Provide a watering berm at each palm. Berms shall extend a minimum of 18 inches out from the trunk all around and shall be a minimum of (6) inches high.
6. Remove twine which ties fronds together after placing palm in planting hole and securing it in the upright position.
7. **STRAIGHTENING PLANTS**
8. Maintain all plants in a plumb position throughout the warranty period. Straighten all trees that move out of plumb including those not staked. Plants to be straightened shall be excavated and the root ball moved to a plumb position, and then re-backfilled.
9. Do not straighten plants by pulling the trunk with guys.
10. **MISCELLANEOUS LANDSCAPE WORK**
11. Place decorative rock as specified under all trees. Install at least the minimum layer of decorative rock in all landscape areas within the scope of work.
12. Before placing decorative rock, compact sub-grade to 85% and apply a pre-emergent herbicide to soil. After placing rock: rake smooth, wet to entire depth, allow to dry; then lightly scarify surface with a leaf rake. Apply a secondary application of pre-emergent herbicide to top of rock. Do not allow rock to touch the trunk of any tree. Install decorative rock after the installation of plant material.
13. **PLANT MAINTENANCE PRIOR TO SUBSTANTIAL COMPLETION ACCEPTANCE**

A. During the project work period and prior to Substantial Completion Acceptance, the Contractor shall maintain all plants.

B. Maintenance during the period prior to Substantial Completion Acceptance shall consist of watering, cultivating, weeding, mulching, removal of dead material, repairing and replacing of tree stakes, tightening and repairing of guys, resetting plants to proper grades and upright position, coordinating the contracted pruning of trees as necessary and furnishing and applying such sprays as are necessary to keep plantings reasonably free of damaging insects and disease, and in healthy condition. The threshold for applying insecticides and herbicide shall follow established Integrated Pest Management (IPM) procedures. Mulch areas shall be kept reasonably free of weeds, grass.

1. **CLEANUP AND PROTECTION**
2. During installation, keep the site free of trash, pavements reasonably clean and work area in an orderly condition at the end of each day. Remove trash and debris in containers from the site no less than once a week.
   1. Immediately clean up any spilled or tracked soil, fuel, oil, trash or debris deposited by the Contractor from all surfaces within the project or on public right of ways and neighboring property.
3. Once installation is complete, wash all soil from pavements and other structures. Ensure that mulch is confined to planting beds and that all tags and flagging tape are removed from the site. The Owner’s Representative’s seals are to remain on the trees and removed at the end of the warranty period.
4. Make all repairs to grades, ruts, and damage by the plant installer to the work or other work at the site.
5. Remove and dispose of all excess planting soil, subsoil, mulch, plants, packaging, and other material brought to the site by the Contractor.
6. The Contractor shall protect planting and related work and other site work from damage due to planting operations, operations by other Contractors or trespassers as described in Tree Protection section. Maintain protection during installation until Substantial Completion Acceptance. Treat, repair or replace damaged work immediately.
7. Damage done by the Contractor, or any of their sub-contractors to existing or installed plants, or any other parts of the work or existing features to remain, including roots, trunk or branches of existing trees, soil, paving, utilities, lighting, irrigation, other finished work and surfaces including those on adjacent property, shall be cleaned, repaired or replaced by the Contractor at no expense to the Owner. The Owner’s Representative shall determine when such cleaning, replacement or repair is satisfactory.
8. **INSPECTION AND ACCEPTANCE**

A. When landscape work is completed, including maintenance, the ENGINEER will, upon request, make an inspection to determine acceptability. Landscape work may be inspected for acceptance in portions as agreeable to the ENGINEER, provided each portion of work offered for inspection is complete, including maintenance.

B. When inspected landscape work does not comply with requirements, replace rejected work and continue specified maintenance until re-inspected by the ENGINEER and found to be acceptable. Remove rejected plants and materials promptly from project site.

1. **MAINTENANCE DURING THE WARRANTY PERIOD BY PLANT INSTALLER**
2. During the warranty period, provide all maintenance for all plantings to keep the plants in a healthy state and the planting areas clean and neat.
3. General Requirements:
   * + 1. All work shall be undertaken by trained planting crews under the supervision of a foreman with a minimum of 5 years experience supervising commercial plant maintenance crews.
       2. All chemical and fertilizer applications shall be made by licensed applicators for the type of chemicals to be used. All work and chemical use shall comply with all applicable local, state and federal requirements.
       3. Assure that hoses and watering equipment and other maintenance equipment does not block paths or be placed in a manner that may create tripping hazards. Use standard safety warning barriers and other procedures to maintain the site in a safe manner for visitors at all times.
       4. All workers shall wear required safety equipment and apparel appropriate for the tasks being undertaken.
       5. The Contractor shall not store maintenance equipment at the site at times when they are not in use unless authorized in writing by the Owner’s Representative.
       6. Maintenance vehicles shall not park on the site including walks and lawn areas at any time without the Owner’s Representative’s written permission.
       7. Maintain a detailed log of all maintenance activities including types of tasks, date of task, types and quantities of materials and products used, watering times and amounts, and number of each crew. Periodically review the logs with the Owner’s Representative, and submit a copy of the logs at the end of each year of the maintenance agreement.
       8. Meet with the Owner’s Representative a minimum of three times a year to review the progress and discuss any changes that are needed in the maintenance program. At the end of the warranty period attend a hand over meeting to formally transfer the responsibilities of maintenance to the Owner’s Representative. Provide all information on past maintenance activities and provide a list of critical tasks that will be needed over the next 12 months. Provide all maintenance logs and soil test data. Make the Contractor’s supervisor available for a minimum of one year after the end of the warranty period to answer questions about past maintenance.
4. Provide the following maintenance tasks:
   * + 1. Watering; Provide all water required to keep soil within and around the root balls at optimum moisture content for plant growth.
          1. Maintain all watering systems and equipment and keep them operational.
          2. Monitor soil moisture to provide sufficient water. Check soil moisture and root ball moisture with a soil moisture meter on a regular basis and record moisture readings. Do not over water.
       2. Soil nutrient levels: Take a minimum of 4 soil samples from around the site in the spring and fall and have them tested by an accredited agricultural soil testing lab for chemical composition of plant required nutrients, pH, salt and % organic matter. Test results shall include laboratory recommendations for nutrient applications. Apply fertilizers at rates recommended by the soil test.
5. Make any other soil test and/or plant tissue test that may be indicated by plant conditions that may not be related to soil nutrient levels such as soil contaminated by other chemicals or lack of chemical uptake by the plant.
   * + 1. Plant pruning: Schedule biannual pruning of trees as directed by the Owner’s Representative.
       2. Restore plants: Reset any plants that have settled or are leaning as soon as the condition is noticed.
       3. Guying and staking: Maintain plant guys in a taught position. Remove tree guys and staking after the first full growing season unless directed by Owner’s Representative.
       4. Weed control: Keep all beds free of weeds. Hand-remove all weeds and any plants that do not appear on the planting plan. Chemical weed control is permitted only with the approval of the Owner’s Representative. Schedule weeding as needed but not less 12 times per year.
       5. Trash removal: Remove all trash and debris from all planting beds and maintain the beds in a neat and tidy appearance. The number of trash and debris removal visits shall be no less than 12 times per year and may coincide with other maintenance visits.
       6. Plant pest control: Maintain disease, insects and other pests at manageable levels. Manageable levels shall be defined as damage to plants that may be noticeable to a professional but not to the average person. Use least invasive methods to control plant disease and insect outbreaks.
6. The Owner’s Representative must approve in advance the use of all chemical pesticide applications.
   * + 1. Plant replacement: Replace all plants that are defective as defined in the warranty provisions, as soon as the plant decline is obvious and in suitable weather and season for planting as outlined in above sections. Plants that become defective during the maintenance period shall be covered and replaced under the warranty provisions.
       2. Mulch: Refresh mulch once a year to maintain complete coverage but do not over mulch. At no time shall the overall mulch thickness be greater than 4 inches. Do not apply mulch within 6 inches of the trunks or stems of any plants. Replacement mulch shall meet the requirements of the original approved material. Mulch shall be no more than one inch on top of the root ball surface.
       3. Bed edging: Check and maintain edges between mulch and lawn areas in smooth neat lines as originally shown on the drawings.
       4. Leaf, fruit and other plant debris removal: Remove fall leaf, spent flowers, fruit and plant part accumulations from beds and paved surfaces. Maintain all surface water drains free of debris. Debris removal shall be undertaken at each visit to weed or pick up trash in beds.
       5. Damage from site use: Repair of damage by site visitors and events, beyond normal wear, are not part of this maintenance. The Owner’s Representative may request that the Contractor repair damage beds or plantings for an additional cost. All additional work shall be approved in advance by the Owner’s Representative.

NOTE TO SPEC WRITER: THE FOLLOWING SECTION IS ONLY FOR PROJECTS THAT INCLUDE SOIL CELLS

1. **STRUCTURAL SOIL CELLS**
2. Excavation: Installer to excavate the structural soil cell area accurately to the dimensions of the detailed plans, allowing 8-inches additional clearance in length and width. Side walls of excavated area to be clean, straight, and within 15° of vertical. Length, width and diagonals at base of excavated area to be measured to ensure that correct dimensions are being obtained (measurements shown on structural soil cell area detail plus 8-inches). Installer to confirm that correct depth has been provided, measuring from finished pavement level, including any drainage layers. Base of excavated area should be flat.
3. Compact Granular Collar: The top perimeter of the structural soil cell area must be further excavated to a depth of 12-inches and to a width of 10-inches, or a width sufficient to permit a narrow foot compacting plate (compacted granular collar) to be installed. Sides and base of this excavation must be clean and straight.
4. Sub-grade preparation: Base of the structural soil cell area must be free of debris and level. Installer to check CBR of the subgrade below the proposed granular pavement layers to ensure it meets the applicable pavement design criteria. Confirm the subgrade surface below the structural soil cell matrix is compacted to a minimum of 95% of maximum dry density at optimum moisture content in accordance with Standard Proctor Method (and has a minimum allowable bearing pressure of 100kpa.) Proof compact the subgrade in natural ground with a minimum of three passes of a suitable vibrating compacting machine or apply other compaction forces as needed to achieve the required subgrade compaction rate. Apply additional compaction forces at optimum water levels**.**
5. Installation of aggregate base below structural soil cell matrix. Aggregate base shall be compact to a minimum of 95% of maximum dry density at optimum moisture content, in accordance with ASTM D 698 Standard Proctor Method. Compact the subgrade with a minimum of three passes of a suitable vibrating machine or apply other compaction forces as needed to achieve the required subgrade compaction rate.
6. Assemble structural soil cell modules per manufacturer’s instructions.
7. Linear barrier: Per structural soil cell design details, a linear barrier shall by installed between the interconnected structural soil cell matrix and the side wall of the excavated area. Ensure the barrier is inserted to the full depth of the pit and is not in contact with any sharp debris or stones that may puncture the barrier. Any joints must have a 6-inch overlap and be taped both sides using external grade, moisture resistant adhesive tape over clean dry surfaces. The top edge of the root barrier should be trimmed with a sharp knife to level with the top of the interconnected structural soil cell matrix.
8. Loading matrix with filler soil**:** Ensure that all required filler soil testing and certification is complete to the satisfaction of the Owner prior to loading into the structural soil cell area. When matrix is fully assembled, with all barriers in place, the filler soil can be loaded into the matrix. Soil should be placed in the matrix using an excavator bucket and spread with rakes or shovels until the void spaces are filled. Ensure the outer trench for the compacted granular collar is kept clean and free of filler soil. Matrix is to be vibrated using plate vibration or needle vibration equipment in order to shake soil into all voids. Continue loading dry soil, raking out and vibrating, until matrix is filled. Should the filler soil constituents and moisture content not permit the voids to be fully filled, assemble the structural soil cell modules in layers and progressively fill, layer by layer.
9. Heavy Grade Non-Woven Filter Fabric: The outer trench for provision of the compacted granular collar should be cleaned and all filler soil and debris removed. Place the heavy grade non-woven filter fabric layer on the top of matrix and cut to length, ensuring that the material fully covers the top of the matrix, the upper side walls of the matrix, and the bottom of the adjacent trench for compacted granular collar. Any material joins must be straight, free of debris and over-lapped 6-inches. Pipe penetrations to be provided by means of two intersecting slits cut with a sharp knife to form a cross.
10. Compacted Granular Collar: Load the granular base course material into the base of the collar trench ensuring the heavy grade non-woven filter fabric layer is not displaced from the base of the trench. Compact the granular material in 6-inch lifts until the collar is level with the top of the matrix.
11. Tree pit opening: Confirm the exact required position of the tree pit opening from project details and with reference to survey markers. Cut heavy grade non-woven filter fabric layer and fold back to expose the tree pit opening. Position form-work to provide for poured concrete system, or other method as specified in project details**.** Place linear barrier within the tree pit opening with vertical ribs facing inwards. Ensure bottom edge of barrier is placed on the structural soil cell matrix and upper edge is at finished pavement level. Trim to suit with sharp knife. Ensure any joins are overlapped a minimum of 6-inches, are clean and dry and taped both sides with external grade, moisture resistant, adhesive tape.
12. Granular base course: Load and spread granular base course material onto the heavy grade non-woven filter fabric layer in an even depth of 4-inches. Compact this layer with a vibrating plate compactor with a mass of 1200kg – 1400kg/m² of base plate, to specified compaction levels. Continue building compacted granular layers to required levels including the compacted granular collar.

**METHOD OF MEASUREMENT**

**212.04.01 MEASUREMENT**

***ADD THE FOLLOWING TO THIS SUBSECTION:***

The quantity of [FILL IN ITEM DESCRIPTION] will be measured per [UNIT].

No direct measurement shall be made for [FILL IN ITEM DESCRIPTION].

**METHOD OF PAYMENT**

**212.05.01 PAYMENT**

***ADD THE FOLLOWING TO THIS SUBSECTION:***

The accepted quantity of [FILL IN ITEM DESCRIPTION] will be paid for at the contract unit price of [UNIT] and shall conform to the requirements of subsection 212.05.01 of the Uniform Standard Specifications and shall include all materials, equipment, labor and disposal required to perform this work and all work as shown on the Plans, as specified herein and as directed by the Engineer. The above payment shall also include,

Unless otherwise provided in the Special Provisions, no payment will be made for Plant Establishment Work as such. The cost thereof shall be considered as included in the price bid for construction or installation of the items to which Plant Establishment Work is required.

Unless otherwise provided in the Special Provisions, no payment will be made for [FILL IN ITEM DESCRIPTION] as such. The cost thereof shall be considered as included in the price bid for construction or installation of the items to which [FILL IN ITEM DESCRIPTION] is required.

Payment will be made under:

|  |  |  |
| --- | --- | --- |
| **ITEM NO.** | **ITEM DESCRIPTION** | **UOM** |
| 212.XXXX | [ITEM DESCRIPTION] | [UNIT] |

END OF SECTION 212