

**DIVISION 32 – EXTERIOR IMPROVEMENTS**

**32 0500 – COMMON WORK RESULTS FOR EXTERIOR IMPROVEMENTS**

- A. Contractor shall thoroughly loosen any compacted subgrades prior to placing topsoil, to a minimum depth of 9". Topsoil shall not be compacted to achieve grade.
- B. Contractor shall remove all weeds, contaminated soils, misc., construction debris (including concrete), and waste materials from areas to be planted and sodded. Contractor shall loosen compacted soils by tilling and import new topsoil as required to restore grades and maintain positive drainage away from structures.
- C. Shrub and perennial beds are to receive 4" depth of shredded hardwood mulch.

**32 1123 – AGGREGATE BASE COURSES**

- A. Material shall be crushed or uncrushed gravel, crushed stone, natural gravel, or a combination thereof and free from sod, plants, roots, other organic matter or other objectionable material.
- B. Compaction shall be between 95 to 105 percent of maximum density as determined by ASTM D698.

Aggregate, as determined by ASTM C136 and ASTM C117:		Crushed Portland cement concrete:	
Sieve Designation	Weight Passing Square Mesh Sieve	Sieve Designation	Weight Passing Square Mesh Sieve
1"	100 %	1 1/2"	100 %
3/4"	90 – 100	1"	90 - 100
3/8"	50 – 90	3/4"	80 - 100
No. 4	35 – 70	No. 4	35 - 70
No. 10	20 – 55	No. 30	16 - 40
No. 40	10 – 35	No. 200	4 - 20
No. 200	3 -10		

**32 1216 - ASPHALT PAVING**

- A. Aggregates: Mix shall be NDDOT Class 29.
- B. Asphalt Binder: AASHTO M 320, PG 58-28.
- C. Tack Coat: Emulsified asphalt.
- D. Verify that subgrade is dry and in suitable condition to begin paving.

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- E. Proof-roll subgrade below pavements with heavy pneumatic-tired equipment to identify soft pockets and areas of excess yielding. Do not proof-roll wet or saturated subgrades.
  - 1. Excavate soft spots, unsatisfactory soils, and areas of excessive pumping or rutting, and replace with compacted backfill or fill as directed.
- F. Proceed with paving only after unsatisfactory conditions have been corrected.
- G. Asphalt Pavement: Saw cut perimeter of patch and excavate existing pavement section to sound base. Excavate rectangular or trapezoidal patches, extending 12 inches into perimeter of adjacent sound pavement, unless otherwise indicated.
- H. Tack Coat: Before placing patch material, apply tack coat uniformly to vertical asphalt surfaces abutting the patch. Apply at a rate of 0.05 to 0.15 gal./sq. yd.
- I. General: Immediately before placing asphalt materials, remove loose and deleterious material from substrate surfaces. Ensure that prepared subgrade is ready to receive paving.
- J. Tack Coat: Apply uniformly to surfaces of existing pavement at a rate of 0.05 to 0.15 gal./sq. yd.
- K. Machine place hot-mix asphalt on prepared surface, spread uniformly, and strike off. Place asphalt mix by hand in areas inaccessible to equipment in a manner that prevents segregation of mix. Place each course to required grade, cross section, and thickness when compacted in accordance with NDDOT.
- L. Construct joints to ensure a continuous bond between adjoining paving sections. Construct joints free of depressions, with same texture and smoothness as other sections of hot-mix asphalt course.
- M. Compaction: In accordance with NDDOT.
- N. Pavement Thickness: Compact each course to produce the thickness indicated within the following tolerances:
  - 1. Base Course: Plus or minus 1/2 inch.
  - 2. Surface Course: Plus 1/4 inch, no minus.

### **32 1313 - CONCRETE PAVING**

- A. Traffic Control: Maintain access for vehicular and pedestrian traffic as required for other construction activities.
- B. Cold-Weather Concrete Placement: Protect concrete work from physical damage or reduced strength that could be caused by frost, freezing, or low temperatures. Comply with ACI 306.1 and in accordance with NDDOT.
- C. Hot-Weather Concrete Placement: Comply with ACI 301
- D. Reinforcing Bars: ASTM A 615/A 615M, Grade 60; deformed.
- E. Joint Dowel Bars: ASTM A 615/A 615M, Grade 60 plain-steel bars.
- F. Bar Supports: Bolsters, chairs, spacers, and other devices for spacing, supporting, and fastening reinforcing bars, welded-wire reinforcement, and dowels in place. Manufacture bar supports according to CRSI's

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"Manual of Standard Practice" from steel wire, plastic, or precast concrete of greater compressive strength than concrete specified, and as follows:

1. Equip wire bar supports with sand plates or horizontal runners where base material will not support chair legs.
  2. For epoxy-coated reinforcement, use epoxy-coated or other dielectric-polymer-coated wire bar supports.
- G. Concrete Materials, as per NDDOT and as shown in the plans.
- H. Moisture-Retaining Cover: ASTM C 171, polyethylene film or white burlap-polyethylene sheet.
- I. Water: Potable.
- J. Evaporation Retarder: Waterborne, monomolecular, film forming, manufactured for application to fresh concrete.
- K. White, Waterborne, Membrane-Forming Curing Compound: ASTM C 309, Type 2, Class B, dissipating.
- L. Joint Fillers: ASTM D 1751, asphalt-saturated cellulosic fiber or ASTM D 1752, cork or self-expanding cork in preformed strips.
- M. Epoxy-Bonding Adhesive: ASTM C 881/C 881M, two-component epoxy resin capable of humid curing and bonding to damp surfaces; of class suitable for application temperature.
- N. Prepare design mixtures, proportioned according to ACI 301, for each type and strength of normal-weight concrete, and as determined by either laboratory trial mixtures or field experience.
- O. General: Comply with CRSI's "Manual of Standard Practice" for fabricating, placing, and supporting reinforcement.
- P. General: Form construction, isolation, and contraction joints and tool edges true to line, with faces perpendicular to surface plane of concrete. Construct transverse joints at right angles to centerline unless otherwise indicated.
- Q. Edging: After initial floating, tool edges of paving, gutters, curbs, and joints in concrete with an edging tool.
- R. Before placing concrete, inspect and complete formwork installation, steel reinforcement, and items to be embedded or cast-in.
- S. Remove snow, ice, or frost from subbase surface and steel reinforcement before placing concrete. Do not place concrete on frozen surfaces.
- T. Moisten subbase to provide a uniform dampened condition at time concrete is placed. Do not place concrete around manholes or other structures until they are at required finish elevation and alignment.
- U. Comply with ACI 301 requirements for measuring, mixing, transporting, and placing concrete.
- V. Consolidate concrete according to ACI 301 by mechanical vibrating equipment supplemented by hand spading, rodding, or tamping.
- W. Screed paving surface with a straightedge and strike off.

- X. Do not add water to concrete surfaces during finishing operations.
- Y. Float Finish: Begin the second floating operation when bleedwater sheen has disappeared and concrete surface has stiffened sufficiently to permit operations. Float surface with power-driven floats or by hand floating if area is small or inaccessible to power units. Finish surfaces to true planes. Cut down high spots and fill low spots. Refloat surface immediately to uniform granular texture and then provide a broom finish or as otherwise noted on plans.
- Z. Cast-in-Place Detectable Warning Tiles: Form blockouts in concrete for installation of tiles specified in Section 321726 "Tactile Warning Surfacing." Screed surface of concrete where tiles are to be installed to elevation, so that edges of installed tiles will be flush with surrounding concrete paving. Embed tiles in fresh concrete to comply with Section 321726 "Tactile Warning Surfacing" immediately after screeding concrete surface.
- AA. General: Protect freshly placed concrete from premature drying and excessive cold or hot temperatures.
- BB. Comply with ACI 306.1 for cold-weather protection.
- CC. Comply with tolerances in ACI 117 and as set forth in NDDOT.
- DD. Testing will be in accordance with NDDOT requirements.

### **32 1373 - CONCRETE PAVING JOINT SEALANTS**

- A. Materials, General, Compatibility: Provide joint sealants, backing materials, and other related materials that are compatible with one another and with joint substrates under conditions of service and application, as demonstrated by joint-sealant manufacturer, based on testing and field experience.
- B. Cold Applied Joint Sealants, Single-Component, Nonsag, Silicone Joint Sealant: ASTM D 5893/D 5893M, Type NS.
- C. Hot Applied, Single-Component Joint Sealant: ASTM D 6690, Type I.
- D. Joint-Sealant Backer Materials: Nonstaining; compatible with joint substrates, sealants, primers, and other joint fillers; and approved for applications indicated by joint-sealant manufacturer, based on field experience and laboratory testing.
- E. Examine joints to receive joint sealants.
- F. Proceed with installation only after unsatisfactory conditions have been corrected.
- G. Surface Cleaning of Joints: Before installing joint sealants, clean out joints immediately to comply with joint-sealant manufacturer's written instructions.
- H. Comply with joint-sealant manufacturer's written installation instructions for products and applications indicated unless more stringent requirements apply.

### **32 1723 - PAVEMENT MARKINGS**

- A. Pavement-Marking Paint: Shall be as per NDDOT. Parking lot stripes shall be yellow and blue for handicap. Crosswalks shall be as per MUTCD.
- B. Glass Beads: AASHTO M 247, Type 1.

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- C. Do not apply pavement-marking paint until layout, colors, and placement have been verified with Architect.
- D. Allow paving to age for a minimum of 30 days before starting pavement marking.
- E. Sweep and clean surface to eliminate loose material and dust.
- F. Apply paint with mechanical equipment to produce pavement markings, of dimensions indicated, with uniform, straight edges.
- G. Protect pavement markings from damage and wear during remainder of construction period.

**32 1726 - TACTILE WARNING SURFACING**

- A. Accessibility Requirements: Comply with applicable provisions in the U.S. Architectural & Transportation Barriers Compliance Board's ADA-ABA Accessibility Guidelines for Buildings and Facilities and ICC A117.1 for tactile warning surfaces.
- B. Cast-in-Place Detectable Warning Tiles: Accessible truncated-dome detectable warning tiles with replaceable surface configured for setting flush in new concrete walkway surfaces, with slip-resistant surface treatment on domes and field of tile.
- C. General: Prepare substrate and install tactile warning surfacing according to manufacturer's written instructions unless otherwise indicated.

**32 3113 - CHAIN LINK FENCES AND GATES**

- A. General: Provide fabric in one-piece heights measured between top and bottom of outer edge of selvage knuckle or twist according to "CLFMI Product Manual" and requirements indicated below in the NDDOT manuals.
- B. Posts and Rails: ASTM F 1043 for framework, including rails, braces, and line; terminal; and corner posts. Provide members with minimum dimensions and wall thickness according to ASTM F 1043 or ASTM F 1083 and as defined in NDDOT manuals.
- C. Metallic-Coated Steel Wire: 0.177-inch- (4.5-mm-) diameter, marcelled tension wire according to ASTM A 817 or ASTM A 824.
- D. General: ASTM F 900 for gate posts and single, double swing gate types and as per NDDOT.
- E. General: ASTM F 1184 for gate posts and single, double sliding gate types, as per NDDOT.
- F. Nonshrink, Nonmetallic Grout: Factory-packaged, nonstaining, noncorrosive, nongaseous grout complying with ASTM C 1107/C 1107M. Provide grout, recommended in writing by manufacturer, for exterior applications.
- G. Anchoring Cement: Factory-packaged, nonshrink, nonstaining, hydraulic-controlled expansion cement formulation for mixing with water at Project site to create pourable anchoring, patching, and grouting compound. Provide formulation that is resistant to erosion from water exposure without needing protection by a sealer or waterproof coating, and that is recommended in writing by manufacturer for exterior applications.
- H. Comply with requirements in Section 260526 "Grounding and Bonding for Electrical Systems."

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- I. Examine areas and conditions, with Installer present, for compliance with requirements for site clearing, earthwork, pavement work, and other conditions affecting performance of the Work.
- J. Install chain-link fencing according to ASTM F 567 and any more stringent requirements specified as per NDDOT.
- K. Install gates according to manufacturer's written instructions, level, plumb, and secure for full opening without interference. Attach fabric as for fencing. Attach hardware using tamper-resistant or concealed means. Install ground-set items in concrete for anchorage. Adjust hardware for smooth operation.
- L. Comply with requirements in Section 260526 "Grounding and Bonding for Electrical Systems."
- M. Gates: Adjust gates to operate smoothly, easily, and quietly, free of binding, warp, excessive deflection, distortion, nonalignment, misplacement, disruption, or malfunction, throughout entire operational range. Confirm that latches and locks engage accurately and securely without forcing or binding.

### **32 8400 – PLANTING IRRIGATION**

- A. Irrigation systems will not be installed without the approval of both the Energy Sustainability Manager as well as the Landscaping supervisor. If approval is granted, the following standards hold.
- B. Irrigation zone control shall be automatic operation with controller and automatic control valves.
- C. Certified Irrigation Contractor Shall: Design a 100 percent coverage irrigation system, including comprehensive engineering analysis by a qualified professional engineer, using performance requirements and design criteria indicated.
- D. Sprinklers General Requirements: Designed for uniform coverage over entire spray area indicated at available water pressure.
- E. Controller Stations for Automatic Control Valves: Each station is variable from approximately 5 to 60 minutes. Include switch for manual or automatic operation of each station.
- F. Exterior Control Enclosures: NEMA 250, Type 4, weatherproof, with locking cover and two matching keys; include provision for grounding.
- G. Earthwork Drain Pockets: Excavate to sizes indicated. Backfill with cleaned gravel or crushed stone, graded from 3/4 to 3 inches, to 12 inches below grade. Cover gravel or crushed stone with sheet of asphalt-saturated felt and backfill remainder with excavated material.
- H. Provide minimum cover over top of underground piping according to industry standard.
- I. Perform startup and training service.
- J. Perform blowout during the first year of service.

### **32 9000 - LANDSCAPING**

- A. Delivery, Storage, and Handling: Seed and Other Packaged Materials: Deliver packaged materials in original, unopened containers showing weight, certified analysis, name and address of manufacturer, and indication of compliance with state and Federal laws, as applicable.

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- B. Harvest, deliver, store, and handle sod according to requirements in "Specifications for Turfgrass Sod Materials" and "Specifications for Turfgrass Sod Transplanting and Installation" sections in TPI's "Guideline Specifications to Turfgrass Sodding." Deliver sod within 24 hours of harvesting and in time for planting promptly. Protect sod from breakage and drying.
- C. Planting Restrictions: Plant in accordance with NDDOT.
- D. Seed Species:
  - 1. Quality: State-certified seed of grass species as listed below for solar exposure.
  - 2. Quality: Seed of grass species as listed below for solar exposure, with not less than 85 percent germination, not less than 95 percent pure seed, and not more than 0.5 percent weed seed:
- E. Turfgrass Sod: Certified including limitations on thatch, weeds, diseases, nematodes, and insects. Sod must be mineral sod, not peat sod. Sod mix shall be comprised of Kentucky Blue Grass (minimum 50%), as well as Fine Fescues and Perennial Rye.
- F. 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, phosphorous, and potassium in the following composition:
  - 1. Composition: Nitrogen, phosphorous, and potassium in amounts recommended in soil reports from a qualified soil-testing laboratory.
- G. Straw Mulch: Provide air-dry, clean, mildew- and seed-free, salt hay or threshed straw of wheat, rye, oats, or barley.
- H. Nonasphaltic Tackifier: Colloidal tackifier recommended by fiber-mulch manufacturer for slurry application; nontoxic and free of plant-growth or germination inhibitors.
- I. Erosion-Control Blankets: As noted on plans and as per NDDOT.
- J. Examine areas to be planted for compliance with requirements and other conditions affecting installation and performance of the Work.
- K. Proceed with installation only after unsatisfactory conditions have been corrected.
- L. General Turf Area Preparation: Prepare planting area for soil placement and mix planting soil according to NDDOT.
- M. Moisten prepared area before planting if soil is dry. Water thoroughly and allow surface to dry before planting. Do not create muddy soil.
- N. Sow seed with spreader or seeding machine in accordance with NDDOT. Do not broadcast or drop seed when wind velocity exceeds 5 mph.
- O. Rake seed lightly into top 1/8 inch of soil, roll lightly, and water with fine spray.
- P. Hydroseeding: Mix specified seed, commercial fertilizer, and fiber mulch in water, using equipment specifically designed for hydroseed application. Continue mixing until uniformly blended into homogeneous slurry suitable for hydraulic application.
- Q. Lay sod within 24 hours of harvesting.

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- R. Turf Maintenance General: Maintain and establish turf by watering, fertilizing, weeding, mowing, trimming, replanting, and performing other operations as required to establish healthy, viable turf. Roll, regrade, and replant bare or eroded areas and remulch to produce a uniformly smooth turf. Provide materials and installation the same as those used in the original installation.
- S. Watering: Install and maintain temporary piping, hoses, and turf-watering equipment to convey water from sources and to keep turf uniformly moist to a depth of 4 inches.
- T. Mow turf as soon as top growth is tall enough to cut. Repeat mowing to maintain specified height without cutting more than one-third of grass height.
- U. Apply commercial slow-release fertilizer after initial mowing and when grass is dry.
- V. Water newly planted areas and keep moist until meadow is established.
- W. Mowing and watering shall be taken care of by the contractor for 30 days after sod is laid down.

**32 9113 - SOIL PREPARATION**

- A. Materials: Contractor shall use non-contaminated topsoil stripped from the site as materials for placement as noted on plans.
- B. 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, phosphorous, and potassium.
- C. Place planting soil and fertilizers according to requirements in the plans.
- D. General: Apply and mix unamended soil with amendments on-site to produce required planting soil. Do not apply materials or till if existing soil or subgrade is frozen, muddy, or excessively wet.
- E. Subgrade Preparation: Till subgrade to a minimum depth of 8 inches. Remove stones larger than 1-1/2 inches in any dimension and sticks, roots, rubbish, and other extraneous matter and legally dispose of them off Owner's property.
- F. Finish Grading: Grade planting soil to a smooth, uniform surface plane with loose, uniformly fine texture. Roll and rake, remove ridges, and fill depressions to meet finish grades.

**32 9300 - PLANTS**

- A. Product Data: For each type of product.
- B. Maintenance Data: Recommended procedures to be established by Owner for maintenance of plants during a calendar year.
- C. Provide quality, size, genus, species, and variety of plants indicated, complying with applicable requirements in ANSI Z60.1.
- D. Packaged Materials: Deliver packaged materials in original, unopened containers showing weight, certified analysis, name and address of manufacturer, and indication of compliance with state and Federal laws if applicable.

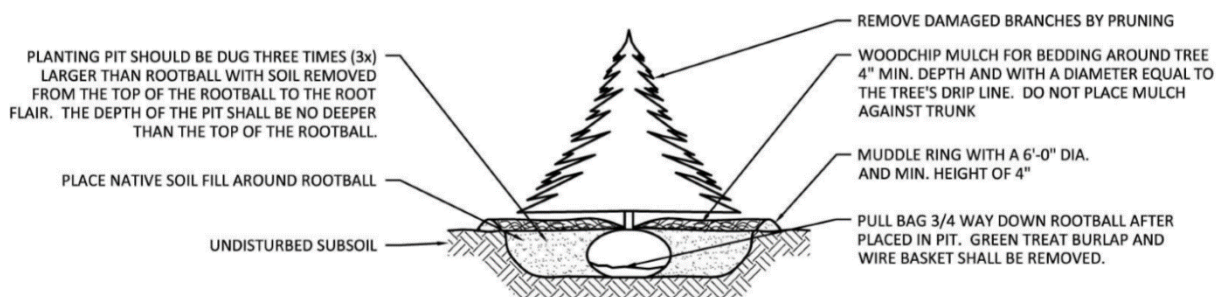


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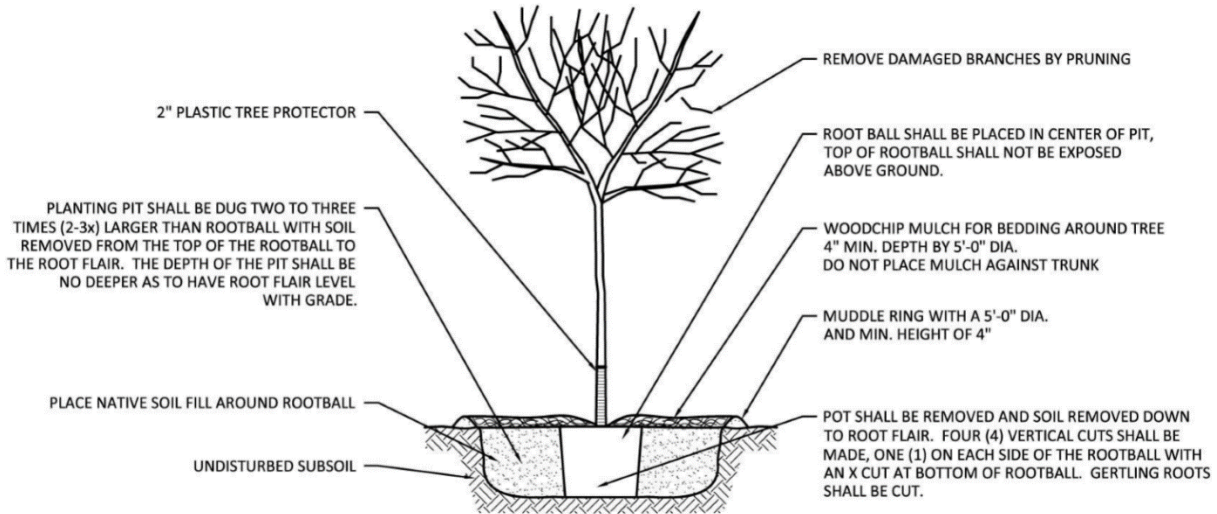
- E. Deliver bare-root stock plants within 24 hours of digging. Immediately after digging up bare-root stock, pack root system in wet straw, hay, or other suitable material to keep root system moist until planting.
- F. Do not prune trees and shrubs before delivery. Protect bark, branches, and root systems from sunscald, drying, wind burn, sweating, whipping, and other handling and tying damage.
- G. Handle planting stock by root ball and when being transported in accordance with the industry standards.
- H. General: Furnish nursery-grown plants, trees, shrubs true to genus, species, variety, cultivar, stem form, shearing, and other features indicated in Plant List, Plant Schedule, or Plant Legend indicated on Drawings and complying with ANSI Z60.1; and with healthy root systems developed by transplanting or root pruning. Provide well-shaped, fully branched, healthy, vigorous stock, densely foliated when in leaf and free of disease, pests, eggs, larvae, and defects such as knots, sunscald, injuries, abrasions, and disfigurement.
- I. Labeling: Label each plant of each variety, size, and caliper with a securely attached, waterproof tag bearing legible designation of common name and full scientific name, including genus and species.
- J. Mulch: Free from deleterious materials and suitable as a top dressing of trees and shrubs.
- K. Nonwoven Geotextile Filter Fabric: Polypropylene or polyester fabric, 3 oz. /sq. yd. minimum, composed of fibers formed into a stable network so that fibers retain their relative position.
- L. General: Pesticide registered and approved by the EPA, acceptable to authorities having jurisdiction, and of type recommended by manufacturer for each specific problem and as required for Project conditions and application.
- M. Trunk-Stabilization Materials, as per industry standard.
- N. Plastic Edging: Standard black polyethylene or vinyl edging, horizontally grooved, extruded in standard lengths, with 9-inch steel angle plastic stakes.
- O. Tree Grates: Manufacturer's standard tree grates with powder-coat finish, low black gloss.
- P. General: Prepare planting area for soil placement and mix planting soil according to Section 329113 "Soil Preparation."
- Q. Fill excavations with water and allow to percolate away before positioning trees and shrubs. Install all trees and shrubs root ball 2" above surrounding soil.
- R. Slopes: 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.
- S. Trees maybe planted with an approved mechanized tree spade at the designated locations. Do not use tree spade to move trees larger than the maximum size allowed for a similar field-grown, balled-and-burlapped root-ball diameter according to ANSI Z60.1, or larger than manufacturer's maximum size recommendation for the tree spade being used, whichever is smaller.
- T. Where possible, orient the tree in the same direction as in its original location; remove only dead, dying, or broken branches. Do not prune for shape. Prune, thin, and shape trees, shrubs, and vines according to standard professional horticultural and arboricultural practices. Unless otherwise indicated by Architect, do not cut tree leaders; remove only injured, dying, or dead branches from trees and shrubs; and prune to retain natural character.

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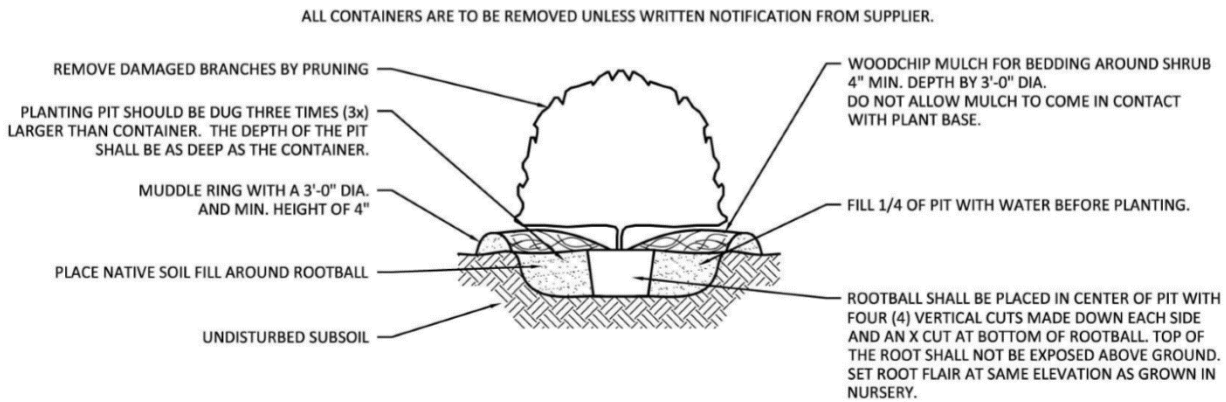
- U. Install root barrier where trees are planted within 48 inches of paving or other hardscape elements, such as walls, curbs, and walkways, unless otherwise indicated on Drawings.
- V. Install weed-control barriers before mulching according to manufacturer's written instructions. Completely cover area to be mulched, overlapping edges a minimum of 6 inches 12 inches and secure seams with galvanized pins.
- W. Plastic Edging: Install plastic edging where indicated according to manufacturer's written instructions.
- X. Tree Grates: Install according to manufacturer's written instructions. Set grate segments flush with adjoining surfaces.
- Y. Apply treatments as required to keep plant materials, planted areas, and soils free of pests and pathogens or disease.
- Z. General: Repair or replace existing or new trees and other plants that are damaged by construction operations.
- AA. Remove and replace trees that are more than 25 percent dead or in an unhealthy condition before the end of the corrections period or are damaged during construction operations.
- BB. Remove surplus soil and waste material including excess subsoil, unsuitable soil, trash, and debris and legally dispose of them off Owner's property.
- CC. 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.
- DD. After installation and before Substantial Completion, remove nursery tags, nursery stakes, tie tape, labels, wire, burlap, and other debris from plant material, planting areas, and Project site.
- EE. At time of Substantial Completion, verify that tree-watering devices are in good working order and leave them in place. Replace improperly functioning devices.
- FF. There shall be a one-year warranty on all tree, shrubs, and perennials.



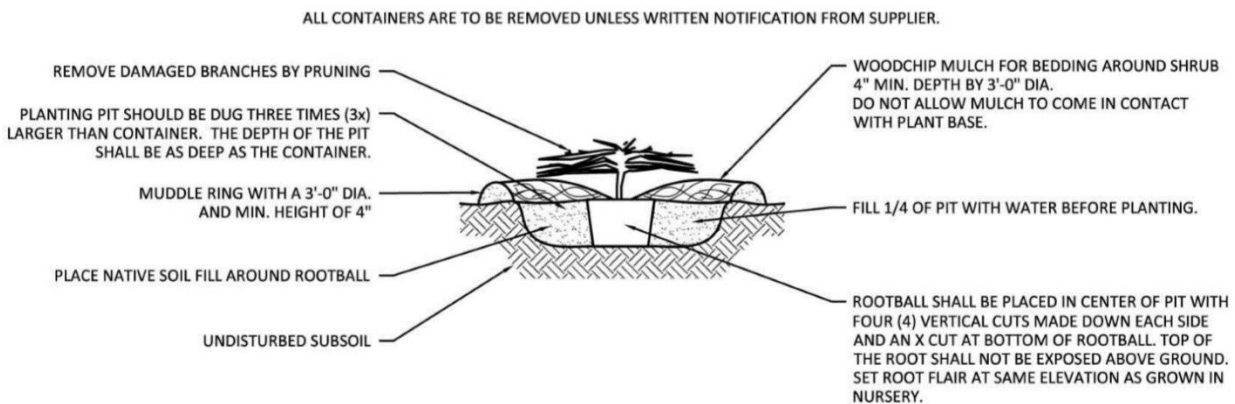
**Figure 1 32 9300: Evergreen Planting**



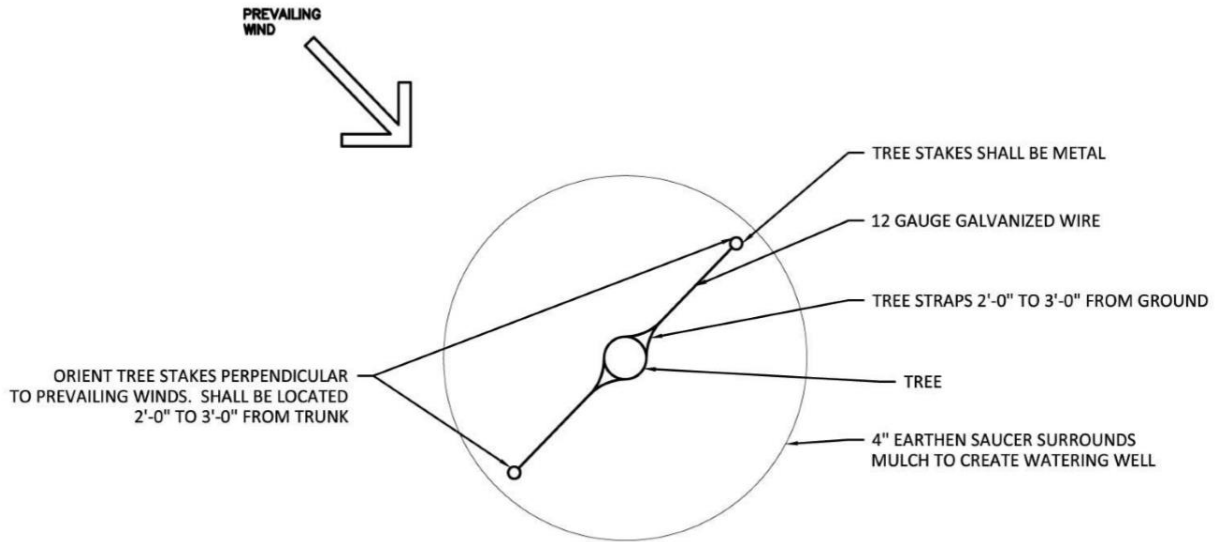
**Figure 2 32 9300: Deciduous Planting**



**Figure 3 32 9300: Shrub Planting**



**Figure 4 32 9300: Creeping Evergreen Planting**



**Figure 5 32 9300: Tree Staking**

End of Division