

02900 Landscaping

Part 1: General

- 1.01 These guidelines are for use for all Campus landscaping.

Part 2: Design Guidelines – General

- 2.01 Use primarily native trees and shrubs.
- 2.02 In natural areas, and the Neuse River Buffer plant only native plants.
- 2.03 Use ornamentals sparingly at campus and building entrances, outdoor seating areas, along the All Campus Path where people can enjoy them up close.
- 2.04 No annual planting beds are desired except as directed by the Grounds Management and the University Landscape Architect.
- 2.05 Foundation plantings shall be planted so that at maturity, maintenance personnel can walk between the building face and the plant material.
- 2.06 Provide a mulch strip at the base of the building where earth meets the building base.
- 2.07 Arrange plant material with safety and security issues in mind. Plant material over 3 feet in height at maturity shall be 10 feet back from the edge of walkways to ensure visual clearances.
- 2.08 Street trees shall be planted on every street to provide shade over the pavement. Coordinate street tree plantings with street lighting.
- 2.09 Locate larger trees so that leaves do not collect on rooftops.
- 2.10 Each tree shall have a 6-foot diameter minimum mulch ring.
- 2.11 Where possible locate trees in groupings within a continuous mulch bed for ease of mowing. In general, locate trees a minimum of 10 feet from paved areas.
- 2.12 Parking lot plantings shall have tree canopy and be in accordance with the City of Raleigh Landscape Ordinance.
- 2.13 Landscape and site designs should preserve existing trees to the maximum extent possible.

Part 3: Design Guideline – Designer Responsibilities

- 3.01 The Designer is responsible for:
- a) including applicable NC State guidelines in the landscape plans and specifications. Additional instructions and materials may be added as determined by the Designer (Landscape Architect).
 - b) providing a description of the scope of the work on the Plans and Specifications.
 - c) initiating a thorough evaluation with Grounds Management and the University Landscape Architect with any proposed to remove an existing tree before committing to a design strategy.
 - d) specifying the common name and the botanical name in the plans.

- e) locating for the contractor at least one plant source for each plant type specified.
- f) providing irrigation plans from a scope of irrigation determined with Grounds Management and the University Landscape Architect.
- g) providing a maintenance plan for the plant material and a description of long term maintenance goals for the landscape.
- h) specifying the preferred planting time is between October 15-December 15 and February 14-April 15 (exceptions require approval by the NC State Design and Construction Managers with permission from NC State Grounds Management).

Part 4: Design Guideline – Warranties

4.01 Contractor's Maintenance Responsibilities Until Final Acceptance

Maintenance and protection of the work is the responsibility of the Contractor until Final Acceptance. Maintenance shall consist of mowing, watering, cultivation, weeding, mulching, resetting of plants to proper grades or upright positions, keeping the plants free of insects and disease and in thriving condition.

If any chemical application is required during installation or the maintenance period, a copy of the applicator's license shall be provided to the NC State Construction Manager at the time the contract is executed.

It shall be the responsibility of the Contractor to provide security or barricade the plants to prevent damage to work in place and to keep the site neat and clean in appearance until the Final Inspection.

4.02 Final Acceptance

After Final Acceptance, the Owner will assume all maintenance of plant material (mowing, cultivation, weeding, mulching, keeping the plants free of insects and disease) of the site. Exceptions include the Contractor responsibilities for watering as defined in the warranty period. The Contractor shall submit to NC State Grounds Maintenance two copies of typewritten maintenance plans with instructions for caring for new plantings for one full year. The Owner shall keep records of maintenance practices during the warranty period.

4.03 Warranty Period Requirements

Usually, the warranty period shall be for 12 months from the date of Final Acceptance for plant material. The warranty period shall be for 24 months from date of Final Acceptance for non-irrigated trees of 3" or larger caliper. For all non-irrigated plant material, the Contractor is responsible for ensuring the plants receive the equivalent of 1" of water per week during the guarantee period of one year. If the warranty period extends to 2 years, water 1" of water every two weeks in the second year.

The Contractor shall use watering bags for all tree watering during the warranty period.

The Contractor shall keep watering and maintenance records submitted monthly during the warranty period to NC State Construction Management and the Facilities Operations Warranty Officer.

The warranty requires that plants be healthy, vigorous, and thriving for 12 months from the date of Final Acceptance. Any replacement plants shall be inspected by the Designer prior to planting to ensure plants are closely matched.

Dead or dying plants will be documented and removed immediately by the Contractor.

At the end of the warranty period the Designer will notify NC State Construction Manager and the Contractor in writing of the plants to be replaced. Replacement dates will be established by mutual agreement between the Designer, NC State Grounds Maintenance, and the Contractor. New plants shall be subject to the original warranty for that plant.

Part 5: Design Guideline – Plant Material and Methods

- 5.01 Plants -The Contractor must provide a list of sources for all plant material for the Designer's review.

No substitute plants shall be ordered by the Contractor without the written approval of the Designer with agreement from the University Landscape Architect and Grounds Management.

All plants must conform to the American Standard for Nursery Stock published by the American Association of Nurserymen.

Plants larger than specified may be used if approved by the Designer. Use of such plants shall not increase the contract price. If larger plants are approved, the soil preparation must be increased to accommodate the size of the plant at no additional cost to the owner.

Plants shall be measured when branches are in the normal position. Height and spread dimensions refer to the main body of the plant and not branch tip to tip. If a range of size is given, no plant shall be less than the minimum size and not less than 40% of the plants shall be as large as the maximum size specified. The measurements specified are the minimum size acceptable. Plants that meet the measurements specified, but do not have a normal balance between height and spread shall be rejected.

- 5.02 Herbicide - Post-emergent: "Round-Up" by Monsanto or equal

Pre-emergent: XL2G or Snapshot (depending on plant crop) or equal

- 5.03 Mulch - Well-composted, double-shredded hardwood mulch with a maximum particle size of 2", free of waste materials.

No Peat Moss or Pine Straw or Trunk Wrap is used at NC State.

- 5.04 Fertilizer - A commercial grade fertilizer with an analysis described in the soil test.

- 5.05 Lime - Agricultural grade dolomitic lime mineral soil conditioner

- 5.06 Packaged Materials - All packaged goods including fertilizer shall arrive to the site in original unopened, undamaged containers showing weight, analysis and name of manufacturer. All packaged goods shall be covered and protected from deterioration until used.

- 5.07 Topsoil - Amended soils are preferred over imported topsoil where practical.

Imported topsoil shall be fertile, friable, natural topsoil of loamy character, without a mixture of subsoil material, reasonably free from clay, lumps, coarse sands, stone, plants, roots, sticks, and other foreign materials.

For nonericaceous plants, topsoil shall have a pH range between 5.8 and 6.5, total soluble salts not to exceed 500 parts per million, and clay content shall range between 5% and 25%.

- 5.08 Erosion Control Materials - Any materials left on the site after the end of the guarantee period shall be biodegradable unless otherwise required and specified in the erosion control plans and specifications.

5.09 Watering Bags - Watering bags shall be of the type that are attached to the trunk and sit vertically when full. No flat bags that cover the root ball will be allowed.

5.10 Delivery of Plant Material - The Contractor shall ensure that the plants are dug within the season planted.

The Contractor must take all precautions customary in good trade practice in preparing plants for moving.

Plants transported uncovered may be rejected.

B&B Plant materials in foliage must be sprayed with anti-desiccant immediately after digging to prevent dehydration.

Provide plants typical of their species or variety, with normal, densely developed branches and vigorous, fibrous root systems. Provide only sound, healthy, vigorous plants free from defects, disease, and all forms of infestation. All plants shall have a fully developed form without voids and open spaces. Plants held in storage will be rejected if they show signs of growth during storage.

Trees that have the main trunk forming a “Y” shape may be rejected

Trees and shrubs shall not be pruned prior to delivery to the site and shall be pruned only to remove broken branches. No other pruning is required at planting. No new pruning wounds shall be present with a diameter of more than one inch and such wounds must show vigorous bark on all edges.

Trees and shrubs shall not be bent or tie-bound in such a way to damage the leader or bark.

B&B plants with cracked or broken root balls shall not be acceptable. B&B stock shall be rejected if more than one inch of fill is found over the original root system. Plant material handled by the trunk or stem may be rejected. Container grown stock shall not be root-bound or with root systems hardened off.

The Contractor shall take precautions necessary to prevent desiccation or mechanical damage prior to, during and after delivery to the site.

All plants remain the property of the Contractor until final acceptance.

Label one tree, shrub, ground cover, etc. in each planting grouping with the correct name and size indicated on the plant list with waterproof labels that remain legible for 60 days minimum.

5.11 Storage on the Site - Notify NC State Grounds Management of delivery schedule in advance so plant material may be inspected by NC State Grounds Management and/or the Designer upon arrival at the job site. Unaccepted plant material shall be removed immediately from the job site.

Deliver trees and shrubs after preparations for planting have been completed, plant locations are field staked, and plant immediately. If planting is delayed more than 6 hours after delivery, set plants in the shade, protect from weather and mechanical damage, keep roots moist, prevent freezing of the root ball, and remove ties from branches. Cool the surface of the storage area by watering before placing plants on it. Keep plants protected from strong direct or reflected light, especially tree trunks. Plants that cannot be planted immediately upon delivery shall be properly protected, heeled in and irrigated daily.

- 5.12 Herbicide Application - Prior to using any herbicide, notify Grounds Management.
- “Round-Up” by Monsanto (or equal) shall be applied to all plant beds and mulch beds with existing vegetation to be removed, such as in the case of changing from existing turf to mulch bed. Apply herbicide per the manufacturer’s directions. Reapply after 30 days if signs of plant growth can still be detected in treated areas.
- To protect waterways and riparian buffers use “Rodeo” according to manufacturer’s directions.
- Pre-emergent XL2G or Snapshot shall be applied by the Contractor to plant beds prior to the emergence of any weed seeds. Pre-emergent is to be applied at rates specified on the package as recommended by the manufacturer. Select pre-emergent based on the season of effectiveness.
- Weeds, grass or other undesirable plants may be removed manually in lieu of herbicides.
- 5.13 Preparation of Sub-grade Plant Beds - Do not work soils that are frozen, muddy or saturated.
- Rough grading shall be brought to a true and uniform grade, clear of all stones larger than one (1) inch, sticks and other extraneous materials.
- Where the subsoil is composed of heavy clays or compacted due to construction activity the soils shall be ripped to a minimum depth of twenty-four (24) inches.
- Ripped areas shall be brought back to a final, fine grade by the Contractor.
- 5.14 Clean up - After final grading is approved the site shall be cleared of all grade stakes, surface trash and other objects.
- Paved areas (including streets and walks) shall be kept clean. Paved areas shall be cleaned by mechanical means and with brooms. No water shall be used to clean paved areas. The wheels of all vehicles shall be kept clean to avoid tracking soil onto road, walks or other paved areas.
- 5.15 Drainage, Detrimental Soil, Underground Utilities, and Obstructions - The Contractor shall notify the Designer in writing of all soil and drainage conditions considered detrimental to growth of plant material as identified by the Contractor or in the soils report.
- Alternate plant locations due to unforeseen conditions must be approved by the Designer, Grounds Management, and the University Landscape Architect.
- 5.16 Locations of Plants on the Site - The Contractor shall lay out and field stake the position of all plants and beds. The Contractor shall then notify the Designer for review and approval of the plant locations. The Designer will notify the University Landscape Architect and Grounds Management who may attend the inspection for field staking.
- 5.17 Soil Amendments - The Contractor shall obtain a NC Department of Agriculture soils test for all areas to be planted. Recommended amendments shall be incorporated into all areas designated as bed prepared areas.
- 5.18 Plant Bed Preparation - Add Amendments per the soil test. Till the area to achieve a granular texture to a depth of 12”. Remove all rocks over 1” in diameter, sticks, or any extraneous matter. Till in 4” of composted fine pine bark (particle size 1” max.) Mound bed to compensate for soil fluffing. Fine grade planting area for proper drainage according to design topography. No pooling will be allowed. The Contractor will bear the responsibility for proper surface drainage of bed areas, as well as those areas disturbed by construction.

Contractor will be required to re-grade and re-prepare any areas that pond or otherwise demonstrate poor drainage.

In wooded areas, “natural” areas, or reforested areas do not bed prepare entire area. Prepare only the planting pits and root transition areas per planting details.

- 5.19 Planting - Excavate B&B pits two times the width of the rootball or container. Excavate as necessary to place the B&B rootball 2 to 3 inches above original grade. Set container plants on undisturbed soil above original grade to ensure drainage

Backfill with amended soil and tamp to remove air pockets. For B&B plants after plant is partially backfilled and stable, remove burlap, wire, rope and straps on the upper third of the rootball.

If additional soil is required for backfilling as a result of raising the plant, use soil similar to the topsoil of the surrounding area. Any imported soil will be approved by Grounds Management.

Build a saucer around the top of the rootball. Extend the saucer one foot beyond the plant pit. Finished height of the completed saucer shall be 4” for B&B plants and container plants 5 gallons and larger and 2” for container plants smaller than 5gallons. The minimum mulch ring for a single plant is 5 feet in diameter.

Water each plant immediately after planting, even if it is raining.

- 5.20 Mulching - Mulch three inches deep at saucers and all mulched plant beds. Do not place mulch within 6” of the base of the plant. The minimum mulch ring for any single plant is 5 feet in diameter.

Cover mulched planting beds on steep slopes with biodegradable matting to prevent mulch from washing.

- 5.21 Staking - Do not stake trees unless determined by the Contractor to be necessary to keep the tree upright and plumb throughout the warranty period. If stabilization is necessary, use white arbor tape, and 18”-24” wooden stakes with holds at the top to secure the tape. Using a bowline knot, attach the tape to the crotch of the first substantial limb. To insure visibility of new tree, attach orange flagging tape to the arbor tape. Staking shall be removed by the Contractor at the end of the warranty period or as directed by Grounds management.

- 5.22 Pruning - Prune dead wood at the end of the guarantee period according to American Standard for Nursery Stock standards and according to standards set forth in the ANSI A300 publication *Pruning Standards for Shade Trees*, published by the National Arborist Association.

- 5.23 Watering - The Contractor shall provide water unless the plantings are irrigated.

Containerized plants shall be watered immediately prior to planting. Thoroughly water plants immediately after planting to thorough saturation of all backfill in the pits and beds during the same day of planting. When fully settled, the plants should be at the proper grades and vertical.

Apply water only by open-end hose at low pressure. Sufficient water is achieved by filling the saucer twice per application per tree and per shrub. Rain substitutes for a scheduled watering when at least two inches of rainfall has been verified. It is the responsibility of the Contractor to keep the plant root zone moist enough to establish healthy and attractive plant material.

Watering requirements during the initial shock period (first 30 days after planting) shall be every day for the first three days; every other day for ten days; twice per week for two weeks.

Watering requirements during the establishment period (warranty period), after the first 30 days shall be 1" of water per week for one year.

- 5.24 Inspections and Acceptance - Request for Inspections shall be made 7 days before the anticipated date of inspection.

Part 6 – Design Guideline – Lawn, Sod, and Turf

- 6.01 Material Requirements - Certification of grass seed - Container must state Botanical and Common name, percentage by weight of each species and variety, percentage purity, germination and weed seed. Include the year of production and date of packaging.

Must be fresh, clean, dry, new crop seed complying with AOSA's "Journal of Seed Technology; Rules for Testing Seeds" for purity and germination tolerances with an inspection date no more than 3 months prior to application. Seed with not less than 85% germination, not less than 95% pure seed, and not more than 0.5 percent weed seed.

Determination of seed type will be made on a case-by-case basis since the exact composition is site and season dependent. The seed type and seeding application rate will be specified on the drawing.

- 6.02 Seeding: March to September:

Full Sun Application: Tall or Dwarf Fescue, minimum of three cultivars.

Sun and Partial Shade: Proportioned by weight as follows: 50% Kentucky Bluegrass, 30% Chewing Red Fescue, 10% Perennial Ryegrass, 10% Redtop.

- 6.03 Seeding: September to March:

Hybrid tall fescue consisting of a minimum of three seed types.

- 6.04 Certification of Sod: Certification of seed as above.

Identify sod source: include name, address and telephone number of supplier that complies with TPI's "Specifications for Turfgrass Sod Materials" in its "Guideline Specifications to Turfgrass Sodding". Furnish viable sod of uniform density, color, and texture; strongly rooted and capable of vigorous growth and development when planted.

Sod of grass with not less than 95% germination, not less than 98% pure seed and not more than 0.5 % weed seed

- 6.06 Full Sun Application: Rebel, Tall Fescue

- 6.07 Soil amendments and fertilizers: Product certificates certified by product manufacturer

- 6.08 Soil: The layer which will support the growth shall be: ASTM D 5268, pH range of 5.5 to 7, a minimum of 4% organic material content, free of stones $\geq 1/2$ " in any dimension, and other extraneous materials such as weeds, soil cores and clods, sod and vegetation etc., harmful to plant growth. This is to be disposed of legally off of the Owner's property.

Source: Reused native surface soil stockpiled on site. Clean all soil of roots, plants, sod, stones, clay lumps and other extraneous material harmful to plant growth. Have soil tested.

- Source: Amended existing in-place surface soil to produce topsoil. Clean all soil of roots, plants, sod, stones, clay lumps and other extraneous material harmful to plant growth. Have soil tested after imported topsoil is incorporated.
- Either of above can be supplemented with imported or manufactured topsoil from offsite source. Obtain topsoil displaced from naturally well drained construction or mining sites where topsoil occurs at least 4 " deep. Do not obtain from bogs or marshes.
- 6.09 Quality Assurance: Soil tests done by NCDA Agronomic Division on native soil and any imported topsoil, and submitted to Grounds Management
- The Contractor will bear the responsibility for proper surface drainage of seeded areas, as well as those areas disturbed by construction. Contractor will be required to regrade and reseed any areas that pond or otherwise demonstrate poor drainage.
- Any seeding ill-timed with other work and requiring correction shall be reseeded by the Contractor at his or her expense up to one year following completion of the project.
- 6.10 Delivery, Storage and Handling:
- Seed: Deliver seed in original sealed, labeled and undamaged containers
- Sod: Harvest, deliver, store and handle sod according to requirements in TPI's "Specifications for Turf grass Sod Materials" and "Specifications for Turf grass Sod Transplanting and Installation" in its "Guideline Specifications to Turf grass Sodding."
- 6.11 Application: Protect structures, utilities, sidewalks, pavements and other facilities, trees, shrubs and plantings from damage caused by planting operations. Provide erosion control measures to prevent erosion or displacement of soils and discharge of soil bearing water runoff or airborne dust to adjacent properties and walkways.
- 6.12 Soil: Do not work under frozen, muddy or saturated conditions.
- Scarify native soil to a minimum depth of 4". If required, add additional imported topsoil. Apply required soil amendments and initial fertilizers and mix thoroughly into top 4" of topsoil. All areas for Seeding or Sodding shall be raked to a uniformly fine texture.
- Moisten prepared lawn areas before planting if soil is dry.
- Water thoroughly and allow surfaces to dry before planting.
- 6.13 Amendments: The area should be limed according to soil analysis reports. A starter fertilizer of 18-24-12 should be put down at ½ lb. Nitrogen per 1000 sq. ft before sod is laid. For seeding, a started fertilizer of 18-24-12 at ¾ lb. Nitrogen per 1000 sq. ft. should be used. Delay mixing fertilizer with planting soil if planting will not proceed within a few days. Mix lime with dry soil before mixing fertilizer.
- 6.14 Seeding New Lawns: Seeding rate required to achieve 90% coverage prior to substantial completion as determined on a per square yard basis. A minimum starting coverage of 15 lbs per 1000 square feet shall be required.
- Sow seed with a spreader or a seeding machine. Do not broadcast or drop seed when wind velocity exceeds 5 mph. Evenly distribute seed by sowing equal quantities in two directions at right angles to each other.
- Rake seed lightly into top 1/8" of topsoil, roll lightly and water with a fine spray.
- 6.15 Hydro-seeding: Protect adjacent and adjoining areas from hydro-seeding overspray.

Mix specified seed, fertilizer and fiber mulch in water, using equipment specifically designed for hydro-seed application. Continue mixing until uniformly blended into a homogeneous slurry for hydraulic application.

Mix slurry with non-asphaltic tackifier

Apply slurry uniformly to all areas to be seeded in a 2-step process. Apply first slurry application at the minimum rate of 500 lb. Per acre dry weight but not less than the rate required to obtain specified seed-sowing rate. Apply slurry cover coat of fiber at a rate of 1000 lbs./acre

- 6.16 Repair or Recondition: Remove sod or vegetation from diseased or unsatisfactory lawn areas, do not bury into soil. Remove topsoil containing foreign materials resulting from Contractor's operations, including oil drippings, fuel spills, stone, gravel and other construction materials, and replace with new top soil. The old soil and debris is to be disposed of legally, off of the Owner's property.

Where repairable lawn remains, as determined by the Owner, mow, de-thatch, core aerate and rake heavily and deeply. Remove weeds before seeding. Where weeds are extensive, apply selective herbicides as required. Do not use pre-emergent herbicides. Fill low spots and remove humps

Cultivate bare and compacted areas to an 4" minimum depth to provide a satisfactory planting bed. Settlement of washout may require re-grading. Provide new topsoil as required to fill low spots and meet surrounding finish grades

- 6.17 Sod: Lay sod within 24 hours of harvesting. Do not lay sod if ground is frozen or muddy.

Lay sod to form a solid mass with tightly fitted joints. Butt ends and sides of sod, do not stretch or overlap. Stagger sod strips or pads to offset joints in adjacent courses.

Lay the sod across the angle of a slope exceeding 3:1.

Roll lightly to ensure contact with sub-grade, eliminate air pockets and form a smooth surface. Work sifted soil or fine sand into minor cracks between pieces of sod. Water sod with fine spray within two hours of planting

- 6.18 Finishing Maintenance: Maintenance shall include mowing. Begin maintenance immediately after each area is planted and continue until acceptable lawn is established, but for not less than the following periods:

Seeded Lawns: 12 months from date of Substantial Completion. When full maintenance period has not elapsed before end of planting season, or if lawn is not fully established, continue maintenance during next planting season.

Sod lawns: 12 months from date of Substantial Completion

Mulch: In areas where mulch has been disturbed by wind or maintenance operations, add new mulch. Anchor as required to prevent displacement.

Seeding Coverage: Protect seeded areas with slopes exceeding 2:1 with erosion control blankets installed and stapled according to manufacturer's written instructions.

Spread wheat straw mulch after completion of seeding operation. Spread uniformly at a minimum rate of two tons/acre to form a continuous blanket 1 ½ " loose depth over seeded areas. Spread by hand, blower or other suitable equipment. Anchor straw mulch by crimping into topsoil with suitable mechanical equipment.

- Bond straw mulch by spraying with asphalt emulsion at the rate of 10-13 gal./1000 sq. ft. Take precautions to prevent damage or staining of structures or other plantings adjacent to mulched areas. Immediately clean damaged or stained areas.
- 6.19 Water: Provide and maintain temporary piping, hoses and lawn watering equipment to convey water from sources and to keep lawn uniformly moist to a depth of 4”
- Schedule watering to prevent wilting, puddling, erosion and displacement of seed or mulch. Lay out temporary watering system to avoid walking over muddy or newly planted areas.
- Seed: Enough to keep the soil moist to a depth of 2”
- Sod: Water 2 times a day for three weeks or to keep the soil below moist to a depth of 2”
- 6.20 Mowing: Mow as soon as the top growth is tall enough to cut. Repeat mowing to maintain specified height without cutting more than 40% of grass height. Remove no more than 40% of grass-leaf growth in initial or subsequent mowings. Do not delay mowing until grass blades bend over and become matted. Do not mow when grass is wet.
- 6.21 Amendments: Post fertilization: Apply fertilizer after initial mowing and when grass is dry. Use fertilizer that will provide actual nitrogen of at least 1 lb/1000sq.ft to lawn area.
- 6.22 Cleanup: Promptly remove soil and debris created by lawn work from paved areas. Clean wheels of vehicles before leaving site to avoid tracking soil onto roads, walks, or other paved areas.
- Erect barricades and warning signs as required to protect newly planted areas from traffic. Maintain barricades throughout maintenance period and remove after lawn is established.
- Remove erosion control measures after grass establishment period.

Part 7 – Design Guideline – Tree Protection

- 7.01 Intent- Individual trees and/or groups of trees identified for protection during construction operations shall be fenced and protected. For highly developed, high traffic campus sites and category 1 trees, a 5-foot high, chain link tree protection fence is required. For short construction periods of approximately three months or less, and for construction projects in less developed, low traffic areas metal poles with orange plastic barricade or wood tree protection fencing may be used. Every 50 linear feet of tree protection fence shall have a sign that says “ Tree Protection Area Do Not Enter” using 2” minimum height black letters on white background. At least one sign is required. This fencing may not be removed without the consent of the University Landscape Architect and permission from the NC State Construction Manager. Request for tree protection fence removal or any change from the contract documents regarding tree protection shall be made to Construction Management prior to any action. All trees to remain shall be watered 1” of water per week if rainfall does not meet 1” per week.
- 7.02 Tree Survey - All trees on campus construction and development sites shall be surveyed. Large wooded areas or groups of trees shall be identified as a cluster on the survey. Major trees within these groupings, as determined by the Designer with the University Landscape Architect, shall be numbered and surveyed according to size and type. Individual trees surveyed or key trees identified by the Designer or University Landscape Architect shall be drawn to scale with the approximate canopy shown. Trees to be saved or removed shall be identified by the Designer and University Landscape Architect and indicated on the site plans. As determined by the Designer, University Landscape Architect, or NC State Design

Project Manager, trees outside the construction area at risk to construction damage also may be identified to remain and be protected.

- 7.03 Tree Protection Area - Establish the critical root zone of the trees to remain and identify this area on the plans. A general rule for establishing the critical root zone is to measure and protect an area 1.5 times the canopy spread. Consult with the University Landscape Architect and Campus Arborist to define the critical root zone area and shape of the area to be protected during construction. Establish the limits to grading and tree protection fence to protect the largest amount possible of the critical root zone.

No materials, equipment, vehicles, or people may enter into the tree protection area. Allow no poisoning to trees with the dumping of materials such as solvents, gas, paint, and herbicides or with the washing of toxic materials into the tree protection area. Exercise care that no runoff from clean up operations (including concrete clean up wash water) enters the tree protection areas.

- 7.04 Tree Watering Plan - All trees to remain shall receive 1" water per week. Surface drip irrigation may be laid throughout the root zone and covered with 2" composted chipped hardwood mulch.

- 7.05 Pruning - The contractor shall not remove or prune any landscape materials without prior consent from the Owner. All tree work shall be by an arborist certified by the International Society of Arboriculture, bonded, and insured. All work shall be according to standards set forth in the ANSI A300 publication *Pruning Standards for Shade Trees*, published by the National Arborist Association. Request for any tree or shrub pruning shall be directed to the NC State Construction Manager. Request for any tree removal shall be directed to the NC State Construction Manager two weeks in advance. The NC State Construction Manager will initiate a tree removal process with Grounds Maintenance. Any inadvertent injury to trees shall be cared for by a certified arborist and paid for by the contractor.

If plans require grading or digging in the critical root zone of protected trees, root prune the tree to avoid the ripping of roots with digging equipment. This may be accomplished with a trencher. Any roots larger than ½" that are damaged due to cut grading or trenching operations must be stubbed cleanly.

- 7.06 Disposal of Trees to be Removed - All debris from the pruning operation shall be disposed of lawfully. With permission from NC State Grounds Management, NC State may provide a dumping site for all chippable organic material removed from campus. If depositing on NC State facilities, materials must be separated by the contractor into size groups (i.e. limbs, brush, and firewood) and placed in areas designated for each material at the dump site. No root balls, stumps, or logs over 6 feet in length will be accepted at the NCSU dump site.

- 7.07 Boring - Evaluate boring under major trees designated to remain to avoid root damage for utility construction. If this option is preferred, include direction to the contractor in the plans and specifications for location and size of boring pits and the direction and location of the bore.

- 7.08 Tree Preparation - Trees may be prepared for damage to the root zone in advance of construction. Evaluate with the University Landscape Architect the need for supplemental watering in the critical root zone to remain.

- 7.09 Construction Traffic over Tree Root Zone - In areas where construction vehicular and equipment traffic over tree roots is unavoidable, place 12" of bark mulch or coarse wood chips as an organic base for traffic. In areas requiring repetitive construction traffic access place a layer of structural geo-textile fabric under the wood chips, and logging mats on top of

- the mulch and cover with additional layer of wood chip mulch. Chipped wood may be used for a temporary pedestrian path over root zones. If green wood chips are used fertilize with 8-8-8, 1 to 2lbs./1000sf.
- 7.10 Trenching - When trenching near trees, use National Arbor Day Foundation standards. In areas where trenching or digging is allowed near trees to remain, store earth outside the critical root zone on the side of the trench *away* from the tree trunk. If this is not possible, excavated earth may be placed in the root zone for periods less than 1 week if 8" minimum layer of coarse bark mulch is placed on top of the root area to receive earth. If large tree roots are encountered, hand dig around the root and allow it to span the trench. During mechanical backfilling operations, stop moving the earth with mechanical equipment when the mulch layer is reached. The remaining clean up shall be by hand.
- 7.11 Clean up - All clean up operations shall avoid any disturbance to the original grades and surface soil in the tree protection area. Clean up in tree protection areas may be accomplished only by hand raking.
- 7.12 Documentation by the Designer - Tree Protection Plan - A separate tree protection plan sheet shall be required if tree protection involves more than a simple tree protection fence. When digging, planting, trenching, boring, watering, driving in the critical root zones, or other special root zone protection is required, a separate Tree Protection Plan describing procedures is necessary.
- Actual, tree protection fence locations shall be shown to scale on all site plans as well as described in the specifications. Trees to be saved or removed shall be labeled as such on all site layout drawings as well as being shown on the demolition plan and grading plans. This includes electrical, plumbing, planting, etc.
- Specifications must incorporate pertinent materials and methods used to protect trees.
- 7.13 Penalties - Specifications must describe that the Designer or the NC State Construction Manager may issue a stop work order if any portion of the tree protection fence or methods are violated. This order remains effective until the protection is reinstated according to the contract documents with no penalty to the owner.

Part 8 – Design Guideline – Irrigation

- 8.01 DESIGN CRITERIA - Irrigated grass will be limited to grass areas between the curb and sidewalk, medians, campus entrances and prominent edges, and large expanses of lawn in high use areas. The irrigation design will be arranged so that there is no wetting of paved surfaces. Turf irrigation shall be on separate zones from other plant irrigation.
- All trees and shrubs, except in natural areas, will have drip irrigation. Drip irrigation shall be on separate zones from spray irrigation.
- All irrigation systems shall be designed according to NC State guidelines. Design-Build irrigation systems will not be accepted at NC State. No irrigation shop drawing will be approved without an accurate irrigation site plan with the irrigation design that is in accordance with all the design guidelines. All irrigation shop drawings shall be reviewed by the designer and by Grounds Management.
- 8.02 The Designer is responsible for:
- a) developing the scope of irrigation for turf and planting areas with Grounds Management and the University Architect;

- b) determining the water supply location and detailed description of the contractor's work for providing water supply to the irrigation site, including the location of the controller and water meter;
 - c) determining the electrical supply location and source for the controller and if an electrical meter is required;
 - d) measuring, researching, or ordering survey information for campus utilities, trees over 3.5" caliper, and delineation of turf and mulch locations;
 - e) ensuring all city and state plumbing code requirements are met and specifying pressure requirements of main and lateral lines;
 - f) spray head irrigation design for turf;
 - g) drip irrigation design for all trees and shrubs;
 - h) providing actual locations of drip heads on plans;
 - i) pre-qualifying bidders with 3 years or more experience installing irrigation systems of comparable scope;
 - j) design of an above ground Reduced Pressure Back Flow Device (RPZ) with cover;
 - k) including site repair and seeding schedule in the specifications;
 - l) providing as-built drawings.
- 8.03 Materials and Methods - Back Flow - The RPZ will be on copper or brass risers 1 inch or larger. The base of the risers at ground level will have unions for winter removal. Provide heat tape.
- The RPZ will be mounted at least 12 inches but no more than 30 inches from the relief valve to the ground.
- A brass ball valve and box will be installed 2 feet from the supply to the back flow for quick shutdown. No gate valves are used on NC State irrigation systems.
- The RPZ will be tested and a certified report sent to NC State Construction Manager.
- 8.04 Hot Box - All RPZ will have a hotbox enclosure. Preferred color is Dark Architectural Bronze.
- 8.05 Controller - The controller shall have multiple start times and programs.
- 8.06 Valves - Valves shall be electrically controlled automatic control systems diaphragm actuated and hydraulically operated solenoid valves. All Valves and wire splices will be in a 1- inch round valve box.
- 8.07 Mainline - Mainline shall be sized to requirements and shall be a minimum of 24" below finish grade.
- 8.08 Lateral Line - Lateral lines shall be 1-inch minimum and at least 12 inches below finish grade.
- 8.09 Sleeves - All sleeves are required under roads and walkways and shall be of Schedule 40 PVC and a maximum depth of 24 inches.
- 8.10 Drip Irrigation - Trees and shrubs will have drip irrigation.
- 8.11 Spray Heads - Six inch spray heads with check valves will be used for rotor turf irrigation.
- All large turf areas will have a gear driven rotor sized for the area.

Twelve-inch spray heads will be used for annual and perennial beds.

- 8.10 Quick Couplers - All quick couplers will be installed on swing joints and secured with ground anchors, surrounded with gravel in a 10-inch box.
- 8.11 Trenching and Backfilling - All trenching will be 6 inches wide minimum. Hand trenching is required to prevent root damage to trees. All backfill will be tamped and disturbed area reseeded or mulched.
- 8.12 Mulch - Well-composted, double-shredded hardwood mulch with a maximum particle size of 2", free of waste material.

END OF SECTION 02900 – LANDSCAPING