

FLORIDA INTERNATIONAL UNIVERSITY

LANDSCAPE & IRRIGATION MANUAL

(OCTOBER 2019)

Table of Contents

1.0	General	3
2.0	Soil	7
3.0	Plant Species	9
4.0	Landscaping Material	10
5.0	Irrigation	12
6.0	Mulch	15
7.0	Fertilizer	16
8.0	Tree Preservation Plan	17
9.0	Landscape and Irrigation Maintenance	32
10.0	Standard Details	33
11.0	Sources	38

1. GENERAL

- 1.1 The purpose of this Landscape and Irrigation Manual is to aid maintenance personnel and qualified professionals in understanding the University's requirements for maintenance and new landscaping and irrigation projects.
- 1.2 Landscaping adds aesthetic and recreational values, and can play a key role in the prevention of soil erosion, water conservation, storm water management, energy efficiency, and long-term health and viability of natural habitat areas.
- 1.3 If conflicts/discrepancies arise between this manual and other governing documents, the most stringent and/or recent shall apply, unless determined otherwise by the University.
- 1.4 The requirements within this manual are minimum standards. Projects are encouraged to exceed these standards whenever appropriate.
- 1.5 The health, safety and welfare of students, staff and visitors of Florida International University is of utmost importance. Landscape design professionals or their sub consultants will be responsible for taking every appropriate measure to assure that their project designs create no hazardous situations. The measures include, but are not limited to, proper selection and placement of plants materials. Plants should not be selected which are considered toxic in any way. This toxic nature of the plant may be from such items as its saps, fruits, leaves, branches or bark. The placement of plants is also of utmost importance. Care must be taken to prevent plant material from causing damage to adjacent structures and utilities. Safety must also be considered when placing plants in areas where falling debris from plants may cause injury or damage to people or property.
- 1.6 Conceptual Landscape and Irrigation plans are required as part of the discretionary review process and shall be approved by FIU Grounds Superintendent prior to subsequent submittals. Landscape and Irrigation Construction Documents shall be prepared in accordance with the requirements of all applicable Florida Statutes.

Landscape drawings shall include, but not be limited to the following:

- Location of all existing and proposed underground utilities.
- Existing and proposed trees, shrubs, ground covers and turf areas within the project limits.
- Plants by botanical and common name, and where applicable, cultivar name; spacing, and quantities of each type of plant by container size and by mature height and spread;
- Existing and proposed hardscape features such as driveway(s) and sidewalk(s) as necessary;
- Existing and proposed buildings;

The Irrigation Plan shall show the following:

- Irrigation point(s) of connection and design capacity;
- Water service pressure at irrigation POCs;
- Flow meter;

- Major components of the irrigation system, including all pumps, valves, and pipe sizes;
 - Irrigation legend will have the following elements: Separate symbols for all irrigation equipment with different spray patterns and precipitation rates and pressure compensating devices; general description of equipment; manufacturer's name and model number for all specified equipment; recommended operating pressure per nozzle and bubbler and low-flow emitter; manufacturer's recommended overhead and bubbler irrigation nozzle rating in gallons per minute (gpm), or gallons per hour (gph) for low flow point applicators; minimum (no less than 75% of maximum spray radius) and maximum spray radius per nozzle; and manufacturer's rated precipitation rate per nozzle at specified psi.
- 1.7 Landscapes shall incorporate sustainable site design practices wherever practicable.
- 1.8 Landscape design shall promote the values and benefits of landscapes while recognizing the need to utilize water and other resources efficiently.
- 1.9 Another important aspect in the design of landscapes is the provision of site amenities which include, but are not limited to, the following:
- Bike racks
 - Bike paths
 - Outdoor water fountains
 - Outdoor seating areas
 - Study areas
 - Outdoor classrooms
- 1.10 It is the University's design intent to establish shaded trees canopies over as many roadways as possible when practical. These tree lined streets, unlike the perimeter landscape zone, will be composed, primarily, of evergreen trees to give optimal shade year round. As the trees grow and mature their canopies, they will eventually spread above across the roadway, creating a tunnel effect.
- 1.11 Trees along roadway shall be located at a sufficient distance from the edge of pavement, to prevent damage to it by the tree's root structure.
- 1.12 Irrigation systems shall be designed to provide the optimum amount of water to the landscape for plant growth without causing soil erosion and runoff.
- 1.13 Plant materials used on slopes shall be those species that are known to have low water requirements and rooting systems of various depths that will minimize erosion and soil slippage.
- 1.14 Plant selection shall be based on the plant's adaptability to the existing conditions present at the landscaped area and native plant communities, particularly considering appropriate hardiness zone, wind direction, soil type and moisture conditions, light, mature plant size, desired effect, color and texture. Plant species that are drought tolerant are preferred.
- 1.15 Plants shall be grouped in accordance with their respective water and maintenance needs. Plants with similar water and cultural (soil, climate, sun, and light) requirements shall be grouped together. The water use zones (hydrozones) shall be shown on the irrigation, layout,

- and planting plans (where required). Where natural conditions are such that irrigation is not required, the presence of site appropriate plants shall not be considered a high water use hydrozone. The combined size of all high water use hydrozones shall be limited. Landscaping site plan shall show all the areas that are shaded for more than six hours per day.
- 1.16 All invasive exotic plant species shall be removed from each site prior to the beginning of construction.
 - 1.17 The slopes of planted areas should permit easy maintenance. Proposed grading shall indicate positive surface drainage (2% grade in planting areas) away from structures and terminating in an approved drainage system. Turf areas shall have a slope of no more than 3:1 and no less than one percent. Areas with slope steeper than 3:1 must be planted with ground cover or constructed with materials specifically designed to control erosion. Slopes steeper than 3:1 are not acceptable. Terracing may be an appropriate solution for sites with large grade differentials, as long as access for lawn mowers and other maintenance equipment is provided.
 - 1.18 The design professional shall visit the project site to become familiar with onsite conditions.
 - 1.19 Grading and design of areas adjacent to bodies of water shall conform to Federal, State and Local regulations which may include but is not limited to the use of berms and/or swales to intercept surface runoff of water and debris that may contain fertilizers or pesticides. Riparian or littoral zone plants that do not require mowing or fertilization shall be planted in these areas.
 - 1.20 Existing trees and other plant materials to be preserved shall be reflected in the grading plan. Where trees are to be preserved, the existing grade within the circle of the tree drip line must not be disturbed by grading or paving. Temporary construction fences shall be erected at the drip line of the existing trees to protect them from construction materials and equipment.
 - 1.21 Site preparation shall include the eradication and removal of any rocks, brush, roots, weeds, grass, and cleanup of any dead material and finish grading as shown in drawings. Entire site must be weed-free prior to sodding. See soil section.
 - 1.22 Location of all utilities and base information is approximate. The contractor is responsible for locating and verifying existing underground utilities prior to trenching.
 - 1.23 Irrigation shall be installed in accordance with local codes, contract drawings, contract specifications, and appendix "F" of the Florida Building Code.
 - 1.24 The contractor shall provide and maintain all the necessary safety measures during construction operations to properly protect public safety.
 - 1.25 No substitutions shall be made without written consent of the owner's representative.
 - 1.26 All existing site roads, parking lots, curbs, utilities, sewers, and other elements to remain shall be fully protected from any damage unless otherwise noted.
 - 1.27 The contractor is responsible for verifying all quantities and reporting any discrepancies to the Landscape Architect or Project Manager for clarification prior to contract award and commencement of work.
 - 1.28 The transplanting of plant material, particularly palms and trees, is a very important function of the landscape architectural task of FIU. For it is the policy of the University that plants in the path of future construction will be relocated, unless otherwise instructed by FIU. Trees shall

- be root pruned a minimum of six (6) weeks and a maximum of three (3) months before transplanting. See Tree Preservation Plan.
- 1.29 All existing trees that are scheduled to be relocated or removed must be carefully scrutinized for any bird nests prior to the commencement of such relocation or removal. If birds are found they are to be protected as per Landscape Architect's recommendation or the national arborist association guidelines. See Tree Preservation Plan.
 - 1.30 During the course of irrigation and landscaping installation, the consultant shall visit the project site to observe the progress of work and compliance with the Construction Documents. Following each site visit, the Consultant shall prepare a field report noting the status of work in place, and deficiencies.
 - 1.31 When the project is substantially completed the consultant shall visit the site and shall complete a punch list identifying all the deficiencies that will need to be completed, repaired, or replaced prior to final acceptance. The Consultant shall schedule a subsequent site walkthrough to verify that the work has been finally completed.

2. SOIL

- 2.1 Soils vary from site to site and even within a given site. During the design phase at least two soil samples shall be taken for proper selection of plants and any needed soil amendments.
- 2.2 **Soil examination and sampling** - The landscape area should be visually examined with the purpose of determining whether important soil differences occur within the site. Are there rocky/marl areas, sandy areas, mucky areas? Soil analyses will be required for each area having significantly different soil characteristics within the landscape site. Within each area greater than 5000 square feet identified as having unique soil characteristics, eight cores with a minimum diameter of 2 inches and extending to 6 inches depth where possible, should be randomly collected from the area and composited to form one sample representing the area. The cores within each area should be thoroughly mixed together to provide a uniform sample. Retain approximately ½ gallon of soil. If samples cannot be taken to a 6 inch depth, additional cores may be required to provide sufficient sample. Provide a record of the sample depth if it is less than 6 inches. When the loose soil is deeper than 6 inches in depth, provide a note indicating the approximate soil depth, and indicating any visual changes in composition with depth.

2.3 **Soil Analysis** - Analyses on the collected samples should include:

2.3.1 Physical analyses of the whole soil sample.

- Soil texture (sand, silt, clay) of particles less than 2 mm diameter (passing a # 10 screen).
- Analysis of the sand fraction (percent by weight of very coarse, coarse, medium, fine, and very fine sand).
- Amount of particles greater than 2 mm diameter, expressed as a weight percentage of the entire sample (including particles less than 2 mm diameter), and the weight distribution of particles greater than ¼ inch but less than ½ inch, greater than ½ inch but less than 1 inch, and greater than 1 inch in diameter.
- Determine whether the predominate mineralogy is limestone by observing effervescence upon addition of a dilute solution of hydrochloric acid.
- Laboratory analysis of saturated hydraulic conductivity and pore space distribution.

2.3.2 Chemical analyses of material passing a 2 mm screen.

- Organic matter content on a weight basis.
- pH
- Lime requirement when pH is below 6.0
- Available mineral nutrients determined by the Mehlich 3 extractant (<http://edis.ifas.ufl.edu/ss620>), including P, K, Ca, Mg, Fe, Mn, Zn, and Cu, expressed as mg/L (ppm), with interpretation of nutrient levels obtained, and recommendations or appropriate soil amendments to adjust pH (if needed) and fertility levels.
- Soluble salts, with interpretation of impact on plant health.

2.3.3 **Laboratories providing physical soil analyses -**
<https://www.a2la.org/dirsearchnew/puglabs.cfm>

2.4 **Soil Modification** - If the loose soil material is 6 inches or greater in depth, and the top 6 inches has 90% by weight particles less than 2 mm diameter, and the less than 2 mm fraction contains at least 1% organic matter (by weight), has pH below 7.0, a saturated hydraulic conductivity greater than 4 inches per hour and a macropore space greater than 20% by volume, and limestone (calcium carbonate) is not the predominant soil mineral, then no soil modification will be required for turfgrass areas.

For soils less than 6 inches in depth, addition of topsoil will be required to achieve a 6 inch soil depth for turfgrass areas, and 8 inches for shrubbery. Incorporate the topsoil into the existing soil if the existing soil depth over consolidated material is greater than 1 inch. The added topsoil must contain a minimum of 1% organic matter, by weight, have a pH below 7.0, 95% by weight mineral particles passing a 2 mm sieve, the predominate soil mineral be silica rather than limestone, a minimum saturated hydraulic conductivity of 4 inches per hour, and a minimum macropore space of 25%, as determined by a physical soil testing laboratory. The topsoil must be analyzed for required plant nutrients by the Mehlich 3 method, and be amended with P, K, Ca, Mg, and micronutrients according to the soil test recommendations. Acceptable topsoil may be found natively, or be constructed from mixtures of sand and peat, or by amending native topsoil, but the final mix must meet the listed specifications. The topsoil must be substantially free of weeds and weed seed, and have nematode numbers below those requiring treatment (see turfgrass in <http://extension.uga.edu/publications/detail.cfm?number=C834>).

For palm trees, the planting hole must be 2 ½ times the diameter of the root ball, and extend a minimum of 12 inches below the bottom of the root ball when the top of the root ball is even with the grade. The hole must be backfilled firmly with topsoil meeting the above-stated specifications.

3. PLANT SPECIES

- 3.1 Florida International University is committed to the use of Xeriscape when appropriate.
- 3.2 Plant species shall be appropriate for their designated use and environment.
- 3.3 Using the concept of a "Florida Friendly Landscape" or Xeriscape, a landscape plan shall be submitted identifying all existing vegetation to be preserved, proposed turf areas and other landscape areas. Installed trees and plants shall be grouped together into landscape plant zones according to water and cultural (soil, climate and light) requirements. Plant groupings based on water requirements are as follows: natural, drought tolerant and oasis.
- 3.4 Non-living ground cover, such as rocks, gravel, and mulch, may be used in combination with living plant material. The use of artificial plants shall not be permitted to meet any of the landscaping requirements.
- 3.5 It is the responsibility of the Consultant to select the appropriate plant species and location.

4. LANDSCAPING MATERIAL

- 4.1 Vegetation that is set aside for preservation shall be protected from all on-site construction.
- 4.2 Contractor shall flag all trees to be protected as shown on demolition and landscape sheets for review and approval by FIU Grounds Department, contracted Landscape Architect and any other owner's representation prior to any demolition.
- 4.3 During construction protective barriers shall be installed along the perimeter of all preserve areas. Protective barriers shall be constructed at such intervals to prevent machinery from passing between them. No equipment or materials shall be permitted to be stored within the set-aside areas, and dumping of excess soil, liquids, chemicals or any other construction debris within the preservation areas is prohibited. Removal or re-grading of soils within preservation areas is prohibited. Any damaged vegetation within the set-aside areas shall be replaced with similar quality and species, sized to match the largest trees of that species being planted as per the landscape plans. If trees are harmed through lack of protection or through negligence on the part of the contractor, the contractor shall bear the burden of the cost of repair or replacement. See Tree Preservation plan.
- 4.4 Plant material shall conform to the standards for Grade #1 or better as given in the latest "Grades and Standards for Nursery Plants, Parts I and II," Florida Department of Agriculture and Consumer Services or to the standards as given in the latest "American Standard for Nursery Stock," American National Standards Institute.
- 4.5 The contracted Landscape Architect / Consultant shall visit the nursery and shall be responsible to select the plant material in conjunction with Contractor. This is of particular importance in tree selection.
- 4.6 All plant sizes shall equal or exceed the minimum sizes as specified in the plant list. The plant list (including plants per pot) shall include the minimum height, spread and leaf density (noted as full).
- 4.7 Sod shall be grade "A" premium and shall be free of insects, fungus, Bermuda grass, nut sedge or other objectionable grassy or noxious weeds.
- 4.8 Upon arrival to the site of work, sod shall be inspected before installation for proper shipping, storage and handling procedures. Sod showing discoloration or wilting will be rejected.
- 4.9 Sod installation shall be smooth, even, and staggered to avoid continuous seams. Sod shall be moist and placed on a moist earth bed. Sod shall be carefully place by hand, edge to edge in rows at right angles to the slope, starting at the base of the area and working upward. On St. Augustine, install only full size (16"x24") pieces of sod (except for cutting-in purposes). There shall be no over lapping of the edges and voids between sod pieces. Broken pad with uneven ends will not be acceptable.
- 4.10 Sod shall be Captiva St. Augustine (for sunny or shady locations) and Seville St. Augustine (for shade locations). Sod shall be class "A" premium" strongly rooted 1-1/2 inch minimum root structure, freshly dug, brought to the site and placed immediately, and shall contain no visible weed species and be certified as free of weed seeds. If any sod becomes damaged prior to Facilities acceptance, it shall be treated or replaced as directed and in compliance with the

original specifications. The Contractor shall submit certification and delivery receipt to Project Manager.

- 4.11 Whenever grass reaches a height of 6 inches, contractor shall cut back to 4" with all clipping. After two mowing (by the contractor), contractor shall top dress the sod with an application of controlled release fertilizer at the rate of 1 pound of actual nitrogen per 1,000 square feet.
- 4.12 Sod areas will be accepted when in compliance with all the following conditions:
- The roots are thoroughly attached to the soil.
 - Absence of visible joints.
 - All areas show a uniform stand of specified grass in healthy condition (green in color) and free of weeds.
 - At least 60 days have elapsed since the completion of the work.
 - The sod is rolled level and has no lips.
- 4.13 If sod work does not comply with the requirements, the contractor shall continue the specified maintenance until the FIU project manager, contracted Landscape Architect and FIU Grounds Department find the work to be acceptable, completed. All rejected plants and materials shall be removed from the project site. Upon completion, FIU will assume the maintenance of all sod areas.
- 4.14 Plants shall be properly set in center of plant pit, straight and level.
- 4.15 The contractor shall be responsible to water all planting areas until work is accepted by the project manager. If water is not available at the site the contractor shall be responsible for making arrangements to supply water by means of a truck or tank at no additional cost to FIU.
- 4.16 All plants shall be guaranteed for three hundred sixty-five (365) consecutive calendar days from the date of final acceptance. Guarantee shall commence from the date of final acceptance. Plant material which is on the site and scheduled to be relocated is not covered by the guarantee except in the case of Contractor's negligence or work that has been done in an unworkman- like manner.
- 4.17 All plants that are pot bound or out of proportion between the root system and the foliage will not be acceptable. Plants shall be carefully removed from the container and if necessary, the container cut so as to render the plant undisturbed.
- 4.18 No plants shall be accepted when the root ball has been cracked or broken.
- 4.19 Trees moved by winch or crane shall be thoroughly protected from chain or cable scarring, girdling, or bark slippage.
- 4.20 Plants which are balled and burlapped and which cannot be planted immediately, shall have the root ball covered with moist soil or moistened burlap to provide protection from wind and sun. All plants shall be watered as required until planted.
- 4.21 Pruning shall be limited to the minimum necessary to remove dead or injured twigs and branches, to compensate for the loss of roots as a result of transplanting and to improve the character of the plant.
- 4.22 Guying and bracing system shall be installed to provide supplemental support, reduce tree movement and keep rootball in place until the roots become established in the surrounding soil. Trees that are staked require constant monitoring and maintenance to prevent damage to the trees, hazardous situations, personal injury and property damage.

5. IRRIGATION

- 5.1 Irrigation systems shall be designed to meet the needs of the plants in the landscape.
- 5.2 The contractor shall provide all labor, equipment and material to have and irrigation system fully operational.
- 5.3 The use of city water for irrigation is prohibited except where deemed necessary. Lake water and or pond water must be used if available; city water may be used around the building if there are no other sources and will not stain the building with rust.
- 5.4 All components of the irrigation system will consist of Rain Bird brand unless otherwise approved by FIU.
- 5.5 No plastic risers or shrub adapters shall be used. Bubblers may be used for larger trees and palms or where necessary and shall be approved by FIU.
- 5.6 All sprinkler heads shall be installed with swing joints (one marlex plus two funny 90°). Provide protection of sprinkler heads from vehicular traffic.
- 5.7 All rotor zones must have a maximum spacing of 40' and shall be triangulated or square where applicable.
- 5.8 Irrigation sleeves are required under hardscape areas; e.g., paved areas, driveways, retaining walls, or any other hard wearing materials such as stone, concrete sidewalks, road, etc. All irrigation sleeve pipe shall be schedule 40 PVC. Sleeves shall be 2 pipe sizes of the running pipe and shall extend 24" from edge of asphalt/roadway or concrete slab. Sleeves under paved areas shall be installed to a minimum depth of 24".
- 5.9 Pump, pipe, valves and fittings shall be installed in accordance with local codes and pipe manufacturer's instructions.
- 5.10 Irrigation main pipe shall be schedule 40 PVC, Zone 160 psi irrigation pipe, and ¾" & 1" class 200 pipe.
- 5.11 All heads surrounding the building perimeter must be triangulated.
- 5.12 Top of valve boxes and sprinkler head shall be installed at finish grade level.
- 5.13 Mains shall be @ 12" below finish grade and laterals between 6" and 12" (depending of the pipe size) below finish grade. All irrigation trenches to be back filled with 100% sand to prevent pipe ruptures.
- 5.14 Zone controlling valves will be Rainbird PEB series electric control valve in Higline 170106 12" rectangular valve box unless otherwise approved by FIU. All valves shall be protected from vehicular traffic. Provide a separate valve box for each valve. Irrigation control wire shall be #18 multiconductor U.L. approved for underground direct burial cable. All zone wires will be installed in a 1" PVC conduit and shall be placed next to the main (in the same trench). Only waterproof connectors will be permitted.
- 5.15 When feasible, irrigation systems shall be designed to separately serve turf and non-turf areas.
- 5.16 The design shall consider soil, slope, and other site characteristics in order to minimize water waste, including overspray, the watering of impervious surfaces and other non-vegetated areas, and off-site runoff.
- 5.17 Rain switches or other approved devices, such as soil moisture sensors, to prevent unnecessary irrigation, shall be incorporated.

- 5.18 A recommended seasonal operating schedule and average precipitation rates for each irrigation zone for both establishment and maintenance conditions shall be provided.
- 5.19 Control systems (Rainbird ESP LXME Series) shall provide the following minimum capabilities:
- Ability to be programmed in minutes, by day of week, season and time of day.
 - Ability to accommodate multiple start times and programs.
 - Automatic shut off after adequate rainfall.
 - Soil moisture sensing.
 - Ability to maintain time during power outages for a minimum of three days.
- 5.20 Irrigation systems shall be designed to maximize uniformity, considering factors such as:
- Head spacing.
 - Sprinkler pattern
- 5.21 Contractor and irrigation sub-contractor shall be responsible for maintaining irrigation service to areas outside of the construction site that would result in the disruption of service during construction. The contractor will restore/repair all damaged irrigation located within the construction site or any areas being used by the contractor, such as staging areas and parking areas. If any sod/landscaping dies inside or outside the construction fence as a result of irrigation failure due to construction, the contractor will be held responsible for restoring the areas exactly as they were previous to construction.
- 5.22 Sprinkler locations shall be coordinated with existing and proposed planting material, site lighting, utilities, etc. to ensure proper coverage with minimal undesirable overthrow.
- 5.23 Before any construction start, a test of the irrigation system must be conducted. The contractor, project manager and irrigation technician must be there to see if there are any infractions that have to be addressed.
- 5.24 All irrigation systems must be designed to incorporate a standard pre-cast (concrete) pump house 46"x 42" with galvanized cover and hasp to lock from vandalism. Install pump house over 6" (minimum) concrete slab. There is to be no irrigation craft and or Hoover systems or any other similar manufacturer. Pump house will consist of at least a 5 horsepower, 3 phase pump motor, or single phase. Same with the disconnect 3 phase or single phase weatherproof switch, and motor starter with 24 volt coil. All equipment will be located inside the pump house. Pump motor to be permanently mounted to concrete slab.
- 5.25 Testing for pressure and leakage shall be accomplished upon the completion of each section of zoned piping. All risers shall be installed prior to testing, and shall be suitable plugged and blocked. The contractor may not backfill joints before testing, and in the event of an unsatisfactory test, the contractor will uncover the sections for location of leaks and make the required repairs.
- 5.26 All lines shall be flushed and all outlets shall be capped and plugged before testing. Pressure testing (100 psi for a minimum of one hour) shall be conducted in the presence of the Project Manager. Test shall pass when there is no detectable change in pressure at the end of one hour period. The testing cost shall be paid for by the contractor.
- 5.27 Backfill shall be carefully placed to avoid pipe dislocation. Backfill material shall be free of rocks, stumps, roots, stones, and other debris that would damage irrigation system components.

- 5.28 Pop-up rotary shall be rain bird 5004 and spray heads shall be rain bird (side inlet) 1806 series. Rotor for athletics fields shall be Falcon 6504 high-speed #12 nozzle.
- 5.29 Six inch pop-up type shall be installed in areas landscaped with sod and mulch. Twelve inch pop-up type shall be installed in areas landscaped with groundcovers. Bubblers shall be installed at royal palms and large trees.
- 5.30 The Contractor shall fully warrant the landscape irrigation system for a period of one (1) year after final acceptance and will receive a written confirmation from the landscape Architect that the warranty period is then in effect.
- 5.31 Foot valve shall be Simons 400SB series (459SB).

6. MULCH

- 6.1 Mulch applied and maintained at appropriate depths in planting beds assist soil in retaining moisture, reducing weed growth, and preventing erosion. Mulch can also be used in places where conditions are not adequate for or conducive to growing quality turf or ground covers. Mulch is typically wood bark chips, wood grindings, pine straws, nut shells, small gravel, and shredded landscape clippings.
- 6.2 A layer of organic mulch 3" deep (measured after settling), shall be specified on the landscape plans in plant beds and around individual trees in turfgrass areas. Mulch is not required in annual beds. Mulch rings should extend to at least 3 feet around freestanding trees and shrubs. All mulch shall be renewed periodically. Mulch shall be kept at least 6 inches away from any portion of a building or structure, or the trunks of trees. Plastic sheeting and other impervious materials shall not be used under mulched areas.
- 6.3 Mulch shall be (red color) Melaleuca or eucalyptus, clean and free of weeds, moss, and other debris. Cypress mulch is unacceptable.
- 6.4 Mulch shall be added within 48 hours from time of planting of each bed or tree.
- 6.5 Mulch shall not be piled against trunks or stems.

7. FERTILIZER

- 7.1 Fertilizers applied to turf and/or landscape plants shall be formulated and applied in accordance with requirements and directions provided by Rule 5E-1.003(2), Florida Administrative Code, Labeling Requirements for Urban Turf Fertilizers.
- 7.2 No applicator shall apply synthetic quick release fertilizers containing nitrogen and/or phosphorus to turf and/or landscape plants during the summer rainy season, typically June 1 to September 30. The reasoning is that rain occurs frequently, saturating the soil, leading to more runoff. Fertilizer management is largely about keeping the nitrogen and/or phosphorus in the root zone where it can be used by the turf. While periods of heavy rainfall contribute to washing fertilizer out of the root zone, the health of the turf grass is an equally important factor. The use of synthetic slow release fertilizer and organic fertilizers shall be used during the "summer rainy season". Healthy turf grass with healthy roots and leaves is important to minimizing fertilizer movement. Because turf grass requires nitrogen throughout its growing period, its health can be negatively affected if nitrogen is deficient.
- 7.3 Spreader deflector shields are required when fertilizing via rotary spreaders. Deflectors must be positioned such that fertilizer granules are deflected away from all impervious surfaces, fertilizer-free zones and water bodies, including wetlands.
- 7.4 Fertilizer shall not be applied, spilled, or otherwise deposited on any impervious surfaces. Any fertilizer applied, spilled, or deposited, either intentionally or accidentally, on any impervious surface shall be immediately and completely removed to the greatest extent practicable. Fertilizer released on an impervious surface must be immediately contained and either legally applied to turf or any other legal site, or returned to the original or other appropriate container. In no case shall fertilizer be washed, swept, or blown off impervious surfaces into stormwater drains, or ponds.
- 7.5 All landscape applications of pesticides, including Weed and Feed products, shall be made in accordance with State and Federal Law and with the most current version of the Florida-friendly Best Management Practices for Protection of Water Resources by the Green Industries. When using pesticides, all label instructions are state and federal law and must be adhered to.
- 7.6 The Contractor shall apply a systemic herbicide at all areas within limits of work infected with weed and/or grass growth. No sand or sod shall be laid until entire area is weed free.
- 7.7 The Contractor shall add controlled release fertilizer on top of the sod one week after planting.

8. TREE PRESERVATION PLAN

8.1 PURPOSE.

The intent of this article is to protect, preserve, restore and manage tree canopy at (FIU) Florida International University. All campus trees shall be protected, regulated and cared for according to the (ANSI A-300 Standards) American National Standards Institute's A-300 Tree Care Manual and the ISA (BMP) Best Management Practices. The goal of a tree preservation plan is to have trees remain assets to the campus site for the natural maturation of each genus and species. In addition, established tree canopy and new tree plantings are intended to create a healthful environment for the FIU students and faculty and to moderate the harmful effects of sun and wind, temperature changes, buffer noise, filter pollutants and assist in the generation of oxygen. Trees also are established throughout the campus in order to stabilize the soil, reduce soil erosion from storm water runoff and provide a natural habitat for birds and other wildlife as well as to create an atmosphere conducive to academic study. This tree preservation plan is also to assure that the design and construction of all development activity on the FIU campus is executed in a manner consistent with the preservation of existing trees and to maximize FIU's tree canopy to the greatest extent possible thus, further enhancing property values and energy conservation. A Certified Arborist should perform or at least oversee all campus tree care work in order to ensure this tree preservation plan is enforced and that proper pruning practices are employed. Healthy, vigorous and well-formed trees with good quality branch structure are the most suitable specimens for preservation. Ultimately 100 % of the trees on the FIU campus should be Florida Grade #1 or better (see Florida Grades and Standards for Nursery Plants, latest edition). This is accomplished through a multiple disciplinary commitment to a dedicated tree preservation program.

8.2 DISASTER RESPONSE PLAN.

8.2.1 Arborist Overview:

Florida International University shall obtain the services of a Certified Arborist to manage the campus trees. This can be performed internally, externally or both. Both young and old trees should be pruned in such a manner to allow for wind to pass freely through the canopy of the tree without snapping branches or uplifting the tree's root system out of the ground during a wind event. Likewise, larger tree canopy should have regular crown pruning or crown reduction cuts made as needed to limit the "sail affect" of high canopy branches. Trees with poor health or structural defects should be mitigated wherever possible by removing them from the campus grounds and new trees planted. Trees with their root systems completely exposed following a wind event are not considered viable trees to preserve (see exceptions below). Tree canopy should not be reduced when standing and bracing trees, except for removing broken branches. It is likely that after standing a tree with the remaining canopy, the new roots that develop

will never be structurally strong enough to hold the existing or future canopy during another wind event (see exceptions).

The exceptions to the above assumption are: trees that are of a fast growing species that could allow for the re-establishment of roots very quickly; (E.g. Ficus species), trees that are high value assets, either by botanical rarity, of particular importance or locations and deemed worthy of the expense. These trees shall be immediately stood upright, replanted, braced, and have any broken branches removed. Immediate removal of tree hangers (branches) is imperative to minimize safety hazards and to allow the university to reestablish pedestrian and vehicular movement throughout the campus. The school must be able to reopen as quickly as possible so students can return to dormitories and classes rapidly to continue their academic studies in a timely fashion. Trees that are only moderately damaged after a wind event and are not structurally damaged can be saved and shall have restorative pruning completed over several years after re-establishment. No one knows how long it will be between high wind events and therefore time and resources must be utilized wisely on trees designated for preservation.

8.2.2 Pre-hurricane Hazard Assessment:

Hurricane events present substantial challenges. A pre hurricane tree hazard assessment should be performed by the Certified Arborist in advance of hurricane season and just prior to each individual storm. Problems that may be identified in the report should be addressed in a manner warranted by the degree of risk severity and mitigated as quickly as possible after approval by FIU. Although trees can cause considerable damage when they fall, in truth, most trees do not fall during storms and of those that do, only a small number strike a target or do damage.

8.2.3 Hanger Identification, Documentation and Removal:

Post hurricane procedures are many. However, one prevailing concern is any existing tree hangers (hanging limb). A tree hanger assessment should be performed as soon as passage through the streets is permissible. Areas with large dangerous hangers in trees should be taped off until remedial trimming is performed. Tree hangers can be identified by a tree inventory number, address or particular location so subsequently dispatched crews can perform hanger removal work easily using the tree hanger assessment. Tree hangers can be large or small and should be properly and promptly removed under a Certified Arborist direction in a manner that would allow the tree to properly seal the wound. Typically trees that only sustain hanger damage can be completely restored to Florida #1 quality over time. For safety reasons, immediate removal of tree hangers is imperative to minimize any potential hazards and more importantly, to allow the university to reestablish pedestrian and vehicular movement throughout campus. The school must be able to reopen as rapidly as possible so students can return to dormitories and classes to continue their academic studies.

8.2.4 Tree Trimming Safety:

Some key safety points regarding tree trimming are as follows: do not trim trees in dangerous weather conditions, minimize exposure to hazards at and near the site after performing a hazard assessment; use cones or tape to identify a hazard area, use proper personal protective gear such as safety glasses and safety boots, gloves, hard hats, hearing protection, chainsaw chaps and all other manufacturer's recommended safety equipment. A Certified Arborist should determine if there is a hinge or lean problem evident and prepare a retreat path before starting any trimming work. Make sure to inspect the tree for strength and stability before climbing and ensure fall protection devices are employed during the climb, and never climb with tools in hand. The climber should determine if tree limbs are underweight pressure or severed free fall pressure. Small cuts should be used to release the pressure slowly, while making sure to stay alert of your surroundings. Use verbal communication during the work to keep all parties aware of progress.

8.2.5 Trees and Power Lines:

Trees near or entangled in power lines are to be trimmed only by specially qualified personnel who are approved in this type of hazardous work. Downed power lines can be extremely problematic when trees are involved. It is absolutely imperative that trees or branches that have fallen onto power lines must not be touched by any FIU staff, contractor or any other entity. Remember that circuits do not always turn off when a power line falls onto a tree or on the ground! Even if the power lines are not sparking or humming, fallen power lines can kill if you touch them or come in contact with the ground nearby. Take every measure of precaution to steer yourself away from downed power lines and any trees in contact with power lines. Only (FPL) Florida Power & Light tree trimming contractors are qualified to perform tree trimming work around power lines. Tree limbs can readily conduct electricity and therefore are extremely hazardous when they are in contact with power lines. In all cases, trees on the FIU campus that are near or become entangled in power lines must be reported to the Florida Power & Light's Hotline at 1-(800) OUTAGE (688243) and to FIU. FPL has tree trimming crews that are specially trained to work on trees in or near power lines. Once the trees have been cleared of the danger posed by any power lines, the trees may then be trimmed by a Certified Arborist in order to structurally repair or remove them if needed.

8.2.6 Restorative Pruning:

All restorative pruning shall be conducted by a Certified Arborist and follow the ISA's Best Management Practices using the latest version of ANSI A-300 (part 1) Pruning Standards Techniques. These specialized pruning techniques for lightning strikes, broken branches, slipped or torn bark, co-dominate leaders, included bark, crossed branches, aspect ratio, dead wooding, etcetera, is the goal of any restorative pruning and shall be performed

under the direction of a Certified Arborist. Restorative pruning is almost always required after a wind event. There can be as many as 4 or 5 pruning phases during the course of a tree's restoration. The interval between trimming phases can vary, but it should not exceed one-year between each visit. A tree initially should have restorative pruning done with the entire tree's overall shape in mind. The initial cuts may be large or they may be small depending on the circumstances and the outcome desired. Subordination of damaged branches may be employed in some instances or removal cuts in other instances. These decisions can only be made on a tree by tree basis and must be done by a Certified Arborist. Heading cuts are typically reserved for nursery plants with branches less than one inch. Although this practice of heading cuts is used on mature trees, primarily in northern climates, it is not a recommended method for reducing damaged branches back to good wood, especially in south Florida. Cutting back damaged branches to branch laterals is the best method for restorative as well as routine and remedial pruning in order to generate new canopy.

8.2.7 Sprouts:

Sprouts often appear on and around damaged branch sites. They can also generate from the base of a tree. Generally speaking, all sprouts around the base of a tree (basal sprouts) should be removed as they will redirect the flow of nutrients away from the main trunk to support their own rapid growth. Upper canopy sprouts (water sprouts) must be evaluated and determined as to whether they are weakly attached or not. Sprouts that are weakly attached should be removed for safety purposes so they do not become potentially dangerous flying projectiles as they get larger and heavier over time, especially in a wind event. Some sprouts emerge as suitable branch replacements and should be nurtured in such fashion while other weaker sprouts should be removed around the branch collar site to minimize competition for nutrients and other elements required for good growth. Some sprouts along the upper branches can remain and then be removed sequentially over time. This will allow them to contribute to important nutrient production and branch strength and taper. These types of sprouts on occasion have been helpful as branch replacement points when upper branches have been severely damaged or broken off at unusually low points.

8.2.8 Tree Removal Guide:

A tree removal can be a subjective judgment. When it is not clear whether a tree needs to be removed, this section should be used as a guide for when to remove a tree. The goal of the FIU campus is to have every tree ultimately be at least a Florida Grade #1 tree. In order for a tree to have a Florida #1 grading, it must have proper structural branching, proper trunk formation and a well-established root system. Thus, the following suggestions shall be a guide to determining when to remove a tree. If 30% or more of a tree's structural branching has been damaged due to any event, 30% (or more) of the canopy section will also potentially be damaged as well and remedial pruning will unlikely re-establish the tree back to a Florida Grade #1 tree. Likewise, if the tree is uprooted due

to any event and the lean is greater than a 60 degree angle that would also be contributing criterion to justify removal of a tree (exceptions previously mentioned). Using a total grading percentage of 100% to determine a trees grading standard, any structural damage equaling or exceeding an overall downgrade of 30% (canopy damage) and/or an applied 30% downgrade for uprooting of a tree is beyond a 60 degree angle of lean (ie.. significant roots exposed); then these two factors combined would equal more than a 60% downgrading from the combined damage. If we assert that the majority of trees with a 50% or higher downgrading should be removed, as per our example, this would constitute a realistic guide for tree removal [subject to species exceptions and other reasons cited earlier]. FIU or its Certified Arborist may have an opposing and compelling argument to preserve the tree regardless of a trees grading. FIU has many trees that fall below the standard of Florida #1. Those particular trees are pruned in such a manner as to keep them at a safe overall height, aspect ratio and free from any potential target hazards. Ultimately, a justified removal is going to be from a Certified Arborist's or it will be just a clear cut decision by management based on the above criteria.

8.2.9 Tree Replacement Plan:

A record of existing trees on campus that are known to have deficiencies and thus recommended for replacement should be compiled into an inventory and rated from highest to lowest priority. Trees that were removed due to damage should also be on a replacement list. A subsequent tree replacement plan should be instituted as quickly as possible in order remove and replace identified trees. This can be performed over time as budget permits. The goal of a tree replacement plan is to achieve a 100 % viable campus tree forest to further its eligibility for Tree Campus USA in the succeeding years.

8.2.10 Tree Bracing:

A Certified Arborist must assess each tree that has fallen after a wind event to determine its value. Should no more than 30% structural damage to the canopy occur, and there is very little root damage evident, the tree should be stood up and braced as soon as possible. Bracing and guying a fallen tree requires strategic planning different from the standards for a newly planted tree. Bracing and guying must be determined by the needs of how the tree can become fully vertical using braces, poles, guy wire and anchors as needed. A crane is often needed and should be contracted immediately upon the decision to stand a tree that warrants this type of equipment

8.2.11 Cost Comparisons:

It is essential to note that the cost associated with erecting, bracing, guying, trimming, watering and the additional ensuing work to attempt to stand up every tree after a wind event is often offset by the implementation of a new tree planting program using Florida

#1 or better quality trees. A viable tree must be capable of sustaining its own life processes unaided by man over the duration of its life span.

8.2.12 Tree Inventory:

A tree inventory is an extremely useful tool to have in place to track trees that may be removed from the property after a wind event. These trees could eventually be replaced with the same species (or other) in the same location to serve the same purpose again. Wind disasters almost always take a serious toll on the existing tree inventory. A tree inventory after a storm would give credence to requests for new tree planting projects in the future to replace lost tree assets. At the same time a tree inventory would provide a road map as to where to begin a tree repopulation project. Also, grants from various sources are often offered after disasters and having sufficient information in the form of a tree inventory (updated) could prove to be priceless for this purpose.

8.3 TREE MANAGEMENT PLAN

8.3.1 International Society of Arboriculture (ISA) Best Management Practice:

Established procedures to minimize storm-related damage have been developed. The ISA has a series of (BMP) Best Management Practices for the purpose of interpreting tree care standards and providing guidelines of practice for arborists, tree workers, and the people who employ their services. These procedures, some of which are used in these specifications, shall be implemented wherever possible when managing trees. It is of utmost importance that "Safety" be the number one concern when working with trees on the FIU campus.

8.3.2 Insect and Disease Control:

Monitor all trees for disease and insect infestations. Provide all pre and post preventative disease and insect control required to keep the trees in a healthy state using the principles of (IPM) Integrated Plant Management. The Arborist shall make appropriate pesticides recommendations and they shall be applied by a certified pesticide applicator using proper label rates and providing proper documentation.

8.3.3 Risk Management Assessment:

There shall be a semi-annual tree risk assessment completed by a contracted Certified Arborist and submitted to FIU and any other entity contracted and responsible for tree care at FIU. This Arborist's report shall be completed using the ISA "Hazard Tree Evaluation" form for all at risk trees on campus. Those trees deemed as safety hazards shall be immediately addressed under the care of a Certified Arborist and either be removed, properly pruned, braced or treated. Trees not requiring a "Hazard" form, but

are found to be deficient in any manner (E.g. insects, bacteria, fungus, nutrition, girdling roots, etc.) are to be identified and noted with the appropriate action necessary for correction and turned into FIU and any other entity that is contracted for tree care at the university. A follow up report with documented treatments shall also be submitted upon final determination that the tree has fully recovered. The contracted Certified Arborist and contracted entity responsible for tree care at FIU will assume responsibility for Duty to Inspect, Duty and Due Diligence for risk assessment and Duty of Care for all trees and palms that fall within all of FIU's properties.

8.3.4 Responsibility of the Contracted Arborist:

A secondary semi-annual report shall be submitted to both FIU and any contracted entity responsible for tree care at FIU. The report shall address the status of all campus trees and palms, and make recommendations for best management practices (BMP's). A scheduled review, discussion and tour shall take place with the contracted Certified Arborist, a representative from FIU and any contracted entity responsible for tree care at FIU. The contracted Certified Arborist and contracted entity responsible for tree care at FIU will assume responsibility for Duty to Inspect, Duty and Due Diligence for Risk Assessment and Duty of Care for all trees and palms that fall within all of FIU's properties.

8.3.5 Standards for Trimming for Vehicular and Pedestrian Clearances:

All the ANSI A-300 Tree Care Manual Standards are to be strictly adhered to with no deviations permitted. The campus requirements for pedestrian clearance are (10) ten feet over sidewalks and (14) fourteen feet over roadways for vehicular traffic. No more than 25% of the canopy per tree may be removed during any one trimming cycle within one year.

8.3.6 Tree Trimming Safety Awareness:

Safety is a key element of all management plans. It is important to perform a hazard assessment first before beginning any work and not trim trees in dangerous weather conditions. Also minimize exposure to hazards at and near a trim site. Always use proper personal protective gear such as gloves, safety glasses, safety boots, hard hats, hearing protection and all other manufacturer's recommended safety equipment. Look for and determine if there is a hinge or lean problem with any tree and prepare a safety retreat path before starting the trimming work. Inspect the tree for strength and stability before climbing and make sure fall protection devices are employed during the climb. Do not climb with tools in hand. Determine if the tree or tree limbs are under pressure and if so, make sure small cuts are used to release the pressure slowly and stay alert of your surroundings. Use verbal communication during the work to keep all parties aware of progress.

8.3.7 Tree Preservation by Bracing, Guying and Cabling:

Bracing, Guying and Cabling of trees shall follow the ISA Best Management Practices - Tree Support Systems latest addition. When the contracted Certified Arborist designates a tree needs to be braced, guyed or cabled, the Certified Arborist shall submit a report stating such a need in writing to a representative of FIU and the contracted entity responsible for tree care at FIU. The contracted Certified Arborist shall ensure proper installation and maintenance of cables, braces, guys and props that can effectively limit the movement of branches, leaders, or entire trees. Once tree support systems have been installed, the contracted Certified Arborist and contracted entity responsible for tree care at FIU shall continue to accept responsibility for managing those support systems and subsequent semi-annual inspections shall be included in the semi-annual Risk Assessment report. All available equipment, tools and manpower shall be employed as quickly as possible to begin the process. Contact a crane company immediately if one is needed. All ANSI Standards shall still apply whenever possible in the pursuit to save a specimen tree.

8.3.8 Remedial Pruning:

Supervised tree maintenance shall be conducted by a contracted Certified Arborist and follow the ISA's Best Management Practices using the latest version of ANSI A-300 (part 1) Pruning Standards techniques. These specialized pruning techniques for co-dominate leaders, included bark, crossed branches, aspect ratio, dead wood cutting, etc. is the goal of any remedial pruning and shall be performed under the direction of the Certified Arborist. Remedial pruning is almost always required after a wind event, even if it is just to remove hangers from a tree; it must be done properly. The thrust of remedial pruning however, is focused on the rehabilitation of damaged trees. There can be as many as 4 or 5 remedial pruning cycles during the course of a tree's rehabilitation. The intervals between trimmings can vary, but it should not exceed one-year between each trim cycle. A tree initially should have remedial pruning done with the entire tree's outcome (shape) in mind. The initial cuts may be great or small depending on the outcome desired. Subordination of branches may be employed in some instances as well as removal cuts in other instances. These decisions can only be made on a tree by tree basis and must be done by the contracted Certified Arborist. Heading cuts are typically reserved for nursery plants with branches less than one inch. The practice of heading cuts in mature trees, especially in south Florida, is not a good method for reducing damaged branches back to good wood. Cutting back damaged branch to a good branch lateral is the best method for remedial and remedial pruning.

8.3.9 Lightning Protection for Specimen Trees:

Lightning protection is a costly procedure and should be performed by an experienced lightning protection expert with many years of experience and following ANSI A-300 (part 4) Lightning Standards. Some trees on the campus may warrant this treatment. These trees should be identified by the contracted Certified Arborist and a cost take-off

performed. Lightning protection shall be monitored on a semi-annual basis by the contracted Certified Arborist and modification made to the system as frequently as necessary as the tree matures. If lightning protect has been installed, it is to be documented and included in the semi-annual report submitted by the contracted Certified Arborist.

8.3.10 Tree Inventory:

A tree inventory is a very useful tool to track trees that may be removed from the property after a wind event and could eventually be replaced through various tree planting programs. FIU has a large and valuable population of maintained trees that grace its streets and walkways. A tree inventory would give credence to requests for tree planting projects in the future to replace tree assets. At the same time a tree inventory would provide a road map as to where to begin a tree planting project. It may also be a good tool in continuing to maintain the Tree Campus USA status. Ultimately a tree master plan should be created along with a tree inventory. All dedicated trees should have a plaque, all rare species and desired focal points identified along with all other important criteria relating to the university's trees. A tree master plan and tree inventory can provide the same kind of diversity in trees that the university itself represents in its international student population. In a tree inventory all future tree plantings and their subsequent care can be documented for future use in grant writing or other proposed projects as well. A tree inventory can also be used to identify the capital asset that the trees have on the campus property when a value is assigned to each tree. Trees on a large university property can equate to millions of dollars in assets.

8.4 CONSTRUCTION AND LANDSCAPE STANDARDS

8.4.1 Tree Protection:

All trees on the FIU campus are deemed protected unless otherwise stated in appropriate documents. All trees to be protected, relocated or removed are to be identified by the contractor on a tree survey plan including all appropriate landscaping details showing each individual tree's disposition as it relates to the construction and must be submitted for approval to the FIU Grounds Superintendent and the FIU Project Manager prior to any developmental activities. The American National Standard Institute (ANSI) A-300 (part 5) Construction Management Standards and the ISA Best Management Practices shall be used as a reference for all construction management concerns for tree care on the FIU campus. The ANSI standards represent the tree industry's criteria for performing tree care operations and shall be strictly adhered to by all contractors.

8.4.2 Pre-Construction:

A meeting shall be arranged with the FIU Grounds Superintendent, the contracted landscape Architect and the FIU Project Manager during the pre-construction phase to review with the construction company or other hired contractor any questions either party may have regarding but not limited to, the work to be performed, the administrative procedures during construction, and the project work schedule. The general contractor is required, including all subs, to follow all the ISA and ANSI Standards as well as the ISA Best Management Practices during all phases of the construction period. The following is a requisite list of personnel that shall attend the preconstruction conference; General Contractor, Consulting Arborist, Landscape Architect, FIU Project Manager and the Subcontractor assigned to install tree protection measures as well as the Earthwork Contractor, all site Utility Contractors that may be required to dig or trench into the soil, Landscape Subcontractor, the Irrigation Subcontractor, etc. Prior to the meeting, trees should be marked as to which shall remain in place, which trees shall be relocated, which trees shall require necessary pruning or removal. The trees shall be given the appropriate colored tape corresponding to a matching color on the plans for review and approval by the FIU Grounds Superintendent and the FIU Project Manager. The colored tapes should be changed as trees are resituated around the site. Likewise, construction plans should be updated to correspond with these changes.

8.4.3 Tree Protection Area:

The (TPA) Tree Protection Area is defined as all areas indicated on the tree protection plan. Where there is no limit or tree protection area defined on the drawings, the limit shall be the (CRZ) Critical Root Zone. The Critical Root Zone protection area is defined as the area having significant impact of a tree's survival and being equal to (1) one foot radius for every (1") inch of (DBH) diameter breast height of any tree. This protective area should naturally correspond to the tree canopy's dripline or the outer edge of the branches of each tree although tree's root system ranges well beyond the dripline. Setting up a TPA at the dripline may not be feasible in all applications during construction activities and any proposed adjustments to the tree protection area should be discussed with FIU contracted Certified Arborist and any contracted entity responsible for tree care at FIU, the FIU Grounds Superintendent and the FIU Project Manager prior to any divergent activities.

8.4.4 Tree Barriers:

Trees shall be protected during all construction activities. A protective barrier shall be erected outside the Critical Root Zone area or a minimum of ten feet radius around from the tree trunk, when approved by the FIU Arborist, Grounds Superintendent and/or Project Manager. The TPA must be clearly identified by chain-link fencing or orange fencing, or other appropriate devices deemed acceptable; such as the use of 2'x4' boards. The barriers must be set securely in place and at a minimum of 5 feet in height. Barriers shall remain in place around the established Critical Root Zone, (see Tree

Protection Area above), until all construction activities have ceased. A bond for specimen trees may be required and held until such time that the tree shows signs of active growth as determined by the Certified Arborist and the FIU Grounds Superintendent; then the removal of the protective barrier can be approved.

8.4.5 Trunk Protection:

If work becomes necessary inside the tree protection area, trunk protection shall be required on each tree by wrapping the trunk with three overlaps of burlap, covering it with a ring of 8 foot long by 2 inch x 4 or 6 inch planks loosely banded onto the tree with 3 steel bands at the top, middle and bottom of the trunk. Staple the bands to the planks as necessary to hold them securely in place with industrial staples. Trunk protection may be kept in place no longer than 12 months. If construction requires work near a particular tree to continue longer than 12 months, the steel bands shall be inspected every six months and loosened and re-banded if they are found to have become tight.

8.4.6 Material Storage:

The Contractor shall not engage in any construction activity within the Tree Protection Area without the approval of FIU's contracted certified Arborist, the FIU Grounds Superintendent, and the FIU Project Manager. Construction activity includes: operating, moving or storing equipment; storing supplies or materials, locating temporary facilities; including trailers or portable toilets, and shall not permit employees to traverse the protection area to access adjacent areas of the project, or use the area for lunch or any other work breaks. Permitted activities, if any, within the Tree Protection Area shall be indicated on all drawings along with any required remedial activity as listed by the Arborist to protect the tree and have prior approval of the FIU Arborist, the Grounds Superintendent and Project Manager.

8.4.7 Watering:

Trees within the Tree Protection Area shall have a temporary irrigation system set up to prevent desiccation of the root system and of the canopy (if required) during construction activities. Other methods of watering are acceptable but shall be approved by the FIU Arborist and FIU Grounds Superintendent prior to use. (E.g. Gator bags, irrigation bubblers, etc.)

The Contractor shall be fully responsible to ensure that adequate water is provided to all trees in order that they shall be preserved during the entire construction period.

Adequate water is defined as maintaining soil moisture above the permanent wilt point (or constant available water) to a depth of 6 inches or greater.

The above watering requirements shall apply to preserved trees, newly planted trees as well as relocated trees. Sufficient water as approved shall continue until such time as to allow for verification of active growth. The FIU Arborist shall determine when the temporary watering can is reduced or removed.

8.4.8 Construction Activity:

In the event that construction activity is unavoidable within the Tree Protection Area, all contractors must notify the FIU Arborist, Grounds Superintendent and FIU Project Manager and shall submit a detailed written plan of action for approval. The plan shall include: a statement detailing the reason for the activity including a description of the proposed activity; why other areas are not suited; the time period for the activity, and a list of remedial actions that will reduce the impact on the Tree Protection Area from the activity.

Remedial actions that will reduce the impact on the Tree Protection Area from the activity shall include, but not be limited to the following:

- In general, demolition and excavation within the drip line of trees and shrubs shall proceed with extreme care either by the use of hand tools, directional boring or Air Knife excavation where indicated or with other low impact equipment that will not cause damage to the tree, roots or soil.
- Exposed roots, when encountered, (1) one inch and larger in diameter shall be worked around in a manner that does not break the outer layer of the root surface (bark). These roots shall be covered with (4) four inches minimum of wood chips and shall be maintained (watered) above permanent wilt point at all times. Essentially the ground should stay moist at all times. Roots one inch and larger in diameter shall not be cut without approval. Excavation shall be tunneled under these roots without cutting them wherever possible. In the areas where roots are encountered, work shall be performed and scheduled to close excavation holes over exposed roots and watered immediately.
- Tree branches that interfere with the construction may be tied back or pruned by a Certified Arborist to clear only to the point necessary to complete the work after approval by the FIU Arborist. Other branches shall only be removed when specifically designated by the FIU Arborist and the FIU Grounds Superintendent. Tying back or trimming of all branches shall be in accordance with accepted arboricultural practices (ANSI A-300), Pruning Standards and the cutting of roots (ANSI A-300-part 8) Root Management and must be performed under the supervision of the FIU Arborist after approval.

8.4.9 Tree Installation:

Trees and plants scheduled to be used at FIU shall conform to the Florida Grades and Standards for Nursery Plants (latest edition). All ball & burlap trees must be root pruned at least 6 weeks prior to moving them and then hardened off before delivery. Trees must be covered during delivery and must not be allowed to sit on the transporting vehicle or on the ground, prior to planting, for more than 48 hours. All container material must have the roots shaved when circling roots are present. All trees must be a minimum of Florida #1 quality with a Florida Fancy trunk or an overall rating of Florida Fancy. Trees shall be installed (1) one inch above grade to allow for settling. Mulch may be placed up to 3" - 4" (inches) away from the tree trunk and shall be approximately 3" (inches) thick

around the tree's root ball bordered by sod or any permanent surface or border. All newly planted trees shall have a one-year guarantee of survival. The contracted Landscape Architect shall include, but not be limited to, soil specifications for all plantings, planting methods, bracing, guying, watering methods and time tables etc. The construction contractor or its landscape sub-contractor shall be fully responsible to ensure that adequate water is provided to all trees in order that they shall be preserved during the entire construction period. Adequate water is defined as maintaining soil moisture above the permanent wilt point (or constant available water) to a depth of 6 inches or greater.

The above watering requirements shall apply to preserved trees, newly planted trees as well as relocated trees. Sufficient water as approved shall continue until such time as to allow for verification of active growth. The FIU Arborist shall determine when the temporary watering can is reduced or removed.

8.4.10 Tree Inspections:

All trees brought to any FIU site shall be a minimum of Florida #1 quality with a Florida Fancy trunk or better and conform to the Florida Grades and Standards for Nursery Plants. All trees should be inspected at the time of delivery and a second inspection at the first tree planting. All subsequent trees planted shall follow the same planting techniques as the first approved tree planting. Bracing of trees shall be implemented if required by the landscape architect. A third inspection shall be performed as a final acceptance once all trees are planted and the FIU Project manager has called for final inspection. The final inspection shall be performed with the FIU Project Manager, FIU Arborist, FIU Grounds Superintendent and the contracted Landscape Architect present. All trees rejected shall be removed from the site within 48 hours of rejection. All replacement trees brought to the site shall conform to the specified Florida Grades and Standards for Nursery Plants (latest edition), have the same aforementioned inspection approvals from the FIU Arborist and follow the same planting instructions.

8.5 TREE RELOCATION PLAN

8.5.1 Certified Arborist Report:

A Certified Arborist must provide a tree evaluation report on every tree proposed for relocation on a tree disposition plan. The tree disposition plan shall be used by the FIU Arborist, Grounds Superintendent and the FIU Project Manager to determine whether the proposed tree(s) and its proposed location is a viable option, and that its location is appropriate for the campus and for that tree species.

The arborist tree disposition report shall include, but not limited to the following to ensure the best possible chance of the relocated tree's survival:

- A description of each tree to be relocated indicating its genus and species, condition including any visible damage to the root system, trunk, canopy or soil within the critical root zone, tree (DBH) diameter at breast height, approximate height and canopy spread, any visible disease, insect infestation, nutritional deficiencies and any branch or trunk defects.
- The report shall note all trees or parts of trees, which are considered to be a hazard, the determination for such significance and risk level. Include the (ISA) International Society of Arboriculture tree hazard evaluation sheet for each tree with proposed risk. The risk level may determine whether the tree should be mitigated instead of relocated.
- Recommendations as to the treatment of all insect, disease and structural problems encountered prior to relocation through establishment.
- Recommendations for fertilizer treatments and application method, if any.

8.5.2 Tree Survey:

A tree survey shall have the normal required information (E.g. Genus, species, DBH, height, condition, deficiencies, etc.) showing existing tree locations, all proposed new location and all proposed relocations. Design criteria must take in consideration the preservation of existing trees first and all measures for this purpose must be exhausted before tree relocation shall be proposed or be approved. Other considerations are if the tree is rare or deemed a high value asset either by botanical rarity or particular location of importance.

8.5.3 Tree Bond:

A bond may be required for specimen trees, rare trees or particular trees of importance that require barriers or trees that are proposed for relocation and due to their high valuation to the campus. The bond amount shall be sufficient to adequately mitigate the cost of replacement of any tree valuation. The bond may be in effect for up to one year at the digression of the FIU Grounds Superintendent and the FIU Project Manager if signs of new growth are not recognized by the Arborist prior to such time.

8.5.4 Root Pruning:

Assuming a tree proposed for relocation is healthy, root pruning shall take place a minimum of 6 weeks prior to the scheduled relocation. The distance away from the trunk to begin trenching is (3) three times the trunk diameter. The trench is to be a minimum of (4) four inches wide but not greater than (12) twelve inches wide. The trench is to be backfilled with 90 % native soil from the trenching site and up to 10 % of amended soil mixed homogeneously. The trench shall be closed after underground work is complete and watered in immediately. (See watering section for additional details).

8.5.5 Tree Relocation & Installation Plan:

All trees proposed for relocation shall be shown on a sign and sealed landscape plan with all the architect's required landscape notes, schedules, rules, legends and other

directions used on a typical landscape plan. This shall include, but not be limited to, soil requirements, planting methods, bracing, guying, watering methods, etc. All relocated trees shall have a one-year guarantee of survival.

All tree relocations shall follow the directions in the root pruning section. All relocated trees shall be planted (1) one inch above the height of the existing soil. This will account for the inherent settling that occurs to trees recently planted and during watering procedures. If used, mulch shall not be placed within (3'-4') inches from the tree trunk and shall be approximately (3) three inches thick over the tree's root ball bordered by sod or other permanent surface material. The construction contractor or its landscape sub-contractor shall be fully responsible to ensure that adequate water is provided to all trees in order that they shall be preserved during the entire construction period.

Adequate water is defined as maintaining soil moisture above the permanent wilt point (or constant available water) to a depth of 6 inches or greater.

The above watering requirements shall apply to preserved trees, newly planted trees as well as relocated trees. Sufficient water as approved shall continue until such time as to allow for verification of active growth. The FIU Arborist shall determine when the temporary watering can is reduced or removed.

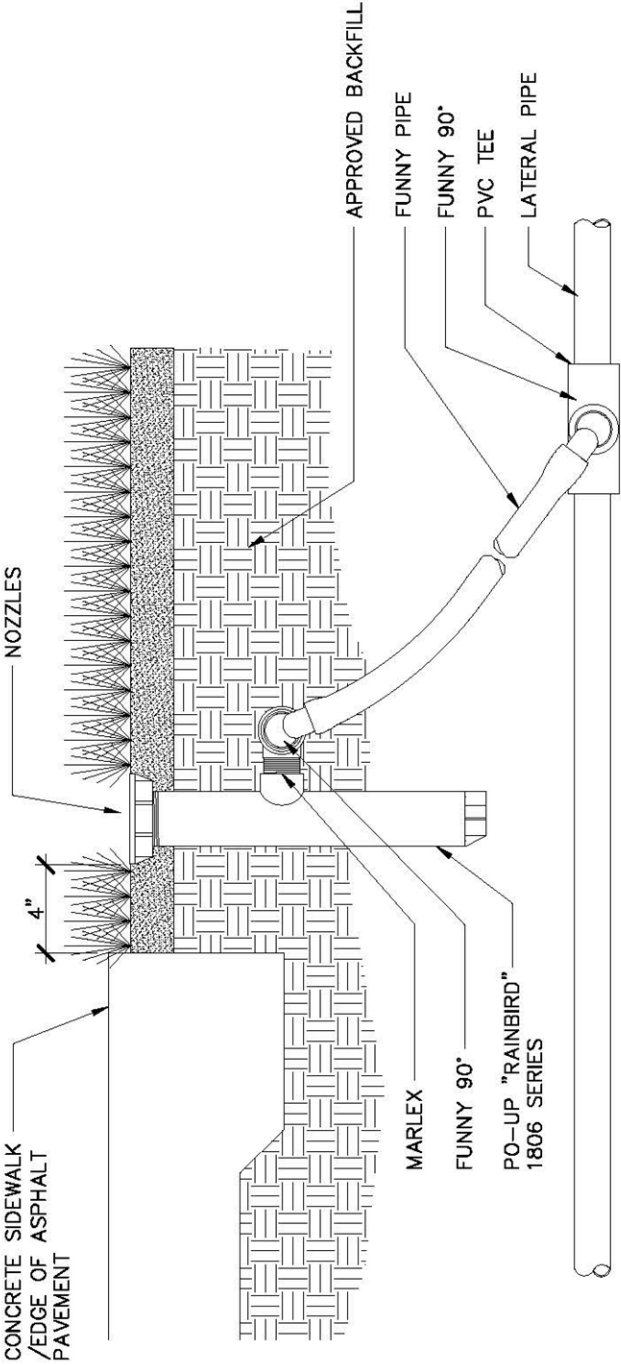
8.5.6 Mitigation:

Emphasis on preserving existing trees is top priority to the FIU campus. As a last resort, mitigation shall be an option and shall be in accordance with the Miami-Dade County "Planting Mitigation Guidelines" to calculate tree replacement values. The canopy square footage shall be calculated by the contractor's Arborist in a report using the formula $[3.14 \times r^2]$ to determine the square footage of canopy and then reviewed by the FIU Arborist for accuracy. Specimen trees (over 18 inches) in DBH are to be assigned double the canopy value regardless of species. The square footage is to be cross-referenced with the "Planting Mitigation Guidelines" from Miami-Dade County. All mitigated trees planted on site shall be Florida #1 quality with Florida Fancy and shall have a one-year guarantee of survival.

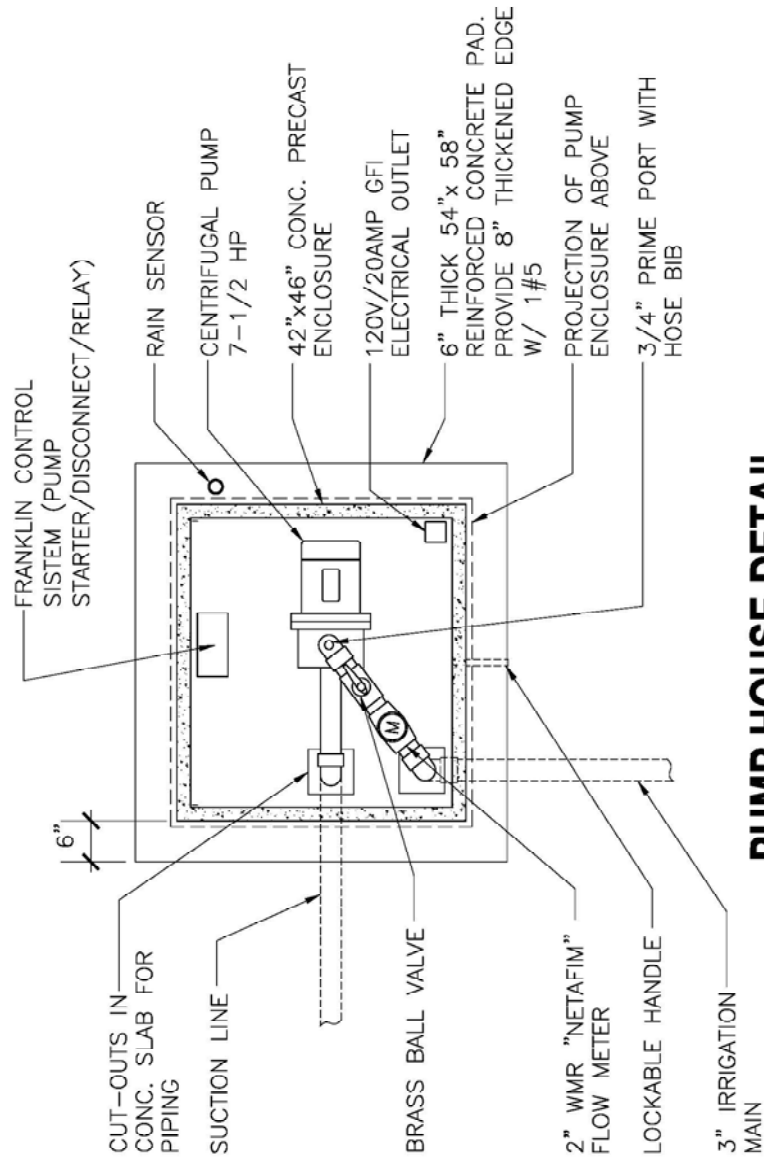
9. LANDSCAPE AND IRRIGATION MAINTENANCE

- 9.1 Proper landscape and irrigation maintenance will preserve and enhance a quality landscape and help to ensure water-efficiency.
- 9.2 In no case shall grass clippings, vegetative material, and/or vegetative debris either intentionally or accidentally, be washed, swept, or blown off into stormwater drains, ponds, or sidewalks or roadways.
- 9.3 Landscape maintenance for hire shall be performed in accordance with recommendations in the Florida-Friendly Best Management Practices for Protection of Water Resources by the Green Industries.
- 9.4 A regular irrigation maintenance schedule shall include but not be limited to checking, adjusting, and repairing irrigation equipment; and resetting the automatic controller according to the season. System shall be programmed to insure all planting is irrigated within the time limits defined in phase II water restrictions.
- 9.5 To maintain the original performance and design integrity of the irrigation system, repair of the equipment shall be done with the originally specified materials or their equivalents.
- 9.6 Mangrove trimming shall be performed in accordance with Sections 403.9321 - 403.9334, Florida Statutes. The Florida Waterfront Property Owners Guide published by the Florida Department of Environmental Protection shall be referred to for additional information about Florida-friendly shoreline practices.
- 9.7 When mowing near the shoreline, direct the chute away from the water body.
- 9.8 Any person that applies fertilizer for hire or in the course of their employment shall hold a current Certificate of Completion in the Florida-friendly Best Management Practices for Protection of Water Resources by the Green Industries.

10. STANDARD DETAILS.

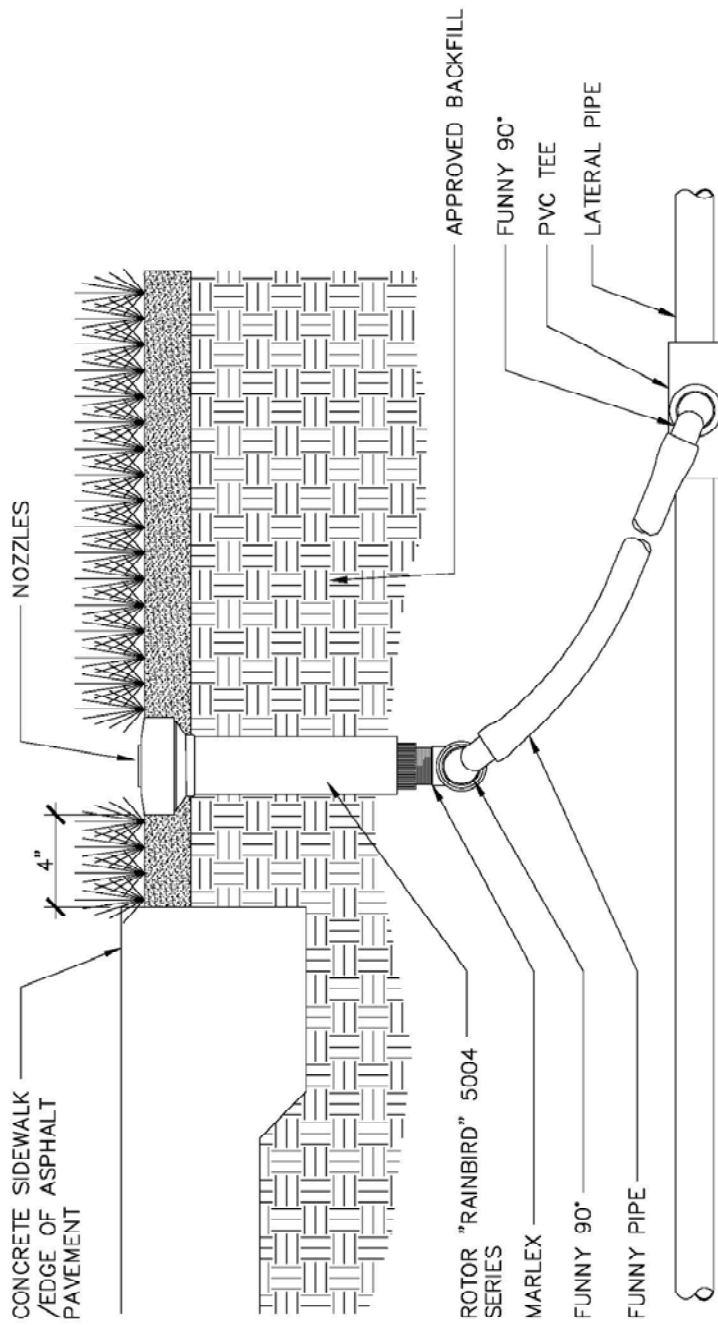


POP-UP SPRAY FLEXIBLE SWING JOINT DETAIL



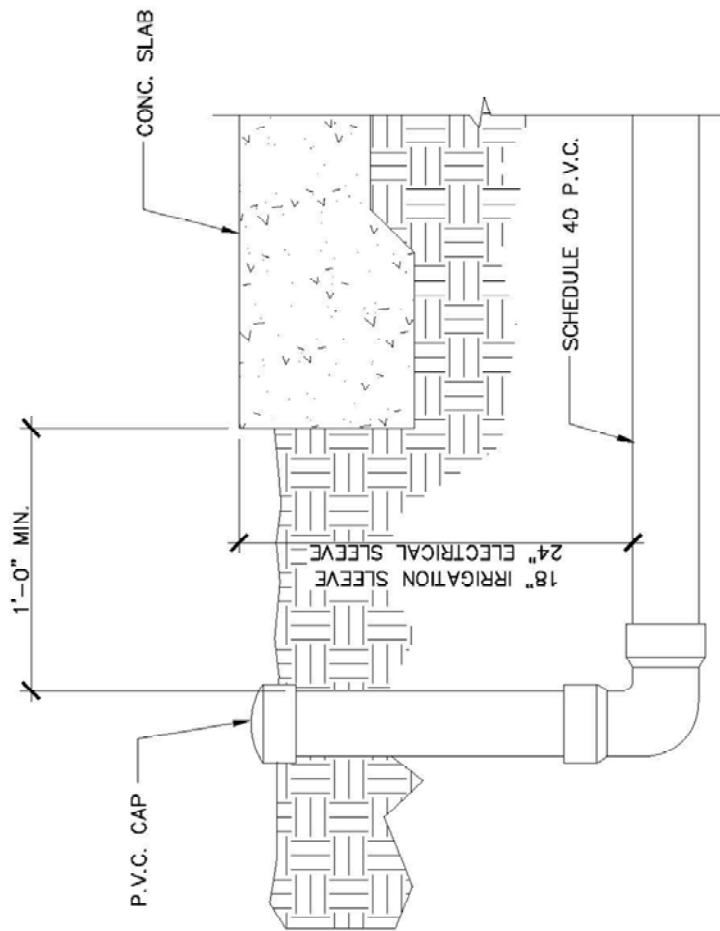
PUMP HOUSE DETAIL

5-3-17

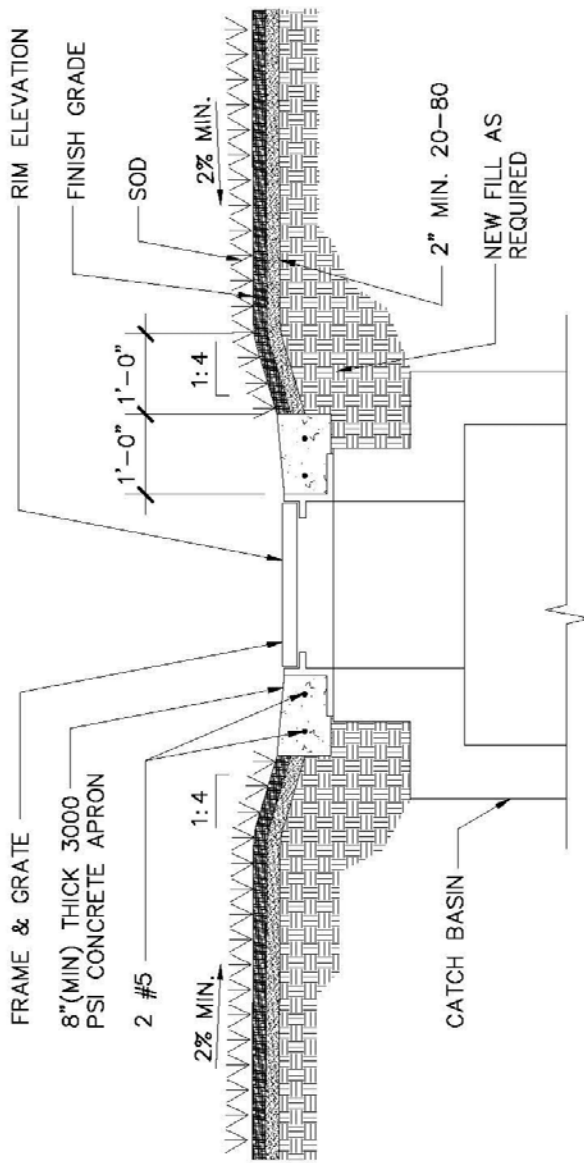


ROTOR FLEXIBLE SWING JOINT DETAIL

5-3-17



SLEEVE FOR FUTURE USE DETAIL



CATCH BASIN & FINISH GRADING DETAIL

11. SOURCES: THIS DOCUMENT WAS EXCERPTED AND EDITED FROM THE FOLLOWING DOCUMENTS:

University of Tennessee Institute of Agriculture, U.S. Department of Agriculture and county cooperating.
<https://extension.tennessee.edu/publications/Documents/SP659.pdf>

Landscape Irrigation & Florida-Friendly Design Standards
<http://www.dep.state.fl.us/water/waterpolicy/docs/LandscapeIrrigationFloridaFriendlyDesign.pdf>

City of Carlsbad Landscape Manual Policies and Requirements
<http://www.carlsbadca.gov/civicax/filebank/blobdload.aspx?BlobID=24086>

Standards for Landscape Irrigation in Florida - Committee on Landscape Irrigation and Florida-Friendly Design Standards (Section 373.228, F.S.) October 2006.

Alachua County – Landscape Irrigation Design and Maintenance Standards Ordinance 2015-11
<http://www.alachuacounty.us/Depts/epd/WaterResources/WaterConservation/Documents/EPDIrrigationBrochureForwebsite.pdf>

Landscape Irrigation Best Management Practices- Prepared by the Irrigation Association and American Society of Irrigation Consultants - May 2014.

City of Santa Fe Water Conservation Office - Landscape Irrigation Design Standards

City of Lancaster – Landscape and Irrigation Design Standards – Public Works Department – October 2008.

City of Santa Monica – Water-Efficient Landscape and Irrigation Standards – Revised 11/3/09
<https://www.smgov.net/uploadedFiles/Departments/OSE/Categories/Landscape/Green%20Building%20WEI%20Standards.pdf>

City of Menifee – Landscape Standards
<https://www.cityofmenifee.us/DocumentCenter/View/2247>

City of San Diego – General Planting and Irrigation Requirements
<https://www.sandiego.gov/sites/default/files/legacy/development-services/pdf/industry/waterordinance09.pdf>

City of Vallejo – Landscape / Irrigation Standards
<http://www.ci.vallejo.ca.us/common/pages/DisplayFile.aspx?itemId=31791>

City of Phoenix – Park and Recreation Department – Street Landscape Standards
<https://www.phoenix.gov/streetsite/Documents/streetman.pdf>

Florida International University – Landscape Design Manual – April, 1990.