32 00 00 - Exterior Improvements
Division of State Architect (DSA) reviews design conformance with CBSC Chapter 11 for accessibility requirements. There are differences between this code and the Americans with Disabilities Act (ADA).

The design professional is required to provide compliance to both the CBSC and the ADA. The University is accountable for compliance to both the ADA and the CBSC accessibility requirements. Drawings describing accessibility requirements provide the DSA reviewer with information that shows compliance to the provisions of CBSC Chapter 11B, as well as other related requirements applied to the project from federal and local agencies.

When required, at least one accessible route shall be provided from public transportation stops, accessible parking and accessible passenger loading zones, and public streets or sidewalks to the accessible building entrance they serve. When applicable, at least one accessible route shall connect accessible buildings, facilities, elements, and spaces that are on the same site. The accessible route shall coincide, to the maximum extent feasible, with the approved main campus circulation routes.

32 01 90 - Operation and Maintenance of Planting

Planting Guarantee:
During the Guarantee to Repair Period specified in the General Conditions the Contractor shall be liable for damages to all trees covered by the provisions of this Section. Compensation to the University shall be as outlined below.

Contractor will not be held responsible for damages due to vandalism or freak acts of nature during the guarantee period. Immediately report such conditions to the University's Representative.

Protection and Preservation Procedures
On any site survey map, all trees should be identified whose root systems are likely to be impacted by construction equipment, staging areas, proposed walks and roads, utility corridors, and any cut or fill activities. A tree protection zone (TPZ) shall be established to encompass the critical root zone (CRZ) and maintained for all trees to be preserved in a construction site. TPZ should be determined by the tree size, health, how the species responds to construction damage, and should be adjusted according to specific tree and site factors; calculated as 1.50’ x the diameter at breast height (DBH) of the tree in inches. For example, a healthy California black walnut with a 30” diameter. = 1.50’ X 30” = 45’ radius TPZ.
At no time should the TPZ be less than a radius of 6’. The TPZ must be clearly identified as an exclusion zone, where construction and equipment use is prohibited, and must be fenced before demolition to avoid damage.

A barrier shall be constructed for each tree or grouping of trees to protect the trunk and root systems. Chain link 6’ fencing shall be the approved barrier material. No root raking shall be allowed within any tree protection zone at any time during clearing, grading, or construction of a project. No equipment or vehicle shall be parked or construction material stored, or substances poured or disposed of or placed within any tree protection zone at any time during clearing or construction of a project.

Vigilance is required to protect trees on construction sites. Monitoring of tree health during and after construction on a regular, frequent basis shall apply to all trees intended for preservation. Monitoring shall be executed by a registered arborist or appointee and shall include watching for signs of tree stress, such as dieback, leaf loss, or general decline in tree health or appearance.

**Pruning Materials**
- Pruning materials shall be in accordance with current horticultural practices.
- Pruning sterilant shall be Physan 20 Fertilome Type A, or diluted bleach.

**Fencing**
Fencing Materials: 11-gauge galvanized 6' high chain-link fence with galvanized steel posts at 10’ o.c. minimum.

A continuous 6’ high temporary chain-link fence will be erected around trees with a caliper of 4” or larger at the dripline, in order to prevent soil compaction, limb damage, or the accidental introduction of toxic materials into the root zone. Fence can be erected around groups of adjacent trees where possible. Otherwise, fence to be erected around individual tree.

The fence will be removed only at the end of construction, as approved by the University's Representative.

**Plant Material Protection:**
Provide protection for all plant materials designated to be retained. Contractor is responsible for replacing damaged plant life with approved equivalent.
New and existing plant materials shall not be allowed to deteriorate and shall be maintained in a healthy and vigorous condition during the course of construction and maintenance period.

During the course of construction the Contractor shall take all necessary precautions, as outlined herein, to protect existing plant materials to be preserved from injury and death. Protection shall be given to the roots, trunk, and foliage.

The Contractor shall conduct operations continually to completion, unless weather conditions are prohibitive.

Provide ample water supply of potable quality and sufficient quantity for all operations required under this Section.

Trees subject to the provisions of this Section, which have been injured shall be repaired immediately by a certified Arborist. Repairs shall include removal of rough edges, sprung bark and severely injured branches as directed by the Arborist.

Necessary measures shall be taken to maintain healthy living conditions for existing plant materials to be preserved. Such measures shall include monthly washing of leaves for the removal of dust, regular irrigation, root feeding, etc.

Tree protection fencing shall be installed for the protection of existing trees to be preserved. No construction, demolition, or work of any nature will be allowed within the fenced area without prior written approval by the University's Representative.

- Approval by the University's Representative for work within the fenced area shall not release the Contractor from any of the provisions specified herein for the protection of existing trees to be preserved.
- During the course of construction of approved work within the fence area, no roots shall be cut without prior written approval by the University's Representative.

During construction, the existing site surface drainage patterns shall not be altered within the area of the drip line of existing plant materials.

Contractor shall not alter the existing water table within the area of the drip line of existing plant materials.
Do not permit the following within the drip line of any existing tree or shrub to be preserved:

- Storage or parking of automobiles or other vehicles.
- Stockpiling of building materials, refuse or excavated materials.
- Skinning or bruising of bark.
- Use of trees as support posts, power poles, or signposts; anchorage for ropes, guy wires, or power lines; or other similar functions.
- Dumping of poisonous materials on or around plant materials and roots. Such materials include but are not limited to paint, petroleum products, dirty water, or other deleterious materials.
- Cutting roots by utility trenching, foundation digging; placement of curbs and trenches, and other miscellaneous excavation without prior written approval by the University's Representative.
- Damage to the trunk, limbs, or foliage caused by maneuvering vehicles or stacking material or equipment to close to the plant.
- Compaction of the root area by movement of trucks or grading machines; storage of equipment, gravel, earth fill, or construction supplies; etc.
- Excessive water or heat from equipment, utility line construction, or burning of trash under or near shrubs or trees.
- Damage to root system from flooding, erosion, and excessive wetting and drying resulting from watering and other operations.

**Excavation around trees**

- Excavation within the drip lines of trees shall be done only where absolutely necessary, under the direction of a Certified Arborist and with prior approval from the University's Representative.
- Where trenching for utilities is required within drip lines, tunneling under and around roots shall be by hand digging. Main lateral roots and taproots shall not be cut. Smaller roots that interfere with installation of new work may be cut with prior approval from certified Arborist.
- Where excavation of new construction is required within drip line of trees, hand excavation shall be employed to minimize damage to root system. Roots shall be relocated in backfill areas wherever possible. If large, main lateral roots are encountered, they shall be exposed beyond excavation limits as required to bend, and relocate without breaking. If encountered immediately adjacent to location of new construction and relocation is not practical, roots shall be cut approximately 6 inches back from new construction under the direction of a certified Arborist.
- Exposed roots shall not be allowed to dry out before permanent backfill is placed. Temporary earth cover shall be provided, or roots shall be packed with wet peat moss or four layers of wet, untreated burlap and temporarily supported and protected from damage until permanently relocated and covered with backfill. The cover over the roots shall be wetted to the point of runoff daily.
- Branching structure shall be thinned in accordance with National Arborists Association "Pruning Standards and Principles" to balance loss of root system caused by damage or cutting of root system. Thinning shall not exceed 30 percent of existing branching structure.
**Tree Trimming**
A Certified Arborist, shall be engaged to direct removal of branches from trees if necessary to protect the health of the tree or if required to clear for construction.

In company with the University's Representative, University and a certified Arborist, ascertain the limbs and roots which are to be trimmed. Clearly mark them to designate the approved point of cutting.

Dead and damaged trees that are determined by the Certified Arborist to be incapable of restoration to normal growth pattern shall be removed.

Cut evenly, using proper tools and skilled workmen, to achieve neat severance with the least possible damage to the tree.

In the case of root cuts, apply wet burlap or other protection, approved as noted herein, to prevent drying out, and maintain in a wet condition as long as necessary for temporary protection.

**Landscape Maintenance**
Plant material will be maintained throughout the duration of the construction period in a healthful manner. Plant material identified which requires special pruning, insect control, fertilization or other remedial health action will be treated during this period. Methods and rates of pesticide and fertilizer application will be reviewed by the University's Representative prior to approval.

**Watering**
Plant materials will be watered on a regular basis, at a rate consistent with their particular requirements. Verification of the proposed watering schedule shall be reviewed by the University's Representative prior to commencement of the maintenance.

- The maintenance of the plant materials shall comply with standard horticultural practice for the correct watering, fertilizing, pruning and spraying of the specimen boxed trees.
- The maintenance and quality of the plant materials shall be subject to monthly checks. The dates of these checks shall be outlined in the University's Representative's field notification relating to the establishment of the plant maintenance period. Additional checks shall be scheduled as determined by the University's Representative.
- Contractor shall be responsible for performing periodic inspections of existing plant materials to be protected and relocated throughout the construction period, and submit written proposals to the University's Representative for additional maintenance work as may be required to ensure the
health and general well-being of the plant material. Contractor shall retain, at the direction of the University's Representative additional specialists as may be required to perform this work.

- Contractor shall keep plant material free from weeds and debris at all times.

**Tree Damage Compensation**

Damage to existing tree crowns or roots over 1" in diameter shall be immediately reported to the University's Representative.

A Certified Arborist shall direct all repairs to trees. Repairs shall be made promptly after damage occurs to prevent progressive deterioration of damaged trees. Repairs shall be at the Contractor's expense.

Development activities shall be planned to preserve and protect trees on Cal Poly's campus. Any tree that must be removed to accommodate development, or because of damage during storm events, disease, or water/sewer repairs must be shown on the site plan and a method of compensation shall apply as follows:

- For trees and shrubs with diameters up to 4 inches, compensation shall be the actual cost on replacement with an item similar in species, size and shape, including:
  - Actual cost of the item boxed out of ground
  - Transportation and delivery of boxed item to Project site.
  - Planting and staking
  - Maintenance, including watering, fertilizing, pruning, pest control and other care for a period of 90 days.
  - Values for removals of trunks up to:
    - Twelve inches - $7,200
    - Thirteen inches - $8,200
    - Fourteen inches - $9,200
    - Fifteen inches - $10,000
    - Sixteen inches - $11,500
    - Seventeen inches - $12,000
    - Eighteen inches and over, add for each caliper inch - $1,200

- A penalty will be assessed for a limb and root injury of $200 per inch of limb/root diameter for and limb/root greater than 2 inches in diameter, measured where the limb should be pruned in order to make a proper thinning cut or root to the point a clean cut can be made.

- A penalty will be assessed of $20 per square inch of tree trunk area injured. This penalty shall be assessed when it is determined that an entity is responsible for the damage to the tree trunk, but the tree is still healthy enough to remain at the site. An example of this kind of damage would be the collision of a tractor with the trunk of a mature tree where the bark is peeled back, and the injured area will require repair and healing.
The Landscape Services operating account shall receive and manage the tree replacement program. Payment shall be made to the tree planting and replacement account if there is a problem with site space or readiness.

General: The Contractor guarantees the protection of all plant material included as part of this work, in a healthful manner during the duration of the construction period. Destruction of, or significant damage to, any or all of the plant materials to be protected, as determined by the University's Representative, will result in compensation by the Contractor of 3-36” box trees, installed on the site, for each existing tree damaged.

Assessment:
All damaged trees on Cal Poly’s campus shall be assessed by a Certified Arborist or outside consultant using the tree evaluation form or other similar methods preapproved by the Landscape Advisory Committee. Results from the evaluation determine whether the tree should be removed, pruned, or receive treatment such as fertilization and insect/disease control. All actions post-evaluation are updated on the tree inventory list.

Enforcement:
Whenever it is determined that violation of this procedure has occurred, the Facilities representative or designee shall immediately issue written and oral notice to the person or company or department in violation, identifying the nature and location of the violation and specifying that remedial action is necessary to bring the violation into compliance.

Penalties:
The person, company or department in violation shall immediately, conditions permitting, commence remedial action and shall have seven (7) working days after the receipt of the notice, or such longer times as may be specified in the notice, to complete the remedial actions required to bring the activity into compliance with this policy.

32 12 00 - Flexible Paving
Consider use of permeable paving.

32 13 00 - Rigid Paving
Concrete Finish: Stamp location of irrigation sleeves into concrete with a “L.”
All hardscape shall be specified to meet (or exceed) SRI of .28 and comply with aging requirements to comply with current LEED standards. Permeable paving is preferred wherever possible.

Concrete is to include fly ash when feasible.

**32 16 00 - Curbs and Gutters**

Regulatory Requirements

Access for Persons with Disabilities: Comply with California Building Code and Americans with Disabilities Act Accessibility Guidelines (ADAAG) for site development, walks, and sidewalks to ensure access for persons with disabilities. Form, shape, and finish curb cuts in accordance with requirements of most restrictive code.

**32 33 13 – Bicycle Racks**

Bicycle Storage: Covered, lockable, high density parking storage is to be provided. Racks and base assembly shall be Hot rolled ASTM A36 solid steel bars welded with GMAW (MIG) industrial high gloss powder coated.

Racks should be secured to concrete with two tamper-resistant stainless steel anchors.

**32 33 23 – Site Trash and Litter Receptacles**

Trash enclosures: A trash enclosure shall be provided that allows for three appropriately sized bins (landfill, recycle and compost). The trash enclosure should be designed to blend contextually with the surrounding buildings, while screening trash and odors as much as possible with a concrete apron.

**32 80 00 – Irrigation**

*Design Guidelines:*

The Irrigation system shall utilize the latest technology in water conservation. Smart controllers with rain sensors, matched precipitation rate spray heads in turf and drip irrigation in planting areas will minimize overspray and run-off. Two bubblers will be placed at each tree location for deep root watering. The irrigation system will be zoned according to site condition, species watering needs, and sun exposure. Quick couplers shall be provided every 75 feet throughout the irrigation system for maintenance.
CSU Requirements:
Conserve water resources, including installing controls to optimize irrigation water, and promoting the use of reclaimed water. Prepare a year-round watering program according to seasonal evapotranspiration data for the region. Decorative fountains should be minimized.

Campus Standard Irrigation System:
Calsense Resource Management Systems (Website: www.calsense.com). Provide a programmable, automatically controlled underground sprinkler irrigation system for landscape planting. Provide components from manufacturers matching standard irrigation equipment used by University, including heads, valves, piping circuits, controls, and accessories, or approved equal. Provide looped layout with isolation valves.

Coordinate with Project Manager to locate inside utility or electrical room with network access and accessible to landscape maintenance staff.

Installed Calsense equipment to be reviewed by manufacturer representative and letter of installation certification shall be provided to campus representative, by contractor, prior to completion.

32 84 00 - Planting Irrigation

Irrigation Controller:
Campus Standard: Calsense CS3000 Ethernet and Radio Controlled. Evapotranspiration (ET)-based controller. Controller shall have non-volatile memory to retain program in memory during temporary power failures. Provide diagram of numbered valves and respective irrigated areas for inside panel of each controller.

Wall Mount Enclosure:
The wall-mounted gray box shall be a completely assembled unit, pre-mounted with the designated controller. The box shall be constructed of weather- and vandal-resistant stainless steel. The wall mount unit shall come complete with transient and lightning protection board and factory-labeled terminals. The transient protection board shall be pre-mounted in the wall mount unit and shall support field replaceable modules which include terminal strips for the connection of irrigation field wires, 2-Wire cable, and weather monitoring devices such as an ET gage, Tipping Rain Bucket, and Wind gage. The wall mount unit shall feature a security-tight locking mechanism, louvered vents, with splash guards, and bee/wasp screens.
All wall mount units shall come with a 10-year limited warranty and shall be fully UL-approved. Double-Wide, Top Entry Enclosure Assemblies:

Calsense Controller Assembly: SSE-D-R, vandal and weather resistant, made entirely of 304 grade stainless steel with the top being 12 gauge and the body being 14 gauge. The pre-assembled vandal resistant enclosure factory pre-assembled and supplied by controller manufacturer shall come complete with 24 VAC lightning and surge protection and all terminals shall be factory labeled. The pre-assembled enclosure shall come provided with an On/Off switch to isolate the controller along with a GFI receptacle. Specific radio antenna(s) shall be pre-mounted and connected on enclosure. The enclosure shall include 2-7/8”, 1-1/2” thick, 6-pin cylinder, die-cast steel padlock with unique shackles design. The assembly shall carry a full U/L listing. The 38 inch height enclosure with flip top should allow for side by side placement of two controllers. All necessary wiring between the two controllers in order to share central communications and/or flow and weather data shall be pre-wired by the manufacturer for easy installation. The main housing shall be louvered upper and lower body to allow cross flow ventilation. A stainless steel backboard shall be provided for the purpose of mounting electronic and various other types of equipment. The stainless steel backboard shall be mounted on four stainless steel bolts that will allow for easy removal of the backboard. The factory pre-assembled enclosures shall carry a ten year limited warranty.

Top Entry Single Enclosure:
Calsense Controller Assembly: SSE-R, vandal and weather resistant, made entirely of 304 grade stainless steel with the top being 12 gauge and the body being 14 gauge. The pre-assembled vandal resistant enclosure factory pre-assembled and supplied by controller manufacturer shall come complete with 24 VAC lightning and surge protection and all terminals shall be factory labeled. The pre-assembled enclosure shall come provided with an On/Off switch to isolate the controller along with a GFI receptacle. Specific radio antenna(s) shall be pre-mounted and connected on enclosure. The enclosure shall include 2-7/8”, 1-1/2” thick, 6-pin cylinder, die-cast steel padlock with unique shackles design. The assembly shall carry a full U/L listing. The 38 inch height enclosure with flip top should allow for one controller. The main housing shall be louvered upper and lower body to allow cross flow ventilation. A stainless steel backboard shall be provided for the purpose of mounting electronic and various other types of equipment. The stainless steel backboard shall be mounted on four stainless steel bolts that will allow for easy removal of the backboard. The factory pre-assembled enclosures shall carry a ten year limited warranty.

Controller Grounding:
Grounding shall consist of one 5/8-inch x 8-foot copper rod installed per irrigation controller and where multiple controllers are not connected to the same ground rod.

The top of each rod shall be installed inside a 10-inch round valve box, with the rod installed as close as practical to the controller. If a pedestal enclosure is used, the ground rod may be installed through the
pedestal base. Under no circumstances shall the rods be shortened. A #6 AWG solid copper wire shall be used to connect from the ground lug of the transient protection board to the copper rod. Brass clamps specifically designed to secure the copper wire to the grounding rod shall be used. There shall be no kinks or sharp bends in the wire. Each wire may be wrapped around the rod and brazed in place as an alternative to clamping. Braze the wire to the rod for at least one circumference of the rod. Recommended: Control System

Low Voltage System: Expressly for control of automatic control valves for underground sprinkler systems.

Transformer: To convert building service voltage to control voltage of 24 volts.

Circuit Control: The controller shall automatically calculate cycle and soak scheduling to water each station for a fixed cycle time and allow the water to soak in between cycles, maximizing infiltration and minimizing runoff.

Timing Device: The controller shall have the ability to accommodate multiple types of irrigation schedules including irrigating even days, odd days, prescribed days of the week, and interval scheduling ranging from every other day up to every four weeks.

Wiring: Solid copper with UL approval for direct burial in ground. Provide one spare control wire along entire wire routing for each controller for each unused station at controller. Loop 36 inches excess wire into each single valve box and into one valve box in each group of valves.

CS 3000, pedestal mounted controller call out: CS3-2W-S/CS3-EN/CS-2W-2ST/CS-2W-POC/FM XX

Provide CAT-5 or 6 cable in conduit from the nearest router to the controller maximum run 328’ including bends and twists.

Two wire plan notes:
Specify number # of decoders needed. Two station decoders. POC decoder included in call out above.
Decoder part number: CS-2W-2ST
Two wire cable: Specify Paige cable P-7354-D in conduit. Maximum run 7,000 feet. 1.25 “Conduit recommended.

Grounding requirements:

- Every 300-400 feet with one 5/8-inch x 8-foot copper grounding rod per irrigation controller and decoder.
- #6 AWG solid copper wire from the copper rod to the field common (white wires in the black harness) of the controller / decoder.

Flow Sensor: The flow sensor used shall be supplied by the same manufacturer as the irrigation controller. The flow sensor shall be wired back to the irrigation controller using two #14 AWG wires, one red, and one black in 1” PVC conduit to connect to the irrigation controller. The maximum wire run between flow meter and controller shall be 2000 ft. The flow meter shall send low voltage digital pulses back to the controller and therefore all electrical connections must be waterproof and be resistant to any moisture entry. It is intended that all wire runs between the controller and flow meter shall be direct pulls and have no splices. If wire splices are unavoidable, they must be installed in a valve box with Spears DS-100 connectors with Spears sealant or 3M Scotch lock No. 3570 connector sealing pack used.

Piping and Fittings

Campus Preferences:

Mainline Pipe and Fittings - PVC Plastic Pipe (3 inches and larger): Rigid unplasticized polyvinyl chloride (PVC) 1120, Type 1, Grade 1, NSF-approved pipe, complying with ASTM D 2241. For mainline to control valve connections, use Schedule 80 PVC threaded both ends.

Mainline Pipe and Fittings - PVC Plastic Pipe (smaller than 3 inches): Rigid unplasticized polyvinyl chloride (PVC) 1120, Type 1, Grade 1, NSF-approved pipe, color – white, complying with ASTM D 1785. For mainline to control valve connections, use Schedule 80 PVC threaded both ends.

Lateral Pipe and Fittings (Downstream of Control Valves): Rigid unplasticized polyvinyl chloride (PVC) 1120, Type 1, Grade 1, NSF-approved, color-white, complying with ASTM D 1785. For pipe and fittings, Schedule 40 solvent weld pipe, and Schedule 40, Type 1, PVC Solvent weld fitting conforming to ASTM D 2466 and ASTM D 1784.

Galvanized Steel Pipe and Fittings: Pipe standard weight, seamless or welded, galvanized conforming to ASTM A 53. Fittings galvanized malleable-iron, threaded fittings conforming to ANSI B 16.3.
Copper Pipe and Fittings: Pipe Type L seamless copper water tube, drawn temper, conforming to ASTM B 88. Fittings wrought copper or cast brass, recessed solder joint type fittings conforming to ANSI B 16.22.

Sleeving: Rigid unplasticized polyvinyl chloride (PBC) 1120, Type 1, Grade 1, NSF-approved pipe, extruded from material conforming to ASTM D 1784, color-white. Schedule 40 solvent weld pipe.

Campus Preference

• Sprinkler Remote Control Valves (RCV) - Angle Valves: Superior Controls Company, Inc.; Model 950A-DWPRS – Electric Diaphragm Angle Valve. Solid brass construction; 200 PSI rating; Website: http://www.bucknersuperior.com/Professionals/Products/AngleValves/950A.aspx
• Sprinkler Manual Control Valves (MCV): Nibco Inc., 1516 Middlebury Street, Elkhart, IN 46516-4740, Phone: 574-295-3000, Fax: 574-295-3307. Model T-211-YK – Class 125 Bronze Globe Valves. Furnish two valve keys, 3-foot long with tee handles and key end to fit valves. Website: http://www.nibco.com
• Isolation Valves (3-inches and smaller): Nibco Inc., 1516 Middlebury Street, Elkhart, IN 46516-4740, Phone: 574-295-3000, Fax: 574-295-3307. Model T-113-K – 250 PSI CSP Bronze Gate Valve. Screw-in bonnet, non-rising stem, solid wedge, push-on ends with joint restraints, 250 PSI / 17.2 Bar non-shock cold working pressure, conforming to MSS SP-80, size - 2-inches. Website: http://www.nibco.com/assets/PR113KIR.pdf
• Isolation Valves (Larger than 3-inches): Comply with Section 33 11 00 – Water Utility Distribution Piping.
• Quick Coupling Valves, Valve Keys and Key Lug: Rain Bird International, Inc., POB 37, Glendora, CA 91740-0037, Phone: 626-963-9311, Fax: 626-852-7343.
  o Quick Coupling Valves: Rain Bird Model 33DLRC. ¼-inch (20/27). Heavy-duty, brass construction, two-piece body design, stainless steel internal valve spring, locking rubber cover. Website: http://www.rainbird.com/landscape/products/valves/quickCouplingValves.htm
  o Locking Cover Keys: Rain Bird Model #2049l. Furnish two cover keys per project. Website: http://www.rainbird.com/landscape/products/valves/lockingcoverkey.htm
  o Valve Keys: Rain Bird Model 33DK. ¼-inch (20/27). Key threads into top of quick-coupling valve to provide water access. Furnish two valve keys per quick coupling valve. Website: http://www.rainbird.com/landscape/products/valves/valvekeys.htm
• Flex Riser - KBI model FR or approved equal (6” length).
• Triple-Swing Assemblies - Rainbird SA series, KBI TSA-TT series, or approved equal. 12” length for 4” and 6” pop-up sprinklers, and 18” length for 12” pop-up sprinklers. Match sprinkler inlet size.
• Sprinkler Heads - Pop-up height: 4" minimum height for turf sprinklers; 12" minimum height for shrub sprinklers.

Campus Alternate

Two-Wire Path and Decoders:

The 2-Wire option shall provide support for up to one-hundred and twenty-eight (128), 2-Wire stations connected to a single controller and shall provide support for up to 6 points of connection (POC’s). The 2-Wire cable shall either be Paige P7354D or Regency’s Hunter® Decoder cable with a maximum length of 7,000 ft. A ground rod, 5/8 inch x 8-ft solid copper shall be required every 300-feet along the 2-Wire path as well as a single ground rod at the end of the cable run.

The station decoder shall be a 2-station decoder and shall be able to operate up to 2-solenoids using unique colored wires for each. A single controller shall be able to operate up to 70, 2-station decoders and it shall be intended that all wire runs between valves and 2-Wire decoders shall be direct pulls and have no splices except at the decoder location. All electrical connections must be waterproof and moisture-resistant and shall be done with 3M™ Scotchcast™ 3570G Connector Sealing Packs. The 2-Wire decoders shall use #14 AWG direct burial wire to connect to remote control valves and the maximum wire run between the decoder and the valve shall be 100-feet.

The POC decoder shall operate a single master valve and flow meter (model FM). A single controller shall be able to operate up to six POC decoders with a maximum of 12-POC’s in a chain, controllers using FLOWSENSE™ technology. The maximum wire run between the POC decoder and flow meter shall be 20-feet while the maximum wire run between the decoder and the master valve shall be 100-feet.

32 91 00 - Planting Preparation

General Standards
• Chemical soil analysis will dictate soil amendment materials to adjust pH and nutrients for optimal plant growth.
• Soil organic matter content will not be less than 2% or greater than 5%
• Soil shall be free of stones larger than ¾” in diameter
• Mulch - Keep 2” minimum from bark of plant.
• Deep Root Planters are not to be used.

Herbicide Use
• Post-emergence (existing weeds): "Roundup" or approve equal.
• Pre-emergence (non-turf areas, prior to seed germination): "Ronstar" or approved equal.

32 93 00 - Plants

**Plant Selection**
Cal Poly holds a “learn by doing” philosophy, the campus represents a living laboratory; therefore increasing the diversity of tree species is extremely important. The landscape planting should be native, non-invasive, drought tolerant species that increase or enhance ecological biodiversity. The plant palette shall be low water use and low maintenance, specific to the regional climate zone and distinct site ecotones. Species are encouraged to be drought tolerant utilizing California native and adaptive native plant material throughout the site. Low hypoallergenic material is encouraged. Invasive plant material causing economic, environmental, and human health harm is not permitted on site. All plant material is susceptible to the surrounding wildlife and cannot be harmful nor an extensive food source. Species selection, however, is subject to dictation by site conditions and pre-approval by the Landscape Advisory Committee.

• All plant suppliers are required to specialize in growing and cultivating plants specified for no less than 5 years and to certify the quality of the plants.
• Standard trees must meet requirements of a single, straight trunk with well-balanced crown and intact leader in containers or boxes.
• A multi-stem tree must have a minimum of 3 stems rising from the crown of the root ball, branched or pruned naturally according to species and with relationship of caliper, height, and branching.
• Trees size shall be minimum 36” box with shrub and groundcover ranging between 1 to 15- gallon container sizes.

**Delivery, Storage, and Handling**
Plants shall be protected from the sun, wind, and physical injury and damage during transit and during storage while awaiting planting work. Trees are not to be pruned prior to delivery except by approval from the University.

• Removal of rejected plants from site shall take place immediately and replaced with plants of acceptable quality.
• Plant deliveries are scheduled to avoid lengthy periods of storage and pre-planting maintenance. Sod delivery will be scheduled for tree installation within 24 hours.
• Plants will be handled by root ball or container, not lifted by the trunk, and container grow stock will not be removed from containers before time of planting.
• Water root systems of plants will be stored on-site as often as necessary to prevent container soil from drying out.
• Leaders shall not be pruned prior to or after delivery, either by nursery or by landscape contractor.
**Site Preparation**

Proper plants for each location shall be chosen to reduce or eliminate the necessity for pruning. A planting hole should be dug no deeper than the root ball when measured from the bottom of the root ball to the trunk flare and twice the size of the root ball diameter. Planting shall proceed only after irrigation systems have been tested and approved.

**32 93 43 - Trees**

**Tree Planting**

Trees are to be placed so the crown of the ball is 2” above surrounding grade and backfill with native soil in 6” lifts. Backfill soil should be watered to settle the soil after each lift. Fertilizer tablets should be distributed evenly around root ball at midway. 3” high water basins shall be built around tree pit and thoroughly watered. The same process should be performed for smaller plants but appropriate basin to the relative size of the plant.

**Staking/Grates/Guards**

- Tree stakes shall be driven 3'-0” into the ground alongside the root ball at 18” apart. Tie trees to stakes at 12” from top of stake and 36” from top of stake utilizing cinch-ties with ties interlocked around trees as approved by the University. Cinch-ties should be stapled to stakes with staples over cinch-tie, not through it.
- Tree grates shall be installed according to manufacturer’s recommendations
- Tree guards will be placed only as required to protect the tree from direct contact with vehicles.

**Approved Trees for Campus Planting:**

<table>
<thead>
<tr>
<th>Scientific Name</th>
<th>Common Name</th>
</tr>
</thead>
<tbody>
<tr>
<td><em>Acacia pendula</em></td>
<td>Weeping myall</td>
</tr>
<tr>
<td><em>Alectryon excelus</em></td>
<td>New Zealand ash or titoki</td>
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<tr>
<td><em>Angophora costata</em></td>
<td>Rose gum</td>
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<tr>
<td><em>Bischofia javanica</em></td>
<td>Toog tree</td>
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<td><em>Caesalpinia ferrea</em></td>
<td>Leopard tree</td>
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<tr>
<td><em>Callistemon salignus</em></td>
<td>Willow bottlebrush</td>
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<td><em>Castanospermum australe</em></td>
<td>Moreton Bay chestnut</td>
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<tr>
<td><em>Cryptocarya rubra</em></td>
<td>Red laurel</td>
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<tr>
<td><em>Dalbergia sissoo</em></td>
<td>Sissoo</td>
</tr>
<tr>
<td><em>Elaeocarpus sylvestris</em></td>
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</tr>
<tr>
<td><em>Eucalyptus spathulata</em></td>
<td>Swamp mallet</td>
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<tr>
<td><em>Ficus sur</em></td>
<td>Cape fig</td>
</tr>
<tr>
<td><em>Harpephyllum caffrum</em></td>
<td>Kaffir plum</td>
</tr>
<tr>
<td>Scientific Name</td>
<td>Common Name</td>
</tr>
<tr>
<td>-------------------------------------</td>
<td>--------------------------------------</td>
</tr>
<tr>
<td><em>Melaleuca styphelioides</em></td>
<td>Prickly-leaved paperbark</td>
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<tr>
<td><em>Peltophorum dubium</em></td>
<td>Yellow poinciana</td>
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<tr>
<td><em>Quercus hypoleucoides</em></td>
<td>Silverleaf oak</td>
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<tr>
<td><em>Robinsonella cordata</em></td>
<td>Blue hibiscus tree</td>
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<tr>
<td><em>Sophora secundiflora</em></td>
<td>Texas mountain laurel</td>
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<tr>
<td><em>Syzygium smithii</em></td>
<td>Lilly-pilly</td>
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<tr>
<td><em>Taxodium huegelii</em></td>
<td>Montezuma bald cypress</td>
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<tr>
<td><em>Tupidanthus calyptratus</em></td>
<td>Mallet flower</td>
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<tr>
<td><em>Agathis spp.</em></td>
<td>Kauri pines</td>
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<tr>
<td><em>Brahea edulis</em></td>
<td>Guadalupe palm</td>
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<tr>
<td><em>Brahea armata</em></td>
<td>Blue Hesper palm</td>
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<tr>
<td><em>Caryota spp.</em></td>
<td>Fishtail palm</td>
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<tr>
<td><em>Cedrela fissilis</em></td>
<td>Brazilian cedarwood</td>
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<tr>
<td><em>Ceiba insignis</em></td>
<td>White floss-silk tree</td>
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<tr>
<td><em>Cercidiphyllum japonicum</em></td>
<td>Katsura tree</td>
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<td><em>Chiranthodendron pentadactylon</em></td>
<td>Monkey hand tree</td>
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<td><em>Dipteronia sinensis</em></td>
<td>Chinese Dipteronia</td>
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<tr>
<td><em>Dombeya spp.</em></td>
<td>Snowball tree</td>
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<td><em>Ficus auriculata</em></td>
<td>Roxburgh fig</td>
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<td><em>Ficus sycomorus</em></td>
<td>Sycamore fig</td>
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<tr>
<td><em>Glyptostrobus pensilis</em></td>
<td>Water pine</td>
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<tr>
<td><em>Griselinia spp.</em></td>
<td>Puka</td>
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<tr>
<td><em>Harpullia pendula</em></td>
<td>Tulipwood</td>
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<tr>
<td><em>Harpullia arborea</em></td>
<td>Tulipwood</td>
</tr>
<tr>
<td><em>Howea forsteriana</em></td>
<td>Kentia palm</td>
</tr>
<tr>
<td><em>Howea belmoreana</em></td>
<td>Curly palm</td>
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<tr>
<td><em>Lagunaria patersonii</em></td>
<td>Primrose tree</td>
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<td><em>Liquidambar orientalis</em></td>
<td>Turkey sweet gum</td>
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<tr>
<td><em>Liriodendron chinense</em></td>
<td>Chinese tulip tree</td>
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<tr>
<td><em>Markhamia lutea</em></td>
<td>African trumpet tree</td>
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<tr>
<td><em>Melia azedarach</em></td>
<td>Chinaberry</td>
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<tr>
<td><em>Parkinsonia aculeata</em></td>
<td>Mexican palo verde</td>
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<tr>
<td><em>Parkinsonia x 'Desert Museum'</em></td>
<td>Desert museum palo verde</td>
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<tr>
<td>Scientific Name</td>
<td>Common Name</td>
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<td>---------------------------------------</td>
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<tr>
<td><strong>Persea indica</strong></td>
<td>Ornamental avocado</td>
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<tr>
<td><strong>Pinus densiflora</strong></td>
<td>Japanese red pine</td>
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<tr>
<td><strong>Pinus roxburghii</strong></td>
<td>Chir pine</td>
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<tr>
<td><strong>Pinus torreyana</strong></td>
<td>Torrey pine</td>
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<td><strong>Pittosporum angustifolium</strong></td>
<td>Willow Pittosporum</td>
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<td><strong>Platanus orientalis</strong></td>
<td>Eastern sycamore</td>
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<td><strong>Platanus occidentalis</strong></td>
<td>Western sycamore</td>
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<td><strong>Platanus Mexicana</strong></td>
<td>Mexican sycamore</td>
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<td><strong>Pseudotsuga macrocarpa</strong></td>
<td>Bigcone spruce</td>
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<td><strong>Pseudotsuga menziesii</strong></td>
<td>Douglas-fir</td>
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<tr>
<td><strong>Quercus virginiana</strong></td>
<td>Southern live oak</td>
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<td>Engelmann oak</td>
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<td><strong>Sciadopitys verticillata</strong></td>
<td>Japanese umbrella pine</td>
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<td><strong>Spathodea campanulata</strong></td>
<td>African tulip tree</td>
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<tr>
<td><strong>Taxus spp.</strong></td>
<td>Yews</td>
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<tr>
<td><strong>Tilia spp.</strong></td>
<td>Lidens</td>
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<tr>
<td><strong>Torreya californica</strong></td>
<td>California nutmeg tree</td>
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<tr>
<td><strong>Tristaniopsis laurina</strong></td>
<td>Water gum</td>
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<tr>
<td><strong>Ulmus pumila</strong></td>
<td>Siberian elm</td>
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<td><strong>Sophora japonica</strong></td>
<td>Japanese pagoda tree</td>
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<td><strong>Allocasuarina torulosa</strong></td>
<td>Forest oak</td>
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<td><strong>Corynocarpus laevigata</strong></td>
<td>New Zealand laurel</td>
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<tr>
<td><strong>Meryta sinclairii</strong></td>
<td>Puka</td>
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<tr>
<td><strong>Olea africana</strong></td>
<td>African olive</td>
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<tr>
<td><strong>Quillaja saponaria</strong></td>
<td>Soapbark tree</td>
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<td><strong>Taxodium mucronatum</strong></td>
<td>Montezuma cypress</td>
</tr>
<tr>
<td><strong>Trachycarpus wagnerianus</strong></td>
<td>Dwarf Chusan palm</td>
</tr>
</tbody>
</table>

* Riparian Locations Only

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32 96 43 Tree Transplanting

**Palm Tree Transplanting and Planting**

Size of palms to plant
• Large palms are easier to planted or transplanted.
• Containerized palms, with little or no root disturbance, size is dependent on the capacity of the equipment to move and handle large, heavy specimens safely.

For palms transplanted from one site to another or field-grown plants dug in a nursery, it is important to select specimens with some visible trunk or stem because they are more tolerant of root disturbance and will reestablish more quickly and successfully.

Do not transplant the following species with visible above-ground trunks:
• *Sabal* (palmetto palm)
• *Bismarckia* (Bismark palm)
• *Latania* (Latan palm)

*When to plant/transplant*
• Root growth is essential for rapid and successful establishment. Root growth is highest during warmer months.
• Transplant palms in the beginning of the warm season to ensure several months of high temperatures for adequate root growth.
• Container palms can be planted safety year round.
• Size of root ball
  o Most palm species with root balls extending out 12 inches from the trunk and 12 to 24 inches deep are adequate for transplanting.
  o A deeper root ball will help to stabilize taller specimens.
  o The larger the root ball the more successful and quick is establishment.
  o Palms with excessively large root balls are more difficult and expensive to move due to their size and weight.
  o The hole left after a palm with a large root ball has been dug usually must be filled, requiring more labor and expense, and perhaps even additional soil.

*Leaf removal/Tie up*
• Consult Cal Poly Landscape Representative to determine if this is necessary. The practice has little value when transplanting in cooler, more humid coastal areas.
• To protect the palm and for ease of handling, tie up leaves during digging, transporting, and replanting. In appropriate situations, untie leaves once the palm is replanted.

*Transport*
• Palm specimens must be well supported and protected during moving and handling to prevent injury to the apical bud or meristem and trunk.
• Protect palm bark; wounds and injuries are permanent and potential sites for disease and insect entry.
• Some species, like Archontophoenix cunninghamiana (king palm), are sensitive to handling. They and other slender trunked palms with heavy crowns should have a wooden splints attached along the trunk and extending into the leaves to prevent the weight of the crown from damaging the apical bud.
• Tie stems together of the multi-trunked species for additional protection.
• Use nylon and/or burlap slings and ties to support and grasp palms to prevent injury to the trunk when moving and handling with heavy equipment.
• Stack or shingle palms securely on the vehicle, either standing them up at an angle from the wind or laying them down with the root balls forward and the crowns at the rear.
• Cover root balls and crowns with shade cloth or other protective material during transport to prevent wind and sun damage and excessive drying.

**Planting**
• Backfill with the same unamended soil excavated from the hole.
• To support the stability of larger palms, consider backfilling with washed builder’s sand to pack more easily and uniformly.
• There is no benefit to amending the backfill with organic matter. Use organic matter as mulch several inches deep and several feet out from the palm’s base. Tamp out air pockets.
• If stabilization is required for large palms:
  o Use 2 x 4 or 4 x 4 wooden bracing attached against one-foot lengths of 2 x 4 vertically strapped or banded around the trunk.
  o Protect the trunk with nylon, burlap, or other suitable material where the one foot lengths of 2 x 4 are secured.
  o Do not nail into the trunk; nailing will cause permanent wounds, and disease and insect entry sites.
  o Palms may also be secured with guy wires or cable instead of wooden bracing.
  o Do not stabilize palms by planting them deeper in the hole; although some palms survive deep planting, most do not.
• Construct an irrigation berm four to six inches around the root ball and hole.
• Provide a two- to three-inch layer of mulch around the base of the palm to encourage new root growth, conserve moisture, and suppress weeds.
• Irrigate deeply and thoroughly.

**Post-planting care**
• Schedule irrigations based on need, not a clock or calendar.
• Irrigate sensibly, keeping the root ball and backfill evenly moist but not saturated.
• Keep turf grass and weeds away from the trunk base.
• Maintain a regular and complete fertilizer program once the palm is fully established.