SECTION 1010
UNIFORM DESIGN CRITERIA

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General

The purpose of establishing these Standards is to help provide guidance for design of public facilities to better ensure health, safety, and enhance community quality of life. These standards are not intended to be a substitute for engineering knowledge, experience, or judgment. It is incumbent on the users of these standards to exercise good judgment, and where needed, seek guidance from the appropriate professional.

This document must be used for new or reconstruction of existing facilities. Where deviation from these standards is necessary, the designer must follow the Design Exception process outlined in this document.

These standards are not retroactive, existing facilities constructed prior to these standards are not required to comply with these standards. New construction and reconstruction must comply with these standards unless a design exception has been approved by the University. The applicant is responsible to either ensure facilities are designed in compliance with these standards, or to secure design exception approval.

This document is supported by various publications that comprise the standard references for Public Works projects. In event of conflict, it is the applicant's responsibility to notify the University of that conflict and request clarification. Without that notification, these standards will take precedence.

Reference documents include:

1. City of San Luis Obispo Engineering Standards
2. City of San Luis Obispo Standard Specifications
3. City of San Luis Obispo Community Design Standards
4. City of San Luis Obispo Fire Development Guide
5. American Water Works Association (AWWA) Standards
6. Caltrans State Standard Plans
7. Caltrans State Standard Specifications
8. San Luis Obispo County Public Improvement Standards
9. Caltrans Manual for Uniform Traffic Control Devices (MUTCD)
10. Caltrans Highway Design Manual (HDM)
11. American Association of State Highway and Transportation Officials (AASHTO), A Policy on Geometric Design of Highways and Streets
12. Americans with Disabilities Act Guidelines (ADAG)
13. Pedestrian Right-of-Way Accessibility Guidelines (PROWAG)
14. Caltrans DIB 82-05 Pedestrian Accessibility Guidelines for Highway Projects
15. National Association of City Transportation Officials (NACTO)

The applicant is responsible for obtaining any other required regulatory permits prior to the start of construction. The Regulatory Agencies that may have jurisdiction over the applicant's project include, but are not limited to:

1. California Regional Water Quality Control Board (RWQCB)
2. California Department of Fish and Wildlife
3. U.S. Army Corps of Engineers (ACOE)
4. Air Pollution Control District (APCD)
5. County of San Luis Obispo
6. State Department of Transportation (Caltrans)
7. United States Environmental Protection Agency
8. United States Fish and Wildlife Service
9. California Department of Water Resources (DWR)

Approval of any improvements plans for construction by the University does not exempt the applicant/owner/contractor from compliance with regulations from other agencies and obtaining authority to construct improvements from all required agencies.

1. Improvement Plans

Complete plans and specifications for all proposed public improvements that are not initiated by City of San Luis Obispo must conform to these Standards. All improvement plans must be prepared and signed by a registered Civil Engineer. Plans and specifications must be submitted to the University for review and approval prior to the beginning of construction of any such improvements. Each utility company whose facilities are involved must sign the original plans indicating they have reviewed and approved the plans. Construction may not begin until the plans are signed by the University, and all submittals required have been provided to the University.

1.1 Preparation of Plans

1.1.1 Plan Review Procedure

A. Plan Check Intake at First Submittal

The Project Engineer must schedule an "intake" appointment, at which time the University will determine whether the application package is complete. Checklists for various types of submittals are available on the University's web site www.slocity.org. Incomplete application packages or plans not conforming to the normal standards of quality and neatness will be rejected. Project approval may be subject to public utility review and approval. It is the responsibility of the Applicant to submit directly to those companies.

B. Plan Revisions

The applicant shall address all plan check comments or redlines prior to resubmittal. The Applicant must provide a plan check response memo outlining the response to the plan check comments. In addition, the applicant shall bubble or delta and number any changes made to the plans not associated with the plan check comments. Failure to supply the required plan check response memo or denote separate plan changes will result in rejection of plans at resubmittal.

When all corrections have been made to the satisfaction of the University, the Applicant must submit original signed, sealed and dated drawings for approval. Plans are not approved until the University signifies approval by signature on the title sheet of the original drawings. Construction is not authorized until the plans are approved and a construction permits have been issued by the University.

Plan revision must be approved by the University prior to being constructed. The Applicant must submit a plan addendum that clearly shows the desired change, and if needed, a request for a variance from City Standards.

C. Phased Improvements

Where the submitted improvement plans cover only a portion of the ultimate development, the plans submitted must be accompanied by the approved overall tentative plan. The tentative plan must demonstrate that the phased improvements are compatible with future phases.

1.1.2 Plan and Profile Layout

All plans must be prepared on:

1. Mylar;
2. Vellum;
3. Bond; or
4. Approved equal

Measuring 24" x 36" (ARCH D). Plans prepared for minor projects that do not require design professionals may be submitted on letter or tabloid size bond paper. Appropriate plan scales are:

Horizontal	Vertical
1-inch=20-feet	1-inch=2-feet or 1-inch=4-feet
1-inch=30-feet	1-inch=3-feet or 1-inch=6-feet
1-inch=40-feet	1-inch=4-feet or 1-inch=8-feet

The scale may be varied in rough terrain upon approval of the University.

A. Earthwork

If any grading is proposed outside the roadway prism, a grading plan must be submitted with the other required improvement plans. Finished grading must be depicted by contour lines, spot elevations, or by "top/toe" indications, as determined appropriate by the University. The grading plan must include a reference to the project soils report, including its title, date and author. In addition, the applicant shall provide the University with proof of an easement or right of entry when grading occurs on private property. The University may request a slope easement for the offsite improvement.

B. Retaining Walls

For any proposed retaining walls, a separate sheet must be provided which depicts the elevation view and typical section for each wall. The applicant shall provide appropriate easements for walls located on private property. Walls on private property for new improvements shall be maintained by the private landowner, maintenance association or homeowner's association.

C. Roadway Improvements

Roadway plan and profile sheets must be of appropriate scale to clearly show the proposed plan layout, along with existing and proposed profiles of all roadways. The boundaries of lots fronting on the roadway, drainage easements, utility easements, slope easements, section lines and corners, land grant lines and temporary construction easements must be shown on all roadway improvement sheets, including proper dimensions. Each roadway plan and profile sheet must include the typical roadway section. The computed curve data for all centerline curves must be shown on the plans.

Streets may be required to be extended to the boundary of a site proposed for development. In such cases, the plans must include an extension of the street profile for a minimum distance of 200-feet beyond the project limits, depicting both existing grade and a potential design grade that comply with the required design speed.

D. Cross Sections

Cross sections must be provided for all designs involving existing road widening. The spacing of cross sections must be based on the characteristics of the project, and as determined necessary by the University.

E. Storm Drainage

Plans for minor drainage facilities may be shown on roadway plans. Plans for major drainage facilities must conform to the sheet size and scale shown above for roadway improvements and included in separate sheets. Profiles of all culverts and drainage structures must be provided, along with the hydraulic grade line for the design event.

F. Water Supply and Wastewater Disposal

Plans for water and wastewater disposal system improvement layout may be submitted on the same plans as the roadways. Improvements outside the roadway prism must be drawn on separate sheets and to an appropriate scale.

G. Utilities

A layout for all utilities including water, sewer, electric, telephone, fiber optic, cable television and gas system improvements must be submitted on a composite utility plan in an appropriate scale, unless approved otherwise by the University. Roadway plans must show placement of utilities in the typical section.

The composite utility plan must clearly show existing overhead utilities, utility poles and guy wires. The exhibit must clearly show facilities that are going to be undergrounded and poles removed and those poles and facilities that are to remain overhead. All required easements shall be shown and dimensioned.

A plan completeness checklist is available for download from the Utilities Department's online documents and files (http://www.slocity.org/government/department-directory/utilities-department/documents-and-files). The checklist covers general items that will facilitate the plan check review process.

H. Traffic Control

Plans for work zone traffic control, and for installation of new permanent traffic control devices and roadway striping, must be drawn on sheets and to an appropriate scale. Work zone traffic control must reference and comply with the most current version of the California MUTCD. If new permanent traffic control devices include traffic signals or lighting, the necessary electrical details must be incorporated into the sheets.

I. Erosion Control

Temporary and permanent erosion control measures are to be shown on a separate plan sheet(s).

J. Landscape Plans

Landscape plans must demonstrate that the landscaping, irrigation, and other features within the right-of-way comply with City Standards including sight distance adequacy, lateral clearance from the roadway and sidewalks, and other improvements within the right-of-way. Standards for irrigation facilities are contained in these Engineering Standards.

K. Details

The plans must include one or more sheets entitled "Details," which show the following as applicable:

1. Detail of all concrete or other structures.
2. Details of any element of the plans required for clarity.
3. Miscellaneous details.
4. Other agencies' standard details which are referenced in the design.
5. Temporary and permanent erosion control standards/details referenced in the design.

1.1.3 Plans Format

The following items are to be submitted to the University for review and approval:

A. Title Sheet

On improvement plans exceeding two sheets in the set, a title sheet must be included. The title sheet must include an index of sheets, stormwater Construction General Permit information and Post Construction Stormwater Requirements including:

1. Index of sheets
2. Vicinity Map
3. Stormwater Construction General Permit Information
    a. WDID
    b. Area of project disturbance (Plans that disturb one acre or greater must include a SWPPP)
4. Post Construction Stormwater Information
    a. Area of existing impervious surfaces
    b. Area of new or reconstructed impervious services
    c. Stormwater Post Construction Regulation Tier
5. Current version date of City of San Luis Obispo's Engineering Standard and Standard Specification governing work including listing of all requested or approved design standard exceptions.

B. Vicinity Map

The title sheet must include a vicinity map depicting the following:

1. Boundaries of the site with City Limits
2. North arrow and scale reference
3. Street names

C. Title Block

Each sheet of the set of drawings, including the title sheet, must have an approved title block showing:

1. Date
2. Name and/or project number.
3. Project Engineer's name, professional registration number, seal and signature, as required by the Professional Engineers' Act.
4. Scale of the drawing.
5. Sheet number and total number of sheets.
6. Sheet title matching the Index of Sheets.
7. Signature blocks for City approval.

D. Right-of-Way

Show and properly dimension on plans:

1. Right-of-way lines
2. Boundaries of lots fronting on the roadway
3. Drainage easements
4. Utility easements

5. Slope easements
6. Temporary construction easements (existing and proposed).

E. Survey Monuments

Pursuant to Section 8771(b) of the California Business and Professions Code, existing survey monuments that control the location of:

1. subdivisions,
2. tracts,
3. boundaries,
4. roads,
5. streets,
6. highways, and
7. provide survey control,

that are within or adjacent to the area of work, must be located and referenced by a licensed land surveyor or registered civil engineer. This must occur prior to the time when any:

8. streets,
9. highways,
10. other rights-of-way, and
11. easements,

Are:

12. improved,
13. constructed,
14. reconstructed,
15. maintained,
16. resurfaced, or
17. relocated.

Survey monuments shall be located, tied out, and a corner record filed, by a Professional Land Surveyor, if the construction will disturb the monument. If any existing survey monument is disturbed in any way by the improvement work, as determined by a licensed land surveyor or registered civil engineer licensed prior to 1982, it must be reset accordingly and an appropriate document must be filed with the County, prior to the final acceptance of the work by the University.

F. Topography

All pertinent topographic features which may affect the:

1. design,
2. construction, and
3. operation of the improvements,

must be shown on the plans, including but not limited to the following:

4. Curbs, sidewalks, shoulders.
5. Existing structures, fences, trees and other foliage.
6. Existing utility lines and facilities.
7. High water and frequent inundation limits.
8. Roadway lines.
9. Storm drains, drainage ditches.
10. Wastewater Disposal systems.
11. Water lines, fire hydrants.

Full topography must be provided for a minimum of 50-feet in all directions of a development site, to evaluate drainage conditions.

G. Profiles

The plans must clearly show the existing and proposed profiles of all:

1. Roadways
2. Drainage ditches
3. Storm drains
4. Water lines
5. Sanitary sewers
6. Clearances at structures and power lines

Including elevations at 25-foot minimum intervals for warped surfaces.

H. Design Basis

The plans must include the basis for design as follows:

1. Road Plans:
    a. Design Speed (V)
    b. Design Volume (ADT)
    c. Traffic Index (TI)
2. Culverts:
    a. Slope (S)
    b. Design Flow
    c. Storm Interval (QX)
3. Storm Drains:
    a. Hydraulic Grade Line (HGL)
    b. Slope (S)
    c. Design Flow & Storm (QX)
4. Drainage Structures: The numerical quantities flow quantity for the Primary Design Storm
5. Drainage Basins:
    a. Design Volume,

   b. Design Inflow (QIN)
   c. Design Outflow (QOUT)
   d. Tributary Area (A)
   e. Design Infiltration Rate
6. Sewer Systems:
   a. Pre-development design flows
   b. Post-development design flows
   c. Average and peak flow rates
   d. Equivalent Dwelling Units (EDUs)
7. Water Systems:
   a. Pre-development design flows
   b. Post-development design flows
   c. Average Daily Demand (ADD)
   d. Maximum Daily Demand (MDD)
   e. Peak Hour Flow (PHF)
   f. Equivalent Dwelling Units (EDUs)

I. Stationing and Orientation

The stationing on plan and profile sheets must read from left to right. Plans must be arranged so that the north arrow is either pointed toward the top or to the right edge of the sheet. Adjustments may be considered when matching existing stations from other plans.

J. Benchmark

The plans datum must be based on published benchmark information from the University of San Luis Obispo. Include a description of the benchmark and the datum for its reference elevation. The plans must reference a durable local benchmark that will be utilized for the construction of the improvements and must include an indication of its location on the Vicinity Map or the plans.

K. Basis of Bearings

The plans must indicate the basis of bearings that will be used for construction of the improvements. The plans must include a description of the points that form the basis of bearings, along with the appropriate reference information.

L. Units of Measurement

The units of measurement on plans submitted to the University must be English Units.

M. Text

The minimum text size on full size plans must be 3/32″ (or 0.1″).

1.2 Design Exceptions

Unusual site conditions or matching existing infrastructure may warrant a deviation from these standards. Where such situations occur, the Engineer of Work may request a design exception. The Engineer of Work must demonstrate that the proposed deviation adequately addresses:

1. public health and safety
2. long term maintenance
3. environmental impacts
4. orderly community development.

Avoiding or reducing project costs is not an adequate justification for design exception approval. As these assessments require professional engineering judgment, all design exception proposals must be prepared by a registered professional engineer and submitted to the University for review and approval prior to construction.

Requests for a design exception must be proposed in writing by the Engineer of Work following the prescribed format. The Engineer of Work must sign and seal the Design Exception Application submitted to the University.

1.3 Americans with Disability Act Requirements

The Americans with Disability Act (ADA) was signed into Federal law in 1990. ADA seeks to provide equal access to public facilities for all Americans regardless of age or physical ability.

Since the ADA and accessibility requirements are contained within Federal and State law, users of these standards are also expected to fully comply with the law. The information included in these standards is provided to assist the user and to help ensure City facilities are also in compliance.

A. Design Requirements

The design and placement of ADA facilities within the public right-of way including curb ramps and designated parking spaces must comply with:

1. Caltrans Design Information Bulletin; DIB 82-05 Pedestrian Accessibility Guidelines for Highway Projects
2. Caltrans Standard Drawing A88A – Curb Ramp Details
3. Caltrans Standard Drawing A88B – Curb Ramp and Island Passageway Details
4. Caltrans Standard Drawings A90A and A90B – Accessible Parking

Curb ramps must be designed and detailed with spot elevations, slopes, dimensions, and profiles of both the existing condition and proposed design.

B. Design Aids

The following are useful design aids for understanding and implementing ADA within the Public Right of Way:

1. CalDAG (California Disabled Accessibility Guidebook)
2. ADAG (Americans with Disabilities Act Guidelines)

3. PROWAG (Pedestrian Right-of-Way Accessibility Guidelines)

C. Design Exceptions

Design exceptions to ADA requirements must be specifically reviewed and approved by the University prior to construction. Requests for an ADA design exception must be proposed in writing by the Engineer of Work. The Engineer of Work must also sign and seal the Design Exception.

2. Site Preparation & Grading

2.1 Design Standards

2.1.1 Site Preparation

This section provides standards for all work that is required to prepare a site for construction of any public improvements, as defined in these Public Improvement Standards.

A. Verification of Underground Utilities

The location of underground utilities must be verified prior to excavation for all work that is covered by these standards and which also includes excavation or other risk to underground utilities. Potholing for locating utilities, for placing sign posts, or for placing fence posts must also be considered as excavation for the purposes of this section.

1. The person(s) performing the excavation must verify the exact location and depth of all utilities including those not shown on the plan prior to start of work.
2. Contact Underground Service Alert (USA) at (800) 642-2444 at least 48 hours before but not more than 10 days before the excavation.

B. Clearing and Grubbing

Clearing and grubbing activities must conform to the Standard Specifications. Additional requirements must apply if determined necessary by the project soils and geological report.

C. Tree Removal

All trees to be removed or impacted must be depicted on the improvement plans, and must be consistent with the environmental determination which was prepared for the project. Required tree removals must comply with section 12.24 of the University's Municipal Code.

D. Refuse Management

All projects must provide a plan for the collection, and disposal of solid waste material for both the residential and non-residential uses during construction, and post-construction activities. The plan must be submitted for approval by the University's Utilities Services Manager and the Community Development Director addressing the following codes and standards:

1. Management of refuse generations for waste, recyclables, and organics shall comply with state law, AB 1826, and the local waste management ordinance aimed to reduce greenhouse gas emissions.

2. Access to trash enclosure(s) shall conform to the requirements by the San Luis Garbage Company and refuse bins shall be sized to provide a reasonable level of service.
3. Separate refuse bins shall be accommodated within the site for waste, recycling, and organics.
4. Designs of trash enclosures shall comply with engineering standards, and aesthetic standards set by the Community Development Department.

2.1.2 Grading Design

Where applicable, grading constructed for projects regulated by these City Standards must conform to Sections 4 through 22 of the Standard Specifications and the latest edition of the California Building Code (CBC). In addition, grading activity reviewed by the University will be subject to the requirements listed below.

A. Grading Plan Submittals

All grading plans reviewed by the University must address the following requirements in their submittals:

1. Soils and Geological Report

The University may require a foundation and soils investigation and/or an engineering geologic report to substantiate road designs. For any grading, which may or will involve a structure (building pads, retaining wall foundations, etc.) the University will:

a) require that a foundation and soils investigation and/or engineering geologic report be submitted with the plans, or
b) documentation that a foundation and soils investigation and/or engineering geologic report is not required, in accordance with CBC Chapter 18, Section 1803.

If a foundation and soils investigation and/or engineering geologic report are required, the preparer of the investigation and/or the report must provide, prior to plan approval, a letter to the University stating that the plans were reviewed by him/her and that the plans conform to the investigation and/or the report.

2. Grading Quantities

The Project Engineer must enumerate the quantity of cut and of fill on the grading plan Title Sheet. When the project site is not anticipated to balance, a note must be provided on the grading plans stating that the earthwork sending/receiving site must secure the necessary permits prior to commencing work. When requested, then engineer of work must demonstrate that the necessary permits have been obtained prior to importing or exporting soil.

3. Erosion/Sedimentation Control Plan

All public improvements involving grading must prepare an Erosion and Sedimentation Control Plan. The grading plans must include a note identifying that proper dust control must be maintained at all times during construction. Dust control must conform to the provisions of Section 10 of the Standard Specifications.

4. Area of Disturbance

The total Area of Disturbance for the project must be shown on the Title Sheet. All projects involving site disturbance great than one acre must comply with the requirements of the National Pollutant Discharge Elimination System (NPDES). The Developer must submit a Notice of intent (NOI) to comply with the General Permit for Construction Activity with the Regional Water Quality Control Board (RWQCB). The Developer must provide the University with the Waste Discharge Identification Number (WDID #).

B. Grading Site Boundaries

Each lot line within a proposed new subdivision must be considered a "grading site boundary" for purposes of implementing grading setbacks as required by the CBC.

C. Foundation Elevations

All grading designs must depict on the plans the "point of discharge" which satisfies the requirements of the CBC, Section 1805.

D. Elevation Standards

The following requirements for the relationship between street improvements and building elevations must also apply to the architectural plans for building construction:

1. The plans must depict the finish floor elevation at all building entrances fronting a current or future public street.
2. The plans must depict the back-of-sidewalk elevations at the locations of all building entrances referenced in #1, based on a typical sidewalk cross-slope of 1.5%.
3. The plans must demonstrate compliance with ADA and CBC requirements for pedestrian access to all building entrances.

E. Slope Easements Required

Slope maintenance easements must be required for any excavation or embankment slopes which are steeper than 5:1 (horizontal: vertical) that extend outside the right-of-way. All such easements must also provide for access and working space rights.

F. Retaining Walls

Prior approval is required for the construction of any:

1. reinforced concrete,
2. reinforced concrete masonry unit (CMU), or
3. mortar-less element

retaining wall which would require a building permit. If a proposed wall is below the threshold where a building permit would be required, it must be shown in the grading plan in order to evaluate its relationship to site drainage. Retaining walls must be constructed based on an approved design. Examples of approved designs include:

1. Design Standards from the State Standard Plans.
2. Design Standards from an approved alternate reference.
3. Designs prepared, signed and sealed by a registered civil engineer.

In addition, the following requirements apply to any retaining walls proposed as part of any public improvements:

1. Designs for any retaining wall must include the location in plan view, a typical cross section, and an elevation view of the full length of the proposed wall. The Project Engineer must also provide all design calculations, signed and sealed, to the University for review, along with any applicable foundation and soils investigation or engineering geologic reports.
2. Wood retaining walls may not be greater than 2-feet in exposed height, and may be considered appropriate for landscaping purposes only. Wood retaining walls must not be located within the right-of-way.
3. Any wall greater than 30-inches in exposed height, within 3 feet of walkway, must include a guard (pedestrian railing) as defined in CBC Chapter 10, Section 1013 "Guards," or maintenance worker fence as defined by Cal-OSHA and shown in the State Standard Plans.
4. The Engineer of Work must demonstrate that wall designs are appropriate for the soil and loading conditions.

G. Preservation of Trees

Existing trees within the area of any grading must be preserved as required by the conditions of approval for the subdivision or land use permit. All trees to be removed or impacted must be clearly shown on the grading plan.

H. Stockpile Requirements

If a project will be stockpiling material from either on-site or off-site sources the following design criteria applies:

1. All stockpile location(s) must be shown on the grading plan and erosion control plan as well as the SWPPP, if a SWPPP is required. Stockpiles must be located a minimum of 50-feet away from drainage structures and water bodies such as creeks, rivers and drainage courses. Stockpiles must not be in environmentally sensitive areas.
2. Stockpiles may not be located on slopes greater than 20%.
3. No stockpile may remain longer than 6 months without prior written approval from the University.
4. All stockpiles must be shaped, not left in an "end dump condition". Stockpiles must have a slope of 3:1 or flatter with the top surface sloped downhill at minimum of 0.5% and a maximum of 5%.
5. Maximum height of any one stock pile may be 20 feet.

6. No one stockpile may exceed 5,000-cubic yards. Adjacent stock piles must not be located closer than 50-feet to each other. Measured from edge to edge.
7. All stockpiles regardless of time of year must have silt fence installed immediately around the perimeter of the stockpile at the toe of slope. This silt fence must be maintained until stockpile is removed.
8. Between April 15th and October 15th stockpiles remaining in-active for longer than one week must be covered with plastic and secured to control dust.
9. Between October 15th and April 15th (rainy season) stockpiles must be stripped of plastic coverings and appropriate Best Management Practices that reduce erosion potential and stabilize the slopes i.e. hydro-seeding, straw, straw wattles etc. be implemented.
10. Once a stockpile is removed, the area below must be returned to the original contours or final project finished grades with established vegetation. This must be done prior to acceptance of improvements.

2.2 Construction

2.2.2 Construction Testing

A. Compaction Standards

The Project Engineer must collect compaction data throughout construction and as required by the CBC. Following completion of the work, the Project Engineer must provide compaction reports to the University, certifying compliance with these requirements, for all the following areas:

1. Each graded lot pad
2. All roadways
3. All roadway shoulders
4. All sidewalk areas
5. All utility trenches

B. Elevation Certification

The Project Engineer must collect elevation data for all graded lot pads. Following completion of the work, the Project Engineer must provide elevation certifications to the University prior to grading permit final, or building foundation pour, whichever occurs first.

C. Inspections

1. The Developer must be responsible for ensuring that all required inspections are requested and performed; the Project Engineer must be responsible for the competency of all required inspections.
2. The Project Engineer must either: (a) document that no Special Inspections are required, or (b) prepare a Statement of Special Inspections in accordance with CBC Chapter 17, Section 1704.

D. Grading in Open Space Areas

No grading may occur in any Open Space area before the pertinent Open Space Agreement is recorded.

E. Erosion Control During Construction

Follow-up applications of hydro-seeding must be made as needed to maintain adequate soil protection. These applications must avoid over-spray onto the traveled way, sidewalks, lined drainage channels, and existing vegetation. After any rainfall event, the Developer is responsible for maintaining all slopes to prevent erosion.

F. Retaining Walls Inspection

Inspections are required at several phases of wall construction.

1. Footings (prior to pour)
2. Walls:
    a. Masonry: Pre-grout/reinforcement steel (prior to grouting)
    b. Reinforced concrete: Forms and reinforcement steel (prior to pouring)
3. Backfill/drainage (prior to backfill)
4. Final

3. Roadways

3.1 Design Standards

3.1.1 General

All roadway cross sections must generally conform with adopted Specific Plans and the Circulation Element of the General Plan, as modified by City direction specific to the area, and circumstances of development.

The design of a subdivision street system must result from an evaluation of topographical conditions, the traffic generated by the types and numbers of planned uses, and the purpose of each street. Street systems should be built to naturally encourage walking, community, safety and environmental stewardship. The University supports concepts such as Complete Streets, Green Streets, and Living Streets. Special approvals by the University Engineer will be needed for alternative street widths and elements. Minimum clear and passable street widths will be as required by the Fire Department.

A complete street is a street designed and built to accommodate all users of the roadway including:

1. Pedestrians
2. Bicyclists
3. transit riders
4. commercial vehicles
5. general motorists.

A complete street provides access for all users regardless of age or ability.

In sloping terrain, separate one-way travel lanes may be used to reduce cut and fill. Such one-way lanes must have a minimum unobstructed width of twenty feet, a minimum paved width of fourteen feet, and a maximum length of five hundred feet.

Wet utilities should be placed within the roadway prism for maximum accessibility.

3.1.2 Roadway Classifications

Classification	**Maximum ADT**	**Minimum LOS**	**Desired Maximum Speed**
Local Commercial Streets	5,000	-	25 mph
Local Residential Streets	1,500	-	25 mph
Commercial Collector Streets	10,000	-	25 mph
Residential Collector Streets (Minor)	3,000	-	25 mph
Residential Collector Streets (Major)	5,000	-	25 mph
Residential Arterials	-	LOS D	85th Percentile
Arterial Streets	-	LOS D LOS E - Down-town	85th Percentile
Parkway Arterials/ Regional Routes	-	LOS D	85th Percentile
Highway/Freeway/Ramps	-	LOS D	85th Percentile

Local Commercial Streets directly serve non-residential development that front them and channel traffic to commercial collector streets.

Local Residential Streets directly serve residential development that front them and channel traffic to residential collector streets.

Commercial Collector Streets collect traffic from commercial areas and channel it to arterials.

Residential Collector Streets collect traffic from residential areas and channel it to arterials.

Residential Arterials are bordered by residential property where preservation of neighborhood character is as important as providing for traffic flow and where speeds should be controlled.

Arterial Streets provide circulation between major activity centers and residential areas.

Parkway Arterials are arterial streets with landscaped medians and roadside areas, where the number of cross streets is limited and direct access from fronting properties is discouraged.

Highway/Regional Routes connect the University with other parts of the county and are used by people traveling throughout the county and state and are designated as primary traffic carriers. Segments of these routes leading into San Luis Obispo should include landscaped medians and roadside areas to better define them as community entryways.

Freeway is a regional route of significance where access is controlled.

3.1.3 Design Speed and Design Vehicle

Speed for City roads is defined as follows:

1. Average Speed is the summation of the instantaneous or spot-measured speeds at a specific location of vehicles divided by the number of vehicles observed.
2. Design Speed is used to determine the various geometric design features of a roadway. Design speed is selected in accordance with these standards or as determined by the University.
3. 85th-Percentile Speed is based upon measured field data and is the speed at or below which 85 percent of the motor vehicles travel.
4. Operating Speed is the speed at which a typical vehicle or the overall traffic operates. Operating speed might be defined with speed values such as the average, pace, or 85th percentile speeds.
5. Pace is the 10-mph speed range representing the speeds of the largest percentage of vehicles in the traffic stream.
6. Posted Speed is the speed determined following an engineering and traffic survey (CVC 627).
7. Prevailing Speed is the 85th percentile speed.
8. Running Speed is the average operating speed over a selected road segment. On a straight level road segment, the running speed will typically equal the prevailing speed throughout the road segment. On road segments with varying conditions such as a curving mountain road, the operating speed may vary at different points along the segment. The running speed is typically determined by the measuring average time to travel the full segment.

Roadway design speed for existing roadway must match existing 85th percentile vehicle speeds. Design speed for new streets is shown below:

Classification	**Design Speed**	**Design Vehicle***
Local Commercial Streets	25 mph	SU-40
Local Residential Streets	25 mph	SU-30
Commercial Collector Streets	25 mph	WB-50
Residential Collector Streets	25 mph	SU-30
Residential Arterials	45 mph	WB-50
Arterial Streets	45 mph	WB-50

Parkway Arterials	45 mph	WB-50
Highway/Regional Routes	45 mph	WB-50
Freeway	55 mph	WB-50

*See AASHTO "A Policy on Geometric Design of Highways and Streets" for design vehicle dimensions

All roadways and access driveways must provide necessary turn around space for emergency vehicles as required by the Fire Department.

3.1.4 Longitudinal Grade

Design of street grades must comply with the most current edition of AASHTO manual "A Policy on Geometric Design of Highways and Streets."

3.1.5 Horizontal and Vertical Alignment

Design of roadway curvature must comply with the most current edition of AASHTO manual "A Policy on Geometric Design of Highways and Streets."

Avoid use of compound curves. Use a minimum of 50-foot separation between horizontal curves.

Provide curb radii that allows for the design vehicles to turn at an intersection without crossing the centerline and into oncoming traffic. The minimum radii for curb ramps is 20' to allow for street sweeping.

All streets must intersect other streets at right angles, and must have at least 50 feet of centerline tangent, as measured from the prolongation of the cross-street property line to the angle point or beginning of curve.

Space for vehicles to turn-around must be provided at the ends of access streets with no outlet. A cul-de-sac may include landscaping or parking within a central island so long as space for turning and backing from driveways is provided. Design of terminus streets, such as cul-de-sacs, must be to the satisfaction of the University Fire Department and City Engineer. This requirement may be waived when the University determines the roadway may be extended, within a reasonable timeframe, in the future

3.1.6 Cross Slope

The slope transverse to the profile or flowline of roads or streets must conform to the following:

1. The standard cross-slope to be used for all new construction is 2.0 percent.
2. The minimum cross slope for widening any roads or streets is 1.0 percent, except for superelevated sections or approaches to cross gutters.
3. The maximum cross slope for widening any roads or streets is 5.0 percent, except for superelevated sections.

4. Grade breaks in the cross slope must be minimized where possible and in no case, be greater than 1.0 percent (algebraic difference) within the traveled lanes nor more than 3.0 percent (algebraic difference) within the paved shoulders.

Streets designed with superelevations must comply with the most current version of the HDM.

Slopes for crossings and access points must meet accessibility requirements.

Cross slope must be considered during street construction and rehabilitation design.

3.1.7 Intersecting Streets, Roads, Driveways, Alleys – Access Control

When two streets or roads intersect, neither must have a grade greater than 3.0 percent for a minimum distance of 40-feet measured from the curb line of the intersected street or road to the beginning of the first vertical curve. In unusually rough terrain, the University may allow up to a maximum of 5.0 percent.

Driveway connections to streets must be designed to conform to the sight distance and spacing requirements of the HDM Table 405.1B Application of Sight Distance Requirements and Engineering Standard 2120 and 7410. Driveways may not be located adjacent to intersection's operational areas.

Block lengths for local, collector, and arterial streets must comply with the latest version of the HDM Table 405.1B Application of Sight Distance Requirements for intersection spacing. For local and collector street block lengths in no case may be less than 150 feet and greater than 600 feet. For arterial streets block lengths in no case may be less than 600 feet. Street systems should be networked to improve connectivity and reduce travel distances for alternative transportation.

Street intersections must meet at an angle of 90 degrees where possible and in no case, may this angle be less than 85 degrees.

Waiver of access rights from abutting properties to public streets may be required by the University. Waiver of access rights must be approved by the University and clearly shown on the final or parcel map.

Alleys may be required in industrial, commercial, and residential subdivisions where necessary to provide alternative controlled access to arterial and thoroughfare streets. Alley right-of-way and pavement width must be a minimum of twenty feet. Where two alleys intersect, a paved area free of obstructions must be provided for safe visibility and turning.

3.1.8 Access Management

Private access points shall be designed in accordance with the following principles:

1. Limit and consolidate direct access to streets when possible.

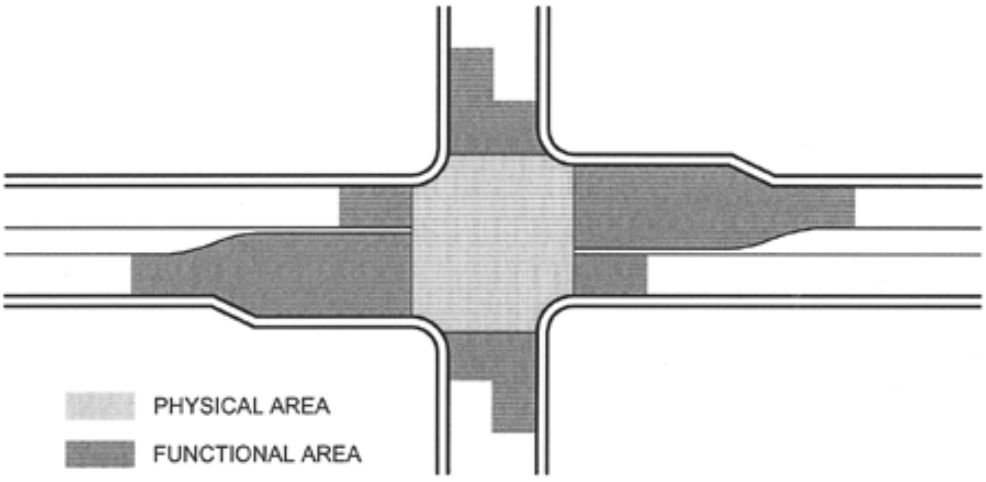
2. Address topographical and geometric limitations that may impact safety & operations
3. Minimize interference with through-traffic operations and accommodate adequate lane capacity for on-site traffic conditions.
4. Promote uniformly and well-spaced full movement intersections to reduce travel delay and crash risk.
   Secondary or more access points are provided based on necessity, where more than one access point is required or indispensable to the property due to circumstances that cannot be sufficiently mitigated by other means. There should be objective and factual evidence to justify and document necessity for multiple access points.

A. Intersections & Driveways:

Intersections should be well spaced at uniform intervals to help support the smooth and safe flow of traffic. New intersections should not be spaced where functional areas (Figure A-1) overlap. Intersections that would otherwise require all-way stop control or signalization should be controlled by Roundabouts or Neighborhood Traffic Circle. All-way stop or signal control may be used if a roundabout or traffic circle control is determined to be not feasible or operate at unacceptable levels. One-half mile spacing is recommended for traffic signals on major arterials.

New or modified driveways shall not be allowed within the functional area (Figure A-1) of adjacent signalized intersections with approach speeds of 30 mph or higher. Driveways maybe placed within the functional area when left turns are restricted or the intersection is controlled by a roundabout. New driveways on streets with speeds of 30 mph or higher should be have minimum spacing per the table below. Where property frontage length restricts attainment of minimum driveway spacing, driveways should be placed at the maximum spacing feasible. Closely spaced driveways may require restriction of left turns or application of a shared driveway.

Figure A-1: Functional Area



Upstream Functional Area		
Speed	Distance	
30 MPH	225'	+ 95th Percentile Queue Length
35 MPH	320'	+ 95th Percentile Queue Length
40 MPH	420'	+ 95th Percentile Queue Length
45 MPH	515'	+ 95th Percentile Queue Length
50 MPH	610'	+ 95th Percentile Queue Length
55 MPH	710'	+ 95th Percentile Queue Length

Downstream Functional Area & Min. Driveway Spacing	
Speed	Distance
25 MPH	150'
30 MPH	200'
35 MPH	250'
40 MPH	300'
45 MPH	360'
50 MPH	430'
55 MPH	500'

See Section 4 "Driveways and Off-Street Parking" for additional requirements.

3.1.9 Roadway Structural Section

Pavement design must follow the HDM, be based on a 20-year design life and the "R-value" of the subgrade material. New local streets must be designed for a 50-year life.

Pavement thickness must be based on Traffic Indices shown in City Engineering Standard 7110. New Roads must be designed to include the Caltrans safety factors of 0.20-foot and 0.10-foot, for flexible pavement with a base layer and for full depth asphalt, respectively. The Empirical Method for calculation of the structural section is discussed in Topic 633 of the HDM.

Variations of the design standards and pavement materials may be approved by the University Engineer to meet individual circumstances.

3.1.10 Sidewalks

A. General

Sidewalks are required on both sides of a roadway and must be designed and constructed per Engineering Standards. In compliance with Municipal Code Section 12.16.020 & 12.16.050 curb, gutter and sidewalk must be installed and maintained along a properties full frontage. In area without curb, gutter and sidewalk new curb, gutter and sidewalk must be installed with any building permit issuance that will:

1. construct or move a new building onto the property, or
2. reconstruct or remodel an existing building increasing the valuation of that building more than 50%.

In the event a frontage has been previously improved with concrete curbs, gutters, and sidewalks, the installation is subject to inspection by the University prior to the final approval of the building permit. In the event the existing concrete curb, gutter and/or sidewalk is damaged or fails to meet acceptable grades established for the frontage or ADA requirements. The permittee must remove and replace those portions of curb, gutter and sidewalk found unacceptable prior to occupancy of the building improvements or finalization of the permit.

B. Sidewalk

New installations of sidewalk minimum widths must be based on pedestrian demand with an objective LOS of B and minimum LOS C. Exceptions to minimum required sidewalk widths to meet

LOS analysis may be granted when the required sidewalk width is not consistent with neighborhood character and existing topography, street design, and density. Within the downtown planning area sidewalks shall have a minimum of 8 feet clear width. Otherwise, the standard minimum sidewalk width is 5 feet for detached and 6 feet when placed integral with curb and gutter. Sidewalk widths for commercial development may be required up to 7 feet detached, 12 feet integral. In areas where these widths cannot be maintained, sidewalk must have a minimum of 5 feet clear width.

New Integral curb, gutter and sidewalk must be constructed without a cold joint between the curb and the sidewalk.

Alternative surface materials may be approved on a case-by-case basis by the University Engineer to facilitate infiltration; however, ADA access requirements must be met. Sidewalks must slope to drainage facilities, either planting areas or gutters.

Any existing feature in the sidewalk that is of a special, unique, unusual, or historic nature, as determined by the University, must not be replaced, removed, or altered without specific approval of the University Engineer.

C. Curb Ramps Required

Any installation of concrete curbs, gutters and sidewalks fronting a property at a public road intersection must include the installation of curb ramps that comply with the current Engineering Standards. Curb ramps must be installed at each corner of an intersection. Existing curb ramps fronting the property that do not meet current standards must be repaired or replaced as needed. No curb ramps may be constructed of Hot Mix Asphalt. Locate curb ramps in the most logical place to accommodate pedestrian crossings. Curb extensions or bulb-outs may be required to improve visibility and to reduce pedestrian crossing distances.

Curb returns must be designed to minimize overly steep grades of curbs through the returns, to the satisfaction of the University Engineer. Generally, the grades of curb returns should not exceed the grades of the adjacent streets, and include accessible curb ramps. Additional landing area may be required at corners that are outside the planned right-of-way to accommodate curb ramps. Curb ramps must comply with the provisions and standards required by the University, State, and Federal Government. Any deviation from standards requires a signed design exception, approved by the University Engineer.

D. Mission Style Sidewalk District:

The following requirements apply to construction in the Mission Style Sidewalk District, which is defined in Resolution No. 9114 (2000 Series). See map in appendix.

Mission Style Sidewalk, curb and gutter must be constructed per City Engineering Standard 4220.

All driveways, curb ramps, tree wells and catch basins must conform to Mission Style Sidewalk requirements.

All sign posts and parking meter posts must be relocated behind the tile row and be installed per City Engineering Standards.

All new utility vaults, water meter boxes, and sewer cleanouts must be located behind the tile row or future tile row and must conform to City Standards. Wells, boxes, lids and covers must be stained or coated to match surrounding sidewalk. Stains and coatings must be submitted to the University for approval prior to application. Lids and covers may be cast iron or dark galvanized slip-resistant diamond-plate. Lids and covers in traffic areas must be traffic rated.

All new installations of Mission Style Sidewalk must include Mission Style Curb and Gutter.

Any existing feature in the sidewalk that is of a special, unique, unusual, or historic nature, as determined by the University, must not be replaced, removed, or altered without specific approval of the University Engineer.

E. Repair and Replacement of Sidewalk

Existing sidewalk fronting the property must be repaired and/or replaced as determined by the following criteria:

1. ADA maximum allowable sidewalk vertical displacement = 1/4-inch
    a. Vertical displacement of 3/4" or less – grind panel to provide smooth transition
    b. Vertical displacement greater than 3/4" – remove and replace panel
2. ADA maximum allowable sidewalk horizontal displacement = 1/2-inch
    a. Horizontal displacement of 1/2" to 3/4" – use appropriate patch filler
    b. Horizontal displacement greater than 3/4" – remove and replace 5-foot panel
3. Misalignment of curb face of 3/4" or greater – remove and replace section
4. Gutters subject to standing water 1/2" deep or greater and for a distance of 5-feet or more – remove and replace section.

3.1.11 Pedestrian Crossings

A. General

Crosswalks, either marked or unmarked, exist at all intersections of streets unless the local authority has implemented traffic controls to restrict the crossing of pedestrian traffic. For locations not controlled by:

1. traffic signals
2. yield signs
3. stop signs

Marked crosswalks and in-ground lighting systems may only be considered after an engineering study is performed per the University's crosswalk policy.

If determined marked crosswalks are appropriate, installations shall be in conformance with the University's crosswalk policy and Manual on Uniform Traffic Control Devices.

All pedestrian crossing must comply with the Pedestrian Crosswalk Policy.

B. Re-Installation or Removal of Marked Crosswalks

Re-installation of marked crosswalks may be evaluated as part of roadway resurfacing projects that cover pavement markings. Markings that do not meet the current design guidelines will be recommended for removal.

The California Vehicle Code, Section 21950.5, requires a public hearing 30 days prior to the removal of a crosswalk. Any crosswalk scheduled for removal must be posted at the site ten days prior to the scheduled hearing.

3.1.12 Bike Facilities

Bikeways must be incorporated into the design of any public improvements whenever a street is recommended for bikeway improvements in compliance with the adopted Bicycle Transportation Plan.

Bikeway design must comply with the University's adopted Bicycle Transportation Plan, Chapter 1000 of the HDM, MUTCD, and these Engineering Standards.

The University may approve alternatives to sidewalks or bicycle lanes incorporated into the roadway section. Such alternate routes must be within a public right-of-way or public easement and must provide a level of access and pedestrian/cyclist safety equivalent to or better than provided by conventional locations. Where alternative pedestrian paths or bicycle paths are provided to the satisfaction of the University, the conventional sidewalks or bicycle lanes may be eliminated. Where curbside parking is provided, there must be safe pedestrian access to it. The alternative pedestrian path or bicycle paths must be logically related to conventional sidewalks or bike lanes to safely divert pedestrian/bicycle travel from roadway sections lacking roadside walks or bike lanes.

The University may require improved walkways, in addition to sidewalks, through blocks more than nine hundred feet long to provide access to parks or public facilities.

Minimum Class I and Multi Use Bikeway Facility Width		
Type	**Paved Width**	**Notes and Additional Guidance**
Class 1 or Multi Use Path	12 ft	Include 2 foot shoulders on either side of all Class I or mulit-use path facilities.

Minimum Class II Bikeway Facility Width					
Type	**Paved Width**	**Next to Parking**	**Vehicles/Day**	**85% Motor Vehicle Speeds**	**Longitudinal Slope**
Class II	5 ft (default)	No	< 10,000	< 35 mph	< 4%
	6.5 ft (Meet 1 Criterion)	Yes	≥ 10,000	≥ 35 mph	≥ 4%
	8 ft (Meet 2 Criteria)	Yes	≥ 10,000	≥ 45 mph	> 4%
Class II Channelization (Use channelization when bike lane adjoins a right turn lane)	5 ft	yes			

* Facility width is measured from the centerline of stripe.

New class II bikeways should include a 2' buffer. Buffer may be included within the Class II bike lane paved width for widths greater than 6.5 ft.

3.1.13 Multi-Use Paths

A. General

Multi-use paths are multipurpose facilities suitable for serving a combination of:

1. recreational hikers
2. pedestrians
3. equestrians
4. bicyclists
5. other non-motorized vehicle users.

Multi-use paths within the University right-of-way must be designed and constructed in accordance with these standards. Multi use path width must be a minimum of 12 feet wide with 2 foot shoulders on each side.

B. ADA Compliant

Multi-use paths must meet ADA requirements for pedestrian paths including those for surface, width and grade unless a nearby ADA compliant alternate path is readily available.

C. HDM Compliant

Multi-use paths that are reasonably anticipated to convey bicycle traffic must be designed either as a "Class I Bikeway" or as "Trail" and must comply with Chapter 1000 of the HDM.

D. Attached and Detached Paths

Where a multi-use path is to be constructed, it may be attached (i.e., integral with the edge of the roadway pavement) or detached (separated from the roadway by a landscaped parkway).

When paths are attached, adequate space must be provided to accommodate 2' shoulder in addition to space for street furniture and signs as needed.

E. Crossing Locations

Multi-use paths which cross public streets or roads should only cross at intersections. Midblock crossings may be considered if warrants provide justification.

F. Path Termini

Where Multi-use paths terminate at or cross public streets, paths shall be split with a landscape median or similar to restrict vehicular traffic.

3.1.14 Street Parking

Parking is not allowed on regional highways. Parking on one or both sides is allowed on all other street types with Public Works Director approval. Where the proposed design allows parking in only certain areas, parking pockets, extended gutter construction, or other methods of clearly defining legal parking, are required.

Parking areas may be used for infiltration of stormwater where suited to the site conditions. Design must be such as to prevent damage to adjacent roadway sections from infiltration, to the satisfaction of the University Engineer.

The University may approve alternatives to the provision of curbside parking. Alternate parking may be allowed where the University determines the resulting street design is adequate for the type and extent of planned uses. Curbside parking reductions are encouraged in hillside developments to reduce grading, drainage run-off volumes, and pavement maintenance costs.

If curbside parking is not provided, alternate parking on-site may be required depending on the development type and anticipated parking demand.

3.1.15 Bus Turnouts

Where construction of a bus turnout is required by project conditions of approval, construct bus turnout in compliance with Engineering Standard 4920.

3.1.16 Cross Gutters

Cross gutters are only allowed at intersections. Cross gutters are not allowed to cross highway/regional routes or arterial streets.

3.1.17 Sight Distance

A. General

No signs, hedges, shrubbery, vegetation, fence or other sight distance obstruction may be placed within the restricted area at the corner of any public road intersection, inside curve of any knuckle, or within the sight triangle of any common driveway. An obstruction is considered any such item which is higher than 2.5-feet above either the nearest pavement surface or the nearest traveled way.

It is the responsibility of property owners to maintain sidewalks and multiuse paths fronting their property free from all encroachments.

B. Public Road Intersections

Sight distance at street intersections must comply with the Highway Design Manual Topic 405.

3.1.18 Roadway Clearances

A. Lateral Clearance

Excluding traffic signal equipment, the minimum lateral clearance is 5 feet for local street and 10 feet for all other street types.

Lateral clearance is measure from the edge of travel way to the edge of an un-yielding fixed object. Examples of unyielding fixed objects include, but are not limited to:

1. Trees
2. utility poles
3. transformers or other above-ground facilities
4. sampling stations or other utility installations
5. signs mounted on standards without “break-away” provisions.

Examples of yielding fixed objects which may be permitted within the lateral clearance include:

1. landscaping other than trees,
2. signs mounted on standards with “break-away” provisions
3. fire hydrants with “break-away” provisions.

B. Vertical Clearance

A minimum vertical clearance of not less than 15-feet, 18-feet preferred, must be provided above the travel way and shoulders, and 8-feet above sidewalks.

3.1.19 Right-of-Way

A. General

Right-of-way easement must be offered for dedication to the public and contain all elements of the roadway prism, as depicted in the Engineering Standards. Right-of-way must extend a minimum of 2' beyond either the edge of:

1. roadway shoulder,
2. back of curb, or
3. back of sidewalk

for the ultimate build out roadway section.

B. Cut and Fill Slopes within the Right of Way

Flatter slopes along the roadway provide:

1. improved appearance
2. reduced erosion
3. reduce maintenance needs
4. increase safety
5. increase public usability.

Therefore, where practical slopes should be 5:1 or flatter within the right-of-way. Where flatter side slopes are not practical the following minimums must apply:

1. 4:1 minimum for a minimum distance of 15 feet from the edge of traveled way on roads with a design speed greater than 30 MPH.
2. 3:1 minimum for a minimum distance of 15 feet from the edge of traveled way on roads with a design speed greater than 25 MPH.
3. 2:1 minimum on roads with a design speed equal to or less than 25 MPH.

The University may approve (via the design exception process) steeper slopes when the following conditions are demonstrated:

1. Proposed slopes have been determined to be stable by a geotechnical engineer
2. Adequate lateral clearance from the travel way is provided
3. Adequate erosion control can be established
4. Adequate access for maintenance is provided
5. Adequate sight distance is provided.
6. Adequate setback is provided from adjoining properties or adjoining facilities.
7. Adequate drainage is provided.

Where excavation or fill slopes continue beyond the street right-of-way, easements for the slopes may be required by the University.

3.1.20 Barricades, Barriers, and Railings

Where improvements only cover a portion of the ultimate improvement and where an improved street is proposed to be extended in the future, the improvements must include a barricade at the end to serve as a warning to the public. The barricade must be constructed, erected,

painted and signed in compliance with Engineering Standards and in compliance with the most current version of the MUTCD.

Railings and barriers must be placed as needed to address:

1. roadway safety conditions,
2. accommodate pedestrian and bicycle traffic,
3. comply with ADA requirements
4. comply with OSHA requirements.

The Project Engineer must evaluate the need to install such railings and barriers based on the following criteria:

1. Guardrails: Design guardrails in compliance with chapter 7 of Caltrans' Traffic Manual. The designer must consider the elimination of obstacles prior to proposing the installation of guardrails.
2. Bikeways: Railings must be installed on structures and along the pavement edge where embankment slopes drop off steeper than 2:1 within the lateral clearance requirement. Railings must conform to the Caltrans Bridge Design Specifications Section 2.7.2 "Bicycle Railing".
3. Pedestrian Railings: Railings are required for sidewalks or multi-use paths when:
    a. When a drop off exceeds 30-inches in height is within 5 feet.
    b. The adjacent slope exceeds 3:1.
4. For locations along the back of sidewalk where the drop-off is greater than 6-inches but less than 30-inches, a 6-inch warning curb must be installed along the edge in conformance with CalDAG.
5. Maintenance Work Surfaces: In any road right-of-way with retaining walls greater than 4-feet in height, but not subject to the bikeway or pedestrian requirements listed above, a railing system must be provided pursuant to OSHA Standard 1910.23(b) "Protection for wall opening and holes," for the safety of maintenance workers. Railing systems must be, at a minimum, a Cable Type railing as detailed in the State Standard Plans.

3.1.21 Street Lighting

A. General

All significant projects including but not limited to:

1. major remodels/substantial remodels: Projects involving the substantial remodel of existing structures that's estimated construction cost is in excess of 50 percent of the value of the existing building.
2. street widenings
3. multi-unit developments
4. high density residential

are subject to providing lighting per the requirements of this standard. Additionally, any

1. major remodels
2. re-developments, or

3. significant sidewalk replacement projects

in the downtown pedestrian lighting master plan area, must provide new pedestrian level lighting.

See section 86-6.01 of the Standard Specifications for Luminaire information.

See Engineering Standard 7520 for lighting circuit requirements.

See Engineering Standard 7910 for pole requirements.

B. Street Light Pole

Foundation mounted steel poles are only allowed for replacement of an existing foundation mounted pole on the existing foundation or as approved by the University Engineer. Embedded steel poles are preferred and must be used for all other conditions.

Street Lights installed in certain areas, such as the Downtown, may be required to be a specialized pole, as determined by the University.

Double arm poles (Type 15D) must be used only in parking lots or areas where a maintenance vehicle can readily access the pole without traffic control. Otherwise use of double arm poles will only be allowed upon approval of the University Engineer and will only be authorized when no other option exists.

C. Street Light Pole Placement Guidelines

Residential Street Light Poles are to be placed on lot lines whenever possible. Street Lights Poles and trees should have a 20-foot minimum horizontal separation. Street Light Poles and shrubs should have a 5-foot minimum horizontal separation.

Street / Intersection Width (1)	Street Light Pole Spacing	Pole Type and Location (3)	Pole Arm Length (2)(3)	Luminaire (4)
Less than or equal to 40 feet	Every 200 to 250 feet. Only one side of street. One light per intersection.	Embedded Pole 18 inches behind curb face	8 feet	Type 1
Greater than 40 feet	Every 200 to 250 feet. Alternating sides of street. Two lights (min.) per intersection.	Embedded Pole 18 inches behind curb face	8 feet	Type 2

(1) Curb to Curb distance
(2) Not including luminaire

(3) Intersection lighting must be placed to minimize the likelihood of the pole being struck by turning traffic and may be set back from the curb face if needed and a longer arm installed to meet light placement requirements.
(4) Refer to Section 86-6.01 "LED LUMINAIRES" of the Standard Specifications for Luminaire information.

D. Street Light Service

Electrical service points must be obtained from PG&E. When the lighting has been installed in conformance with the University's requirements, the University will authorize PG&E to energize those lights installed as part of public improvements and will be owned and maintained by the University. Lights to be owned and maintained by a private party must be authorized to energize by that party.

When service points are used for more than one light in series, an electrical design for the lighting circuit must be submitted to the University for approval. Voltage drop between the point of service and the end of each lighting circuit must not exceed 5 percent. All street lighting must be 120VAC.

3.1.22 Intersection Controls

New intersections that would otherwise be controlled by all-way stop or signalization shall be controlled by roundabout or traffic circle except where operational or physical constraints render roundabout control infeasible. Roundabout design shall conform to FHWA roundabout design guidelines.

All-way stop control and signalization shall only be considered if Manual on Uniform Traffic Control Devices warrants are satisfied for the respective control type. Satisfaction of warrants is only a prerequisite for consideration and shall not require the installation of either control. All-way stop control and Traffic Signals must comply with current design standards in the Manual on Uniform Traffic Control Design.

Traffic signal conduit fill must not exceed 25%.

3.1.23 Streets Trees

A. Definitions

Rights of Way

1. Fee title: City owns the land on which the road is constructed.
2. Easement: Adjoining property owners own the land on which the road and sidewalk is constructed.
3. Street Tree Easement: Easement area adjacent to sidewalk or public utilities easement reserved for street tree installation.
4. Public Utility Easement: Easement area adjacent to sidewalk typically reserved for utilities and street tree installations.

5. Public Right-of-Way: Area reserved for road, curb, gutter, and sidewalk. This area width is typically from back or sidewalk on one side of roadway to back of sidewalk on the other side of the roadway.

Tree Ownership

1. City tree: Any tree partially or wholly based in a "fee title" right-of-way.
2. City tree: Any tree within the public right-of-way, easement or fee title.
3. City tree: Any tree in designated street tree easement or public utility easement, including those trees planted as a condition of approved development.
4. Privately owned tree: Any tree not designated as City tree.

Hazardous Tree – any tree that contains one or more of the following conditions:

1. Split trunk.
2. Cracked main branches.
3. Trunk leaning off vertical by at least 15 degrees.
4. Diseased or damaged trunk or main branches.
5. Over half of main branches have been broken off leaving skeleton or unsightly tree.
6. Any condition that threatens the safety of the public or endangers City facilities.
7. Dead tree.

Install one street tree per 35 feet of street frontage. Street trees may be grouped if necessary to avoid conflict with other improvements.

Parkway areas which include trees must be a minimum of 5 feet wide. Parkways created in existing integral sidewalk areas will be handled on a case-by-case basis.

B. Preservation of Existing Trees

Existing trees within the area of any roadway public improvement must be preserved unless a tree removal permit has been issued. All trees within or near the lateral clearance requirements must be shown on the improvement plans. All trees planned to be removed or impacted by the improvements must be shown on the improvement plans.

C. Responsibility for Trees

1. The University will maintain City trees (those within fee rights-of-way).
2. Privately owned trees must be maintained by the property owner.

D. Procedures for Applying for Tree Removal within City Rights-of-Way

Trees within Street Tree Easement or Public Utilities Easement adjacent to the right-of-way may be removed by the property owner at the property owner's expense subject to the following the issuance of a Tree Removal Permit from the University.

3.2 Construction

3.2.1 Testing

A. General

Project testing must conform to the requirements of the University's Quality Assurance Program.

B. Basement Soil

Resistance factor "R" tests must be made by the Project Engineer as required by the University. The location of the tests within the area must be selected so that an average "R" value may be determined for the entire development area.

"R" value tests may be required prior to approval of construction plans in cases where a road is anticipated to have a high forecast traffic volumes and traffic index or known poor quality basement soil.

4 Driveways and Off-Street Parking

4.1 General

Driveways, driveway ramps, parking stalls, and aisles, including pavement, drainage, landscaping, screen fencing, and lighting, must conform to these standards and all requirements of the Municipal Code. All spaces and driveways must be designed to function properly. City inspection is required at appropriate times to ensure that all specifications are met.

The grade break at the gutter should not exceed 20 percent at a driveway to prevent vehicles from dragging on the ground or sidewalk.

Parking lots and driveways must be paved with an all-weather surface, such as asphaltic concrete (AC) pavement or Portland cement concrete (PCC) pavement.

4.2 Permits

If the parking lot is not a part of a larger project, the builder must obtain a parking lot permit from the Community Development Department prior to constructing a new or modifying an existing parking lot. To obtain a permit, a plan for the project must be submitted to the Community Development Department.

Any restriping or improvements, other than for maintenance purposes, to a parking lot also requires approval of a parking lot permit by the Community Development Department.

4.3 Plans

Plans for the parking lots must conform to city standards and must show design for grading, paving, striping, signing, curbing, lighting, landscaping, and trash enclosures.

4.4 Driveways

4.4.1 Driveways on Arterial and Collector Street

Driveways on arterial streets must conform to the following requirements:

1. Driveway access may must comply with section 3.1.8 "Access Management "of this standard.
2. Driveways may only be served by a break in a center median when such a break is not detrimental to the traffic flow.
3. Where possible, driveways must be located on cross streets or roads, rather than on arterial or collector streets.

4.4.2 Driveway Widths

Driveways must be the same width as the curb opening (not including the transitions). They must be within the width limitations noted on Engineering Standard 2120. Exceptions may be granted in special circumstances by the Public Works Director or Community Development Director. Unless authorized by the:

1. Public Works Director
2. Property owner
3. Adjacent property owner
4. Community Development Director

the driveway ramp and transition must lie entirely in front of the property served. The Fire Department may require greater driveway widths to allow for proper emergency vehicle access.

4.4.3 Number of Driveways Permitted

Only one driveway is allowed per street frontage for residential property unless the frontage exceeds 70 feet; then a maximum of 30 percent of the frontage may be in driveways. The total width of all driveways to commercial or industrial property must not exceed 50 percent of the frontage of the property. Additional restrictions may be placed on driveways entering arterial streets in order to minimize the disruption to traffic.

4.4.4 Abandoned Driveways

As a condition of permit issuance, all abandoned driveways and driveway ramps on the same property must be removed, landscaped and the curb, gutter, and sidewalk properly restored.

4.4.5 Turnarounds – Deep Driveways

Driveways which are over 100 feet long must have a turnaround at the end allowing cars to safely exit in a forward direction. In some instances, the Community Development Director may require turnarounds for shorter driveways.

4.4.6 Turnarounds – Single-Family House Driveways

Single family residential developments generally do not require turnarounds unless there are extreme grade, fire hazard or alignment problems as determined by the Community Development Director or Fire Marshall.

4.4.7 Common-Access Driveways

Common access driveways may be permitted:

1. On lots of record (existing before the effective date of this section) if the Community Development Director approves an administrative use permit; or
2. In new subdivisions where a common driveway is proposed as part of subdivision approval.

A common-access driveway must meet all the following criteria:

1. The driveway must not be inappropriately located (for example, too close to a dwelling, play area or sloped bank).
2. It must be determined that there is no significant potential for conflict between the parties sharing the driveway because of its location, length, grade, usage, or other characteristics.

Residential common-access driveways, those driveways that serve premises zoned or used for residential purposes must:

1. Provide an easement and covenant filed with the County Recorder setting forth driveway usage rights and responsibilities of each parcel serviced. This instrument must be in place prior to any permit issuance authorizing construction and at a minimum include the following provisions:
2. All affected property owners will be jointly responsible for the improvement and maintenance of all parts of the common-access driveway.
3. All parking on the commonly used portions of the driveway is prohibited.
4. Any affected property owner may use vehicle-removing authority granted private property owners in Section 22658 of the California Vehicle Code when any vehicle is parked in the common-access driveway and interferes with entry or access to a parcel it serves.
5. Property owners agree to hold the University harmless from all claims of damages or liability arising from any action to tow away vehicles pursuant to section “c” above.
6. If the easement or covenant is abandoned or dissolved, each lot previously served by the common-access driveway must be provided with standard access as required by these regulations.
7. The driveway must serve no more than four residential units unless special circumstances warrant the grant of an exception by the Community Development Director.
8. The Director or Planning Commission may add other requirements or conditions deemed necessary or appropriate.

Commercial and industrial common access driveways, those that serve premises zoned or used for commercial or industrial purposes, may be subject to all conditions of residential common

access driveways in addition to other requirements or conditions the University deems necessary or appropriate.

4.5 Off-Street Parking

4.5.1 General

Location and design must comply with the Community Design Guidelines.

A. Pavement Surfacing

Parking lots and driveways must be paved with an all-weather surface, such as asphaltic concrete (AC) pavement or Portland cement concrete (PCC) pavement. The minimum thickness of pavement must be as specified in these standards. Base material must be compacted to a minimum of 95 percent. Compaction test reports must be submitted to the Community Development Department for verification of proper compaction. All motorcycle spaces within parking lots must be PCC pavement. If surfacing is allowed within the dripline of existing trees, porous pavement surfaces must be used if approved or required by the University Arborist.

Alternative Permanent Paving: The Community Development Director may approve alternatives to AC or PCC paving surfaces on private property. The Director may approve such alternative paving to achieve aesthetic and environmental objectives, such as:

1. improved appearance,
2. increased water percolation,
3. reduced erosion and runoff,
4. increased aeration and water for tree roots,
5. reduced glare,
6. increased area available for landscaping

upon finding that the alternative paving will provide public aesthetic or environmental benefits, and is equal to or better than AC or PCC paving in terms of:

1. public safety,
2. performance,
3. strength,
4. quality
5. durability

Examples of permanent alternative paving surfaces include, but are not limited to:

1. interlocking pavers,
2. eco-block,
3. porous AC paving,
4. cobblestone,
5. or other equivalent material as determined by the Community Development Director.

Alternative paving materials, when installed per manufacturer's specifications, must provide a suitable, all-weather, load-bearing surface to support passenger cars and light-duty trucks. Alternative paving surfaces for driveways or parking lots serving large commercial vehicles or fire

trucks must be designed to accommodate a maximum vehicle weight of 45,000 lbs. Alternative paving materials over City utility easements will not be repaired or maintained by the University.

B. Geometrics

Turning Radii: The minimum allowable inside vehicle turning radius in parking and driveway areas must be 20 feet unless Fire Apparatus access is necessary, in which case the minimum inside radius must be 30.5 feet and the outside radius must be 46 feet or as required by the Fire Department. (Turning radii are not necessarily the radii of curbs around islands and other improvements.) Additional details are as shown on the standard drawing.

Spaces Which Back onto Street: Except as noted in Tandem Parking Below, parking spaces which back directly onto the public street must be set back a minimum of 20 feet from the back of the sidewalk, regardless of the zoning of the property. No portion of any parking space or aisle, except driveways for ingress or egress, must be permitted in a required street yard setback area.

Tandem Parking: Residential uses may have required spaces arranged in tandem subject to the approval of the Community Development Director. Single dwellings where tandem parking is approved may have one unenclosed parking space within the street yard (refer to Section 17.16.020 - Yards in the University's Zoning Regulations).

Walls/Walkways/Entrances: A parking space facing a wall containing entrances and abutting a walkway to those entrances must be at least 4 feet clear of such a wall.

Wheel Stops: Wheel stops are required if the space is headed into a wall, fence, landscaped area, building, walkway, or side of another auto. Additional wheel stops may be required by the Community Development Department. Concrete curbing may be substituted for wheel stops with the approval of the Community Development Director.

Overhangs/Encroachments: Dimensions shown on the standards must be clear of overhangs or other encroachments which might interfere with vehicular access. Circulation areas must be provided at the ends of aisles.

Maneuvering: Parking lots with more than six spaces must be designed so that automobiles will exit onto a public street in a forward direction and with no more than two maneuvers. A maneuver is defined as each motion in either a forward or backward direction. No space may be allowed that requires a vehicle to be maneuvered on the public sidewalk to exit. All spaces must be designed to be entered in one maneuver. A turnaround may be required if it's considered unsafe for a vehicle to back into the street by the Community Development Department and/or Public Works Director.

Stall Sizes: All parking stalls must comply with the parking bay dimension standards for average sized cars as provided in the engineering standard details. Upon approval of an exception by the Community Development Director or Architectural Review Commission, a limited number of compact parking spaces may be allowed if justified by unusual circumstances such as saving a tree or using otherwise unusable space. Compact stalls, if used, must be designed and constructed in accordance with the engineering standard details. Accessible spaces must be designed and constructed in accordance with state and local requirements.

Motorcycle Spaces: All motorcycle spaces must be designed and constructed in compliance with the engineering standards for motorcycle spaces.

Bicycle Parking Standards: Bicycle parking must be provided in accordance with city zoning requirements. Bicycle parking may include racks and/or lockers to the approval of the Community Development Department.

Truck Access: Commercial and industrial parking lots serving loading zones must be designed to accommodate access and circulation movement for on-site truck circulation. The Community Development Director or Public Works Director may require wider driveways and aisles as determined warranted.

Safety Features: Additional requirements and guidelines for parking facility safety including:

1. design,
2. internal layout,
3. acceptable turning radii,
4. pavement slope,
5. vehicular and pedestrian circulation, and
6. other design features

may be required by the Community Development Director. Visibility of and between pedestrians, bicyclists and motorists must be ensured when:

1. entering individual parking spaces,
2. circulating within a parking facility,
3. entering and exiting a parking facility

To the extent possible, the parking facility must be designed so that primary pedestrian access to and from building entrances is along, rather than across parking aisles. Bicycle and automobile parking areas must be separated by a physical barrier or sufficient identification and distance to protect parked bicycles from damage by cars.

Access for off-street parking facilities: The location and design of all entrances and exits onto public rights-of-way is subject to the approval of the Director of Public Works to ensure minimum interference with the traffic flow and adequate site clearance.

Clearance for off-street parking facilities: All driveways must maintain a vertical clearance of not less than 12 feet. Where fire access is required a vertical clearance of not less than 13.5 feet is required. No encroachment into this vertical clearance may be permitted.

C. Slope

Parking spaces may not slope more than 5 percent in any direction and no less than 0.5 percent in the direction of drainage. A maximum of 10 percent slope in aisle and turn-around areas may be allowed. Swales of less than 1 percent slope must be concrete. Variations of these standards may be allowed by the Community Development Director for hardship situations providing safety and convenience concerns have been met.

D. Drainage

All parking facilities must be graded and drained to dispose of surface water, subject to the approval of the University Engineer. Oil separation or low impact development stormwater devices are required. Surfacing, curbing and drainage improvements must be sufficient to prevent the free flow of water onto adjacent properties or public streets or alleys, and to avoid standing pools of water within the parking facility.

E. Marking and Signing

Except for R-1 zoned and R-2 zoned property, entrances and exits that are one-way must be marked with an approved sign and pavement marking. Accessible, compact car, and loading spaces must be signed with pavement marking or markings on wheel stops in accordance with state code and local laws. The minimum dimensions of parking bays and maneuvering aisles must comply with Engineering Standard. The number and size of accessible spaces are specified in the California Building Code (part 2 of Title 24) Chapter 11. Each accessible parking space must comply with the most current version of Caltrans Standard Plan A90A or A90B.ADA spaces must be marked and signed to current requirements.

F. Parking Lot Maintenance

It is the duty of the property owner to maintain and repair the parking lot and related improvements in accordance with the above standards and any other conditions imposed at the time of approval. If the Community Development Department finds that the lot needs maintenance or repair, to ensure public safety and welfare, the University may pursue enforcement under the authorities of the Municipal Code.

G. Loading Zones

Off-street loading zones must be a minimum of 12 feet wide and 25 feet long. Loading zones must be designed so that trucks parking in them will not encroach onto the public right-of-way or into required parking spaces or driveways. Loading spaces designed for large trucks must have appropriately larger access to allow maneuvering without encroaching into landscape areas. Loading zones or areas may not encroach into fire lanes. Loading zones (spaces) must be provided in accordance with the University's zoning regulations (refer to sections 17.46.020 and 17.48.010).

Additional loading zones may be required by the Community Development Department or Fire Department.

H. Screening

In Large Parking Lots: Any parking lot with more than six parking spaces adjoining a street must have the street frontage screened with a 3-foot (minimum) high wall, fence, and hedge consisting of 5-gallon or larger plants, or landscaped berm. The area between such screen and the street must be landscaped.

Near Residential Development: A parking lot on a site adjacent to a residential development or next to a residential zone must be screened by a solid 6-foot-high wall, fence, or an existing mature hedge.

I. Landscaping

Planting Area Placement: Provide planting areas in all parking lots after each sixth parking space in any row and at the ends of each row of parking spaces. Landscape areas must have a minimum dimension of 4 feet by 4 feet; except, those areas with trees must have a minimum dimension of 8 feet by 8 feet. Landscape areas must be defined by concrete curbs or bands designed to minimize damage to pavement caused by irrigation of landscaping. Landscape areas defining ends of rows must extend to the minimum inside turn radius, must not conflict with an aisle or back-up area, nor be less than 4 feet in width. (Exceptions to this provision may be granted by the Community Development Department or the Architectural Review Commission.)

Planting Arrangement: To prevent large expanses of pavement, parking lots must have at least 5 percent of their surface devoted to landscaping (exclusive of setbacks) arranged in an appropriate and effective manner. Additional landscape area may be required by the Community Development Department or the Architectural Review Commission.

Maintenance: In all zones, required street yard areas must be landscaped and perpetually maintained. All landscape planting must be maintained and dead plants must be replaced as necessary. Drought tolerant planting must be used in accordance with the University's landscape standards for water conservation.

J. Landscape Preservation

Planting areas which may be hit by automobiles or where drainage control is necessary must be defined by a 6-inch curb or berm of reinforced concrete, brick, or block. A header-board protected by parking bumpers or other suitable permanent material may be approved by the Community Development Department. Header boards, walls or berms must also be provided between the back of a City sidewalk and a planting area to prevent soil from washing onto the sidewalk.

K. Temporary Parking Lots

Parking lots and driveways which will be used for one year or less may be developed with Community Development Director approval. The Director may require a recorded agreement and/or cash surety to guarantee:

1. removal of the temporary parking
2. site restoration
3. and clean-up and/or repair of City streets

Such temporary facilities need not provide landscaping, striping and wheel stops as would otherwise be required for permanent facilities, but they must meet all other parking and driveway design standards (parking space and driveway dimensions, aisle widths, and so on). Temporary parking lots and driveways must have an all-weather, dust-free surface with sufficient compacted base material or undisturbed grade to safely accommodate the intended use. Examples of temporary paving surfaces include, but are not limited to:

1. compacted "redrock" or decomposed granite;
2. compacted road base over compacted natural grade;
3. other temporary surface which the Director determines to provide an all-weather load-bearing surface equivalent to the above materials in terms of safety, maintenance, and appearance.

Gravel or similar materials must not be used where average cross-slopes exceeds 5 percent.

L. Irrigation

Landscape areas must have a permanent underground irrigation system. Irrigation must provide uniform precipitation for overhead areas and adequate water to maintain healthy plants. Check valves are required at the toe of all slopes to prevent low head drainage. Overspray must be minimized to prevent runoff, and shall be consistent with the University's water conservation measures.

M. Lighting

Lighting must comply with Community Design Guidelines 2010 Section 6.1.C.

5. Drainage

5.1 Design Standards

5.1.1 Requirements

A. General

All new development or redevelopment must comply with the criteria and standards set forth in the:

1. Waterways Management Plan – Drainage Design Manual,
2. applicable area specific plans,
3. and the Post-Construction Stormwater Management Requirements for Development Projects in the Central Coast Region, adopted by the Central Coast Regional Water Quality Control Board, and included in their appendices.

Where requirements conflict, the stricter requirement applies.

Stormwater Control Plan, and Operation and Maintenance Plan are required prior to final approvals.

Stormwater management facilities may be built into the right-of-way, including medians, traffic circles, and parkways, subject to approval by the University Engineer. Where stormwater management features are built into the right-of-way, water must be managed to prevent damage to the roadway structural integrity.

B. Provide for Overland Escape

All components of drainage systems in public improvements must be evaluated to consider the effect of failure of individual components and identify the route of overland escape. The evaluation must identify any necessary measures to prevent erosion or flooding along this route.

C. Conveyance of Drainage in Urban Areas

Drainage must be conveyed in surface facilities such as:

1. bioswales,
2. street gutters
3. cross-gutters
4. basins

to the maximum extent possible. Flows which cannot be conveyed within the capacity of these facilities may be conveyed in culverts or storm drains.

D. Sidewalk Underdrains

No concentrated flows may be permitted across the surface of any sidewalk. Inlets or under-sidewalk drains must be used in such situations.

5.1.2 Alignment of Drainage Facilities

A. Locate within Road or Public Easement

Drainage facilities accepting runoff from public streets or other public areas must be in a public street or within a public drainage easement. These easements must be offered for dedication to the public.

B. Avoid Combining with Utility Easements

Drainage easements must be used for drainage purposes exclusively and not combined with easements required for other public utility purposes.

C. Easement Width

Easements for culverts and drainage facilities must be a minimum width of 15-feet. All such easements must provide access and future maintenance working areas. Easements must be along or adjacent to property lines and outside areas of proposed or existing structures.

When drainage pipes are 24-inch in diameter or greater, or trenches exceeding 5-feet in depth, provide additional drainage width to accommodate future maintenance needs.

D. Storm Drain Alignment

Storm drain pipes must be parallel with the centerline of streets. The design must avoid:

1. Meandering
2. Offsetting
3. unnecessary angular changes.

No angular changes more than 10 degrees may be made without a junction structure. No single change, even with a junction structure, may exceed 90 degrees.

E. Cross Culvert Alignment

Cross culverts must be aligned with the natural water course and which might not be perpendicular to the road way. The culvert must be sized and sloped to not cause downstream erosion.

5.1.3 Drainage Structures

A. Manholes

Standard precast concrete manholes must be used wherever feasible. When cases arise where special manholes or junction boxes are required, the design must be prepared by a Civil Engineer and submitted to the University for review. Manholes must conform to the following requirements:

1. Place manholes, at a minimum, every 500 feet.
2. Place manholes at junction points.
3. Place manholes at changes in gradient
4. Place manholes when pipes change size.
5. On curved pipes with radii of 200 feet to 400 feet, place manholes at the BC or EC of the curve and on 300-foot maximum intervals along the curve.

B. Catch Basin

Catch basins must conform to the following requirements:

1. Design capacity and spacing of drainage inlets so the spread of water roadway design event does not inundate the traveled way see Section 5.1.2.A for design parameters.
2. Sufficient drainage capacity must be provided within the road right-of-way and other drainage facilities to convey a 100-year storm without damage to any structures.
3. No more than 1.0 cubic feet per second may be allowed to "bypass" a midblock inlet. No more than 0.3 cubic feet per second may be allowed to "bypass" a curb return at an intersection.
4. Sheet flow across a road must not exceed 0.1 cubic feet per second.

C. Junction Boxes

Junction boxes must conform to the following requirements:

1. Junction boxes may be construction per:
    a. Engineering Standard Storm Drain Manholes,
    b. Caltrans Standard Plans for Junction Boxes, or

c. individual design prepared and stamped by a Civil Engineer that includes the design, structural calculations, and design loading.

2. The inside dimension of junction boxes must be such as to provide a minimum of 3-inches clearance on the outside diameter of the largest outfall pipe.
3. Standard manhole entrance.

D. Other Structures

The following requirements apply to drainage structures, as required by the University:

1. Trash racks must be provided where in the opinion of the University they are necessary to prevent clogging of culverts, storm drains, or to provide safety to the public.
2. Guardrail or pedestrian/worker railings may be required by the University at culverts, headwalls, and box culverts and on steep side-slopes.

5.1.4 Bioretention Basins

A. General

In addition to flood control basins, bioretention basins can be used to improve storm water quality and reduce flooding impacts in storms.

B. Design Criteria

The following must be considered and presented in the design of bioretention basins and bios-wales.

1. Lateral distance to vehicle travel lanes, bike lanes, and pedestrian paths
2. Vertical drop offs adjacent to travel lanes, bike lanes, and pedestrian paths
3. Long term percolation rate
4. Landscape establishment and irrigation
5. Maintenance practicality including landscape maintenance and maintenance access
6. Porosity of engineered soil Bioretention Soil Media (BSM)

C. Materials

1. Bioretention Soil Media (BSM). Use a mixture of sand and compost conforming to the post construction handbook or other source approved by the University
2. Filter fabric is prone to clogging and may not normally be used within the right-of-way.
3. In lieu of filter fabric, use gravel filter conforming to Caltrans Class 2 Permeable Material per Section 68 of the State standards or approved equal.

D. Maintenance

Perpetual maintenance of bioretention basins and landscaping is the responsibility of the Developer, unless the maintenance responsibility is assumed by a public entity or a property owners' association.

5.1.5 Bioswales

A. Facility Design and Dimensions

1. Bottom width: Provide 2′ wide minimum flat bottom for facilities with side slopes and longitudinal slope.
2. Allowable standing water duration: 72 hours.
3. Planter minimum widths are typically associated with their application. Considerations influencing minimum widths include: 4′ minimum for planters with trees, 2′ minimum for planters without trees
4. Ponding depth - Min. 6", max. 12"
5. Planter depth – (from adjacent pedestrian walking surface to facility finished elevation/planting surface) is based on desired ponding plus freeboard, but also relates to planter width. Planters can be deeper if they are wider, and need to be shallower as they narrow. This is a pedestrian perception and safety issue. Some recommended width to depth guidelines are:

Planter Width	Max. Planter Depth
Greater than 5 feet	16 inches
4 – 5 feet	12 inches
3 – 4 feet	10 inches
2 – 3 feet	8 inches

B. Slopes and Grades

1. Side slope: 4:1 or 3:1 maximum with a minimum 12-inch-wide shoulder (2% slope toward facility) adjacent to pedestrian use or curb.
2. Longitudinal slope: Maximum 6% longitudinal slope of bottom. Erosion and movement of soil and mulch intensifies with increased longitudinal slope, minimize longitudinal slope. Stair stepping planters on a slope to provide flat bottomed cells separated by check dam/weir overflows can provide more storage and infiltration than a sloped facility.
3. Grades on opposite sides within a facility should be similar to optimize ponding across the entire basin/cell.

C. Infrastructure

1. Inlet curb cut design selection should be based on application considerations:
    a. Sloped sided or flat/planter facility
    b. Curb and gutter adjacent to facility or separated by pedestrian sidewalk
2. Sidewalk edge type selection should be based on application considerations:
    a. New or retrofit
    b. Sloped sided or flat/planter
3. Sidewalk Curb: flat/planter requires 4” min. height curb adjacent to sidewalk for pedestrian safety. Provide 4 to 6-inch-wide sidewalk curb notch when sidewalk drains to planter. Provide as many notches as required to convey flow.

4. Energy dissipation: provide aggregate splash pads at inlets per inlet details. Provide 6" depth, 3" – 6" rounded, washed cobble. For sloped sided facilities where inlet flow velocity is high, extend cobble into facility, but avoid excessive or decorative use.
5. Overflow structure: Provide overflow structure or connect to approved discharge point.

D. Soil, Aggregate and Mulch

1. Aggregate layer: Where an aggregate layer is included in the design use Caltrans Class 2 Permeable. Caltrans Class 2 Permeable does not require an aggregate filter course between the aggregate storage layer and the bioretention soil media above. When Caltrans Class 2 Permeable is not available, substitute Caltrans Class 3 Permeable. Class 3 Permeable requires an overlying 3" deep layer of ¾" (No. 4) open graded aggregate (between Class 3 and bioretention soil media above). Use a minimum depth of 12 inches.
2. Bioretention Soil Media (BSM): use Bay Area Stormwater Management Agencies Association (BASMAA) Specification of Soils for Biotreatment or Bioretention Facilities (Attachment L). Provide pre-mixed BSM, do not mix onsite. Provide a minimum of 24 inches of BSM depth. Where aggregate layer is used and trees are specified, replace aggregate with increased BSM depth in tree planting locations.
3. Filter fabric - do not use fabric between BSM and aggregate layer
4. Provide mulch depth of 2 to 3 inches. Mulch use optional below ponding high water mark. Do not apply mulch in ponding zone just prior to or during rainy season. Mulch non-floating mulch.

E. Planting, Irrigation, and Underdrains

1. Irrigation: Provide irrigation for plant establishment (2-3 years), and supplemental irrigation during periods of prolonged drought. Provide separate zone for connection to water supply
2. Planting: Do not locate plants at inlets. Consider mature growth to determine planting layout and avoid future blockage of inlets by plants.
3. Underdrain: Use 4" diameter, PVC SDR 35 perforated pipe. Install underdrain with holes facing down. Underdrain discharge elevation must be near top of aggregate layer. Underdrain slope may be flat. Provide capped, threaded PVC cleanout for underdrain, 4" min. dia. with sweep bend.

5.1.6 Channel and Swales

No diversion to roadside ditches will be allowed from natural drainage courses.

A. Types

Open channels may be:

1. natural watercourses
2. earthen channels
3. swales
4. bioswales

or channels or swales lined with the materials such as those listed below. Channels lined with impermeable surfaces such as:

1. concrete
2. mortar
3. pipe-like materials

are discouraged and may only be used where permeable linings are impractical.

Lining materials must be selected that:

1. are non-erosive under velocities calculated in the design storm
2. provide ease of ongoing maintenance

Where linings are required, they must extend to the full height of freeboard, as defined below.

B. Freeboard and Side Slopes Required

Channels or swales may be required to be lined to an elevation of at least 1.0-foot above the design hydraulic gradient. The side slopes for channel or swale must not exceed 2:1 or 3:1 in sandy soils. Provide a minimum of 1-foot of freeboard at design capacity.

C. Improvement Plans

Provide typical sections and profile of the existing and proposed channels for a minimum of 500-feet each side of the development to establish an average profile grade through the development.

D. Velocity Requirements

Channels or swales must comply with the following requirements:

1. Minimum velocity for channels or swales flowing full, with freeboard, must be 2 feet per second.
2. Minimum velocity in bioswales may be less than 2 feet per second but must provide for positive drainage.
3. The maximum velocity in constructed unlined earth channels or swales must not exceed that which would cause erosion; which is typically less than 4 feet per second.
4. The maximum velocity concrete lined channels must not exceed 10 feet per second.

E. Natural Waterways

For natural waterways, the design flow may be allowed in the natural overflow area if a drainage easement is provided, which will include the overflow area, and freeboard as specified above exists between the water surface and adjacent ground.

5.1.7 Culverts and Storm Drains

A. Minimum Diameter

Minimum pipe diameter allowable on any storm drain or culverts that are maintained by the University is 18-inches. A lesser size may be approved for privately maintained facilities.

B. Velocity Requirements

Culverts must comply with the following requirements:

1. Minimum design velocity must be 2 feet per second when conduit is flowing at the 2-year design discharge.
2. Maximum design velocity must not exceed 15 feet per second when culvert is flowing at the Primary Design Storm.

5.1.8 Outfalls

A. Culvert Energy Dissipaters

Design energy dissipaters in compliance with the HDM Chapter 870, Channel and Shore Protection Erosion Control. Show the following items on the plans:

1. Stable rock size (weight)
2. Rock Slope Protection (RSP) class
3. Dissipater trench dimensions
4. Rock placement method
5. RSP fabric type

Culvert energy dissipaters must be designed for the flow from the Design Storm. Rock slope protection gradation must conform to Section 72 of the State Standard Specifications.

5.1.9 Bridges

A. Design Criteria

Design must conform to the requirements of current California Department of Transportation and AASHTO guidelines and standards. Any variation from standards must be approved in writing by the University Engineer. Bridges must be clear spans.

All bridge designs require approval by the University's Architectural Review Commission.

Bridge design must account for impacts of future development considering areas within the University's adopted urban reserve line.

Submittals must include the full construction plans for the bridge including:

1. details
2. geotechnical report including log of test borings, corrosivity testing of the soil, and testing for the presence of naturally occurring asbestos
3. scour calculations that indicate adequate structure depth to prevent scour damage or undermining for the life of the structure
4. design calculations including design loads
5. hydrologic and hydraulic calculations

A hard copy and an electronic PDF format copy for archiving must be submitted for documents.

Structures with a required span between 19 feet and 20 feet must be constructed with a minimum span of 20 feet. Clear span bridges must be constructed in lieu of closed culverts whenever possible and a natural channel maintained. Closed culverts will be allowed where site constraints prevent a bridge from being constructed with enough clearance to allow for required storm passage with 12 inches of freeboard. Authorization to build culverts in lieu of clear span bridges must be approved by the University Engineer and regulatory agencies. Closed culverts must be upsized to increase the depth of the culvert to allow the placement of 12 inches of natural gravels in the bottom of the culvert.

B. Materials

Vehicle bridges must be constructed of a material which requires no maintenance for the first 30 years of its life. Concrete is the preferred material for construction; however, alternative materials may be approved by application in writing to the University Engineer with sufficient documentation to support an alternative including information showing the alternative is a superior material, or that concrete will not provide the desired life or freedom from maintenance in the given conditions. Vehicle bridges may use a pre-approved prefabricated structure.

Pedestrian and bicycle bridges may be furnished as prefabricated structures, including "weathered" steel. The material must be approved prior to the submittal for the structure itself.

New bridge decks may not be overlaid with asphalt unless authorized by the University Engineer. Where the University approves an overlay on the deck, an approved waterproof membrane must be installed between the deck surface and the overlay. Waterproof or sealing membranes such as methacrylate seals may be required prior to acceptance where cracking of the deck is observed.

C. Barrier Rails

Barrier rails for vehicle crossings must meet current AASHTO guidelines for crash ratings. Barrier rails for pedestrians on private property adjacent to the Right of Way must comply with the most current California Building Code.

D. Bicycle and Pedestrian Facilities

Vehicle bridges must be of adequate width to accommodate, bike lanes and sidewalks on both sides. Bike lanes and sidewalks must be constructed regardless of the presence of those facilities on the abutting roadway.

E. Design Life

All structures must be designed for a minimum 50-year service life.

5.1.10 Fencing

All open channel drainage facilities and drainage basins, must provide fencing as follows:

1. Constructed channels, swales and basins with side slopes five to one (5:1) or flatter and depths less than 3.0-feet do not require fencing.
2. Natural channels do not require fencing.
3. Any required fence must be located no more than 4-inches within the required easement lines and must provide sufficient room for maintenance vehicles.
4. Fencing must be 42 inches tall.

5.2 Post Construction Stormwater Compliance

5.2.1 Performance Requirements

A. Performance Requirement No. 1: Site Design and Runoff Reduction

Projects that create and/or replace 2,500 square feet or more of impervious surface must:

1. Limit disturbance of creeks, wetlands, riparian habitats and provide adequate setback
2. Limit clearing and grading of native vegetation and conserve natural areas, existing trees, and soils. Avoid excessive grading and disturbance of vegetation and soils by conforming the site layout along natural grades.
3. Minimize impervious surfaces by concentrating improvements on the least-sensitive portions of the site, leave the remaining land in a natural undisturbed state. Define the development envelope and protected areas, identifying areas that are most suitable for development and areas to be left undisturbed.
4. Minimize stormwater runoff by implementing one or more of the following site design measures:
    a. Direct roof runoff into cisterns or rain barrels for reuse
    b. Direct roof runoff onto vegetated areas
    c. Direct runoff from sidewalks, walkways, and patios onto vegetated areas
    d. Direct runoff from driveways and uncovered parking lots onto vegetated areas
    e. Construct project using permeable surfaces

B. Performance Requirement No. 2: Water Quality Treatment

Projects that create and/or replace 5,000 square feet or more of impervious surface must treat stormwater runoff from existing, new, and replaced impervious surfaces on sites where runoff from existing impervious surfaces which cannot be separated from runoff from new and replaced impervious surfaces. Water Quality Treatment must be treated onsite and designed to treat stormwater runoff equal to the volume of runoff generated by the 85th percentile 24-hour storm event, of 1.1 to 1.3 inches depending on location in the University. Water Quality Treatment may implement a treatment system that use multiple methods to comply with Water Quality Treatment requirements. The Water Quality Treatment system must first implement Low Impact Development Treatment Systems, then may implement Biofiltration Systems, and then finally may implement Non-Retention Based Treatment Systems. Projects subject to Performance Requirement No. 2 must also include design strategies required by Performance Requirement No. 1.

Provide storage for the 85th percentile 24-hour storm event. See Performance Requirement No. 3: Runoff Retention for information to volumetric design water quality volume.

Provide Biofiltration treatment systems that comply with the following design parameters:

1. Must prevent erosion, scour and channeling within the biofiltration treatment system from a rain event of 0.2 inches per hour intensity.
2. Provide a minimum surface water storage volume equal to the biofiltration treatment systems surface area times a depth of 6 inches.
3. Provide a minimum of 24 inches in depth of Bioretention Soil Media (BSM) equivalent to soil media as specified in Attachment L.
4. Proper plant selection for facility.
5. Provide a minimum subsurface gravel storage layer of 12 inches for entire biofiltration systems surface area.
6. Provide underdrain or French drain at the top of gravel layer.
7. Do not compact soils below the biofiltration facility. Rip and loosen soils if previously compacted.
8. Do not use liners or barriers.
9. Hydraulic capacity that collectively achieves at least one of the following criteria:
    a. Volumetric Design: Provide storage for the 85th percentile 24-hour storm event.
    b. Flow Based: Provide capacity at a minimum of a rain intensity of 0.2 inches per hour.

C. Performance Requirement No. 3: Runoff Retention

Projects that create and/or replace 15,000 square feet or more of impervious surface must retain runoff for optimal management of watershed processes. Projects subject to Performance Requirement No. 3 must also include design strategies required by Performance Requirement No. 2 and 1.

Replaced impervious surface, may receive a 50 percent reduction when calculating the volume of runoff subject to Runoff Retention Performance Requirements.

Retention must meet the following performance requirements:

1. Prevent offsite discharge from events up to the 95th percentile 24-hour rainfall event.
2. Achieve retention by:
    a. optimizing soil infiltration
    b. storage
    c. rainwater harvesting
    d. evapotranspiration.

Provide a site assessment document that identify opportunities and constraints to implement LID Stormwater Control Measures for development site. Site assessment document must review and document the following site characteristics:

1. Site topography
2. Hydrologic features including contiguous natural areas, wetlands, watercourses, seeps, or springs
3. Depth to seasonal high groundwater
4. Locations of groundwater wells used for drinking water
5. Depth to an impervious layer such as bedrock
6. Presence of unique geology
7. Geotechnical hazards
8. Documented soil and/or groundwater contamination
9. Soil types and hydrologic soil groups
10. Vegetative cover/trees
11. Run-on characteristics (source and estimated runoff from offsite which discharges to the project area)
12. Existing drainage infrastructure for the site and nearby areas including the location of municipal storm drains
13. Structures including retaining walls
14. Utilities
15. Easements
16. Covenants
17. Zoning/Land Use
18. Setbacks
19. Open space requirements
20. Other pertinent overlay(s)

Delineation of discrete Drainage Management Areas (DMAs) to support a decentralized approach to stormwater management. Provide a map or diagram dividing the entire project site into discrete DMAs. Account for the drainage from each DMA using measures identified as:

1. Self-treating area
2. Self-retaining area
3. Area draining to self-retaining area
4. Area draining to Stormwater Control Measure (SCM)

When the applicant has demonstrated through their Stormwater Control Plans that use of Site Design Measures of Performance Requirement No. 1 have been implemented to the maximum extent practicable, the use of Structural Stormwater Control Measures may be used. The Structural Stormwater Control Measure must be designed for water quality treatment and flow control may be used to comply with Performance Requirement No. 3. Stormwater Control Measures must be designed as to optimize retention and result in Structural Control Measures that are small-scale, decentralized facilities, that are designed to infiltrate, evapotranspirate, filter, or capture and use stormwater.

Determine sizing of runoff retention design based on volumetric basis for the 95 percentile 24-hour rainfall event. Retention Tributary Area must be calculated for each individual Drainage Management Areas as follows:

$$Area_{Retention\ Tributary\ Area} = Area_{Entire\ Project\ Area} - Area_{Undisturbed\ or\ Planted\ Areas} - Area_{Impervious\ Surface\ Areas\ that\ Discharge\ to\ Infiltration\ AReas}$$

Calculating the 85th Percentile 24-hour event used for Water Quality Calculations and the 95th Percentile 24-hour event used for Retention Volume is completed as follows:

Compute the Runoff Coefficient "C" for each DMA using the equation:

$$C = 0.858i^3 - 0.78i^2 + 0.774i + 0.04$$

Where "i" is the fraction of the tributary area that is impervious

Calculate the volumetric design quantity as follows (area in square feet, depth in inches):

$$Volume_{Water\ Quality} = C \times Depth_{Rainfall\ Event} \times \frac{1\ foot}{12\ inches} \times Area_{Retention\ Tributary\ Area}$$

Compute the Retention Volume in cubic feet (area in square feet):

$$Volume_{Retention} = C \times 1.8\ inches \times \frac{1\ foot}{12\ inches} \times Area_{Retention\ Tributary\ Area}$$

The County of Santa Barbara has developed a sizing calculator that may be used and down-loaded at the following site:

http://www.sbprojectcleanwater.org/development.aspx?id=76

D. Performance Requirement No. 4: Peak Management

Projects that create and/or replace 22,500 square feet or more of impervious surface must retain runoff for the optimal management of watershed processes. Projects subject to Performance Requirement No. 4 must also include design strategies required by Performance Requirement No. 3, 2 and 1. Post-development peak flows, discharged from the site, must not exceed pre-project peak flows for the 2 through 10-year storm events.

E. Impervious Surface Correction Factors

Surface must not broadly be characterized as completely pervious. Use correction factors to calculate equivalent impervious surface area for Post Construction Stormwater Runoff Requirements.

Surface	Equivalent Impervious Surface Factor
Roof	1.0
Concrete	1.0
Asphalt	1.0
Porous Concrete	0.1
Porous Asphalt	0.1
Grouted Paver Unit	1.0
Solid Paver Unit set in Sand	0.5
Crushed Aggregate	0.1
Landscape	0.1

5.2.2 Stormwater Control Plan

The applicant must provide a Stormwater Control Plan that clearly provides engineering analysis of all Water Quality Treatment, Runoff Retention, and Peak Flow Management controls for projects subject to those performance requirements. All reports must be completed by either a Registered Civil Engineer or Qualified Stormwater Pollution Prevention Plan Developer (QSD).

A. Minimum Requirements for Content

1. *Project information including:*
    a. *project name;*
    b. *location;*
    c. *parcel numbers;*
    d. *applicant contact information;*
    e. *land use information;*
    f. *site area;*
    g. *area of existing impervious surfaces,*
    h. *area of new impervious surfaces*
    i. *area of replaced impervious surfaces*
    j. *applicable PCR Performance Requirements*
2. *Narrative description of site features, opportunities and constraints for stormwater control.*
3. *Narrative description of site design characteristics that protect natural resources including endangered species habitat, vegetation, archaeological resources, natural drainage features, and design features that minimize imperviousness of project and manage runoff from impervious areas.*
4. *Tabulation of proposed pervious and impervious DMAs, showing self-treating areas, self-retaining areas, areas draining to self-retaining areas, and areas tributary to each LID facility.*
5. *Proposed sizes, including supporting calculations, for each stormwater facility.*
6. *Narrative description of each DMA and explanation of how runoff is routed from each impervious DMA to a self-retaining DMA or stormwater control facility.*
7. *Description of site activities and potential sources of pollutants.*

8. *Table of pollutant sources and source control measure(s) used to reduce pollutants to the maximum extent practicable.*
9. *Description of signage for bioretention facilities.*
10. *General maintenance requirements for bioretention facilities and site design features.*
11. *Means by which facility maintenance will be financed and implemented in perpetuity.*
12. *Statement accepting responsibility for interim operation & maintenance of facilities.*

B. Exhibits

1. *Existing natural hydrologic features (depressions, watercourses, relatively undisturbed areas) and significant natural resources.*
2. *Proposed design features and surface treatments used to minimize imperviousness and reduce runoff.*
3. *Existing and proposed site drainage network and connections to drainage off-site.*
4. *Entire site divided into separate Drainage Management Areas (DMAs). Each DMA has a unique identifier and is characterized as self-retaining (zero-discharge), self-treating, or draining to a LID facility.*
5. *Proposed locations and footprints of stormwater control facilities.*
6. *Potential pollutant source areas*

5.2.3 Operations and Maintenance

The Applicant must develop, implement and provide the University an Operations and Maintenance Plan and Maintenance Agreements that clearly establish responsibility for all Water Quality Treatment, Runoff Retention, and Peak Flow Management controls for projects subject to those performance requirements.

A. Operations and Maintenance Plan

The Operations and Maintenance Plan must include, at minimum:

1. *A site map identifying all Stormwater Control Measures requiring Operations and Maintenance practices to function as designed.*
2. *Operations and Maintenance Procedures for each structural stormwater control measure including, but not limited to, Low Impact Design facilities, retention and detention basins, and manufactured or propriety devices operations and maintenance.*
3. *Short-and long-term maintenance requirements, recommended frequency of maintenance, and estimated cost for maintenance.*

***B.* Maintenance Agreement**

The Applicant must provide a signed statement accepting responsibility for the Operations and Maintenance of the installed Storm Water Control Measures. The Applicant must include written conditions in the sales, lease agreements, deed, CCRs, HOA, or any other legally enforceable mechanism that require the assumed responsibility for the Operations and Maintenance of Stormwater Control Facilities. Additionally, the signed statement must include the following information:

1. *The location and address of Storm Water Control Facilities*

2. *Completion dates of the following milestones*
3. *Construction*
4. *Field verification of Stormwater Control Facilities*
5. *Final Project approval/occupancy*
6. *Party responsible for O&M*
7. *Source of funding for O&M*
8. *Statement indicating the Storm Water Control Facilities are Maintained as required in the Operations and Maintenance Plan and facilities continues to function as designed or have been repaired or replaced*
9. *Statement describing any vector or nuisance problems.*

C. Maintenance Notification

The Owner/Applicant must provide a signed statement notifying the University of all maintenance of the installed Storm Water Control Measures. Additionally, the signed statement must include the following information:

1. *The location and address of Storm Water Control Facilities*
2. *Completion date of the maintenance activities*
3. *Party responsible for O&M*
4. *Source of funding for O&M*
5. *Statement indicating the Storm Water Control Facilities are Maintained as required in the Operations and Maintenance Plan and facilities continues to function as designed or have been repaired or replaced*
6. *Statement describing any vector or nuisance problems.*

5.3 Groundwater

5.3.1 Subsurface Groundwater Drainage:

Underground dewatering improvements (such as retaining wall sub-drains or groundwater collection system) must not deposit collected groundwater or spring water to the gutter or other surface drainage facility. Such systems must be designed to retain the water on-site or deposit the collected water to an approved collection system.

5.3.2 Source Control:

(per 2013 State General Stormwater Permit Section E.12.d)

Projects with pollution generating activities and sources must be designed to implement operation or source control measures consistent with recommendations from the California Stormwater Quality Association Handbook for New Development and Redevelopment or equivalent, including:

1. Accidental spills or leaks
2. Interior floor drains
3. Parking / storage areas and maintenance
4. Indoor and structural pest control
5. Landscape / outdoor pesticide use

6. Pools, spas, ponds, decorative fountains and other water features
7. Restaurants, grocery stores, and other food service operations
8. Refuse areas
9. Industrial processes
10. Outdoor storage of equipment or materials
11. Vehicle and equipment cleaning, repair, and maintenance
12. Fuel dispensing areas
13. Loading docks
14. Fire sprinkler test water
15. Drain or wash water from boiler drain lines, condensate drain lines, rooftop equipment, drainage sumps, and other sources
16. Unauthorized non-stormwater discharges
17. Building and grounds maintenance

Design should prevent water from contacting work areas, prevent pollutants from encountering surfaces used by stormwater runoff, or where contact is unavoidable, treat stormwater to remove pollutants.

Operations and maintenance activities required to achieve Source Control are to be included in the Operation and Maintenance Plan submitted for approvals and recorded with the property as required by ordinance.

5.3.3 Groundwater Well Protection Buffers:

Groundwater well protection buffers must follow the standard of practice to meet the minimum horizontal separations and vertical sanitary seal requirements listed by the California Department of Water Resources, and the County of San Luis Obispo Department of Public Health. All new water wells shall be located an adequate horizontal distance from know or potential sources of pollution and contamination. Such sources include, but are not limited to:

1. Sanitary, industrial, and storm drainage systems;
2. Septic tanks and leach fields;
3. Recycled water irrigation systems;
4. Sewage and industrial waste ponds;
5. Barnyard and stable areas;
6. Feedlots;
7. Solid waste disposal sites; or
8. Above and below ground tanks and pipeline for storage and conveyance of chemicals.

Where a groundwater well exist within the proposed development project, the well will need to be rehabilitated to meet the protection buffers, or may need to be destroyed per County Health Requirements and the California Department of Water Resources Standard Bulletins.

6. Water Supply

6.1 Design Standards

6.1.1 Quantity of Water

The quantity of water delivered to the distribution system from all sources must be sufficient to:

1. supply adequately
2. dependably
3. safely

the total requirements of all customers, including fire hydrants, under maximum consumption. The distribution system must be capable of adequately delivering this water supply to all the customers.

6.1.2 Distribution System

A. Operating Pressure

Water distribution system mains must be designed to maintain normal operating pressures, excluding fire flows, of not less than 40 psig at the service connection and may not be more than 80-psig. Residual pressures throughput the entire distribution system under fire flow conditions shall comply with the fire protection standards.

B. Size of Water Mains

Minimum water main diameter size is 8-inches except:

1. A 6-inch main may be used in normal gridded street patterns where two 8-inch looped mains in adjacent streets are to be connected if the length is less than 350 feet and it will not have to support a fire hydrant.
2. Dead-end mains require special approval of both Fire Dept. and Utilities Dept. For dead-end mains, the minimum size must be:
    a. 4-inch main if less than 150 feet long and serving less than 10 dwelling units.
    b. 6-inch main if over 150 feet but less than 350 feet long and serving less than 25 dwelling units.
    c. 8-inch main if over 350 feet but less than 700 feet long and serving less than 50 R-1 dwelling units (with triple valve at intersection)
    d. 10-inch main if over 700 feet but less than 1500 feet long and serving less than 75 R-1 dwelling units (with triple valve at intersection and 250-foot maximum fire hydrant spacing).
3. Recycled water mains must be sized in accordance with the Recycled Water Master Plan, or as determined by the Utilities Department.
4. Recycled water mains design pressure may be reduced, if a lesser pressure class can be justified. Pressure varies in the recycled water system, and shall include a surge allowance per AWWA standards. Designers must contact the Utilities Department to obtain operating pressures, to properly design any extensions to the system.

C. Alignment and Layout of Mains

Water mains must be located per Engineering Standards 6010, 6110 and 6140.

Minimum clearance between mains and street surface must be 3 feet.

Minimum clearance between recycled water mains and street surface must be 5 feet.

Clearance between waterlines and other fluid pipelines must comply with California Code of Regulations Title 22, Division 4, Chapter 16, Article 4, section 64572; Installations in existing developed areas must comply with current State guidance memorandums on separation.

D. Valves

The distribution system must be equipped with enough valves so that no single shutdown will result in shutting down a main, or necessitate the removal from service of a length of pipe greater than 500-feet. Valves must not be in gutters, spandrels or cross-gutters, and shall have 6″ clearance between lip of gutter and the outside concrete collar when the valve is in asphalt pavement. Existing valves must be relocated as necessary.

E. Hydrants

Fire hydrants must be installed per the University Fire Code and to the satisfaction of the Fire Marshal and City Engineer. Fire hydrant location and service sizing must meet the requirements of the Fire Department Developer's Guide.

On mains of 12 inches and larger, fire hydrant location and spacing must allow, whenever possible, for the placement of a fire hydrant instead of a blow-off assembly at low points and at the ends of water mains, as appropriate.

F. Service Lines

Water service must include all facilities necessary for the transmission of water from the nearest point of adequate supply to a meter vault at the front of each lot. For condominium projects, a separate meter vault must be provided for each condominium unit at the street frontage or as approved by the University Engineer. Pumping and storage equipment to provide sufficient volume and duration of flow of water must be provided. The design and location of the water system serving the proposed subdivision must be provided to the satisfaction of the University Engineer and Utilities Director. Water services may not be required to lots which will be in perpetual open space and will not require irrigation or fire suppression.

All new services must be 1, 2 or 4 inches and larger. All new services 4 inches and larger shall comply with Engineering Standard 6250.

Size of water services must be based on California Plumbing Code (CPC), and adequate for maximum density allowable on each specific lot. Meters must not be larger than service line and must be reasonably sized to maintain flow velocities within the manufacturer’s recommended operating range. In general, the operating range must result in a 95% to 100% meter reading accuracy during average and maximum day demands.

New water services must be installed perpendicular to water main, and must have a minimum of 18″ between service points.

New irrigation services must connect to the recycled water system if the project site is within 500-ft from the existing recycled water main and within the masterplan service area. Financing of the mainline extension must be performed by the development and will be eligible for reimbursement agreements in accordance with the University Municipal Code.

G. Thrust Blocks

Concrete thrust blocks must be installed to properly restrain and protect pipeline, as shown in the Standard Drawings. Thrust blocks must be installed at all:

1. bends of 22 ½ degrees or more
2. end of plugged mains
3. behind each tee
4. each cross which is valved in such a manner that they can act as a tee
5. back of fire hydrants.

The thrust block must extend from the fitting to undisturbed soil, and must be of such bearing area as to assure adequate resistance to the force to be encountered per the recommendations of a geotechnical engineer. Prior to pouring concrete, all fittings must be wrapped in minimum 8-mil polyethylene plastic sheet to protect bolts from being covered with concrete. In lieu of the above, movement may be prevented using restraining joints, where thrust blocks are not feasible due to limited space or other reasons, subject to the prior approval of the University.

H. Valve Anchors

Concrete valve anchors must be provided at all in-line valves. Prior to pouring concrete, all fittings must be wrapped in plastic to protect bolts from being covered with concrete.

I. Air and Vacuum Release Valves

Air and vacuum release valves must be installed in the water system at all points where it is indicated that air pockets may form. The design must be such as to ensure the release of air automatically from the water main, and mitigation of surge pressures when warranted. All valves must be designed for a minimum of 150 psi operating pressure. Air and Vacuum release stations must be located in order to provide the minimum lateral clearance from the travel way.

J. Blowoffs

A blowoff or fire hydrant must be installed in the water system at all dead-ends and low points.

K. Sampling Stations

Sampling stations may be required to be installed when directed by the University.

6.1.3 Cross Connections

A. Backflow Prevention Required

Backflow prevention devices must be installed on all service connections that pose a potential threat to health and safety of the community. At a minimum, the following service connections must require backflow prevention:

1. Landscape irrigation
2. Medical and health care facilities
3. Areas served by private wells
4. Restaurants and other food-preparation facilities
5. Private fire-protection lines, including fire sprinkler systems
6. Laboratories
7. Commercial and industrial facilities that use water for other than domestic purposes
8. Areas in a Manufacturing zone
9. Sites that are used or plumbed to use gray water systems.

B. Location of Backflow Prevention Devices

Backflow prevention devices must be located as close as practical to the point of connection. In addition, backflow devices must be located in accordance with Section 7603 of the California Code of Regulations.

C. Ownership and Maintenance

Potable Water Systems: The property owner where any service connection requiring a backflow prevention device is located, must be responsible for operation and maintenance of the device. The University is not responsible for operation and maintenance of these devices.

Recycled Water Systems: *The Applicant must develop, implement and provide the University an Operations and Maintenance Plan and Maintenance Agreements that clearly establish responsibility for all Recycled Water Irrigation Systems* for projects subject to those performance requirements as listed in the Procedures for Recycled Water Use Manual.

7. Wastewater

7.1 Design Standards

7.1.1 Quantity of Flow

Design flow criteria are summarized as follows (for newly constructed mains only – the Utilities Department will provide data for older mains):

Domestic Sewage Generation Factors	
Average dry-weather flow (ADWF):	
Single Family Residential	150 gpd/EDU
Multi-Family Residential	105 gpd/EDU
Industrial / Manufacturing	54 gpd/k-sqft gross floor area
Business Park	54 gpd/k-sqft gross floor area
Commercial	60 gpd/k-sqft gross floor area
Motel / Hotel	70 gpd/room
Peak dry-weather flow (PDWF):	ADWF x Peaking Factor

Reductions in peak flows occur because of storage in the system and diversification of development. The following peaking factor must be used to obtain peak dry-weather flows:

Residential Peaking Factor = 2.6*(Q^-0.10)

Where Q is the cumulative average dry weather flow in the conveyance system calculated in million gallons per day (MGD). Example: PF=2.6*(5.4MGD^-0.10) equals a peaking factor of 2.19.

Curves may be permitted if pipe deflection is limited to manufacturer's recommendations, with a minimum radius of 100 feet, and the curves are only in one plane (either horizontal or vertical) between adjacent manholes. Sewer mains and laterals must be located as shown in Engineering Standards 6010, 6110, 6140 and 6810.

Clearance between waterlines and other fluid pipelines must comply with California Code of Regulations Title 22, Division 4, Chapter 16, Article 4, section 64572, Installations in existing developed areas must comply with current State guidance memorandums on separation.

7.1.2 Manholes

Manholes may not be spaced further than 400 feet apart. Upstream ends of sewer mains must terminate at manholes. Coatings will be required for drop manholes and other locations where gases are expected to accumulate. Drop manholes must be installed where invert transitions are greater than 30 inches.

All inlets must be designed and installed such that the top of pipe elevations match. Where pipelines transition flows within the manhole more than 45 degrees, the flowline of the pipe flowing into the manhole must be a minimum of 0.10-foot above the flowline of the pipe flowing out from the manhole, or an amount necessary to match the top of pipe and hydraulic grade line, whichever is greater.

All manholes must be constructed with precast bases as shown in Engineering Standards 6610 and 6620. Manholes must be 4 feet in diameter unless the size and/or number of inlet(s) and outlet(s) warrant the use of a 5-foot diameter manhole. Brick or block manholes will not be allowed. Cast-in-

place manholes may be allowed under special circumstances where it is not feasible to construct pre-cast manholes.

Concentric cones must be used. Eccentric cones may be used only in special cases, and only with approval of the University Utilities Department. Steps will not be allowed in manholes. Manholes must be watertight and pass vacuum test requirements.

Manholes may not be located at the centerline of intersections.

Where two or more lines enter a manhole, sufficient elevation difference must be provided in the trough elevations, whenever possible, to prevent the smaller of the lines from being surcharged by the larger line(s) under normal operating conditions. Top of smaller pipe must be no lower than top of larger pipe(s).

7.1.3 Pipe

A. General

Sewer main size must be determined by designing for flowing half-full, considering the flow generated by the development, the ultimate upstream development, and existing infiltration. New sewer systems shall be provided with pipe materials that eliminate infiltration, and reduce the potential for root intrusion.

Minimum sewer main size is 8-inches diameter; except a 6-inch minimum size main may be allowed for the last run which ends in a manhole and cannot be later extended to serve other properties. Laterals must be sized to be adequate (4 inch minimum) for maximum allowable density on each specific lot.

Pipe material must be fused HDPE unless otherwise required for special conditions such as bridge crossings.

B. Laterals

Sanitary sewer laterals must be stubbed to the front property line of each lot. All facilities for the transmission of sewage from each of the lots to the nearest adequate point of connection to the University's sewer system must be installed as acceptable to the University Engineer. Sewer services are not required for lots which will be in perpetual open space use. The requirement for a sewer lateral may be waived upon a finding by the University that an alternative waste disposal system, which will provide a level of protection for public health and natural resources at least equivalent to public sewer, will be installed and maintained.

Sewer laterals must have backwater valves installed whenever the flood level rim of the lowest fixture in the building (including basements) is less than adjacent upper or lower manhole, whichever controls, as determined by the University Engineer. See municipal code section 13.08.200.

New developments planning to re-use an existing lateral shall provide CCTV inspection to confirm the integrity of the pipe preventing infiltration and root intrusion. CCTV requirements listed in the engineering specifications must be used in the video recording and reporting of the lateral condition.

C. Slope and Alignment

Sewer main slopes must be sufficient to provide a minimum velocity of 2 feet per second based on the peak dry-weather flow conveyed in the pipe. Grades must be designed from manhole outlets to inlets. Design velocities for sanitary sewers must not exceed 10 fps at peak flow, and must remain in a sub-critical flow.

Minimum Slope for Sanitary Sewer	
Diameter	**Slope (%)**
6 inch	0.50%
8 inch	0.35%
10 inch	0.25%
12 inch	0.20%
15 inch	0.15%
18 inch	0.12%
Lateral	2.00%

Sewer mains and laterals must be designed to be usable by each lot without the need for an ejector pump. Exceptions may be granted on a case-by-case basis by the University Engineer. Sewer main depth must accommodate all lateral connections and allow a 12-inch minimum vertical clearance between laterals and other utility conduits.

Sewerage systems must be designed to have a minimum of curvature, both horizontal and vertical. Whenever possible, sewer lines must be laid out in a straight line between structures. Curved sewer lines will be allowed only under the following conditions:

1. All curve data must be shown on the plans.
2. Minimum radius of curvature must be as recommended by the pipe manufacturer and approved by the University.
3. No deflections may be made at the pipe joints.

D. Sewer Lines Within Easements

All sewers must be located within a dedicated city street or alley or within a recorded easement. Sewer main and manholes not within a street of paved drive must be within an all-weather dust free access road at least 12 feet wide and must provide access to all manholes for maintenance with truck-mounted equipment. The access road grade must not exceed 20 percent, and a truck turn-around may be required. When required due to terrain or depth of sewer line the required easement width must be increased. All easements must include right of ingress and egress over adjoining property for maintenance, replacement and operation.

8. Dry Utilities

8.1 Design Standards

8.1.1 General Provisions

A. Improvements Required

Subdivision improvements include:

1. Electrical
2. Telephone
3. Gas
4. cable television.

Other public improvements, as defined in this document, must include utility improvements where required by conditions of approval or as determined necessary by the University.

B. Plan Requirements

The intent of these requirements is that sufficient utility detail be shown to permit the University, or other appropriate agency, to locate all utilities when maintenance to the roads and other utilities in the public right-of-way or easements becomes necessary. The plans must show the following utility information as a minimum:

1. Show all utilities in detail on the typical street sections. Include trench dimensions, depth, number of lines, and description of lines (line material, size, etc.)
2. Show complete utility layout. Include line location, road crossings, junction boxes, manholes, service connections or stubouts, etc.
3. The following note must be placed on utility improvement plans:

   "All wire and gas utility connections, distribution lines, and service locations shown on these plans are for information only and should not be considered final design. Utility purveyors may need to alter their design from what is depicted herein based upon future design modifications or during construction. This may result in additional redesign costs or charges to the owner for this work.

   No revisions to what is depicted herein may be constructed without the prior approval of the University. No above-ground facilities may be located where they block the accessible path of travel or intersection or driveway sight distance.

   Prior to final project acceptance it will be the owner's responsibility to verify final utility alignments and ensure that adequate easements for such facilities are provided"

C. Underground Installation Required

All new and remodeled buildings must have service supplied by underground facilities in compliance with the University's Municipal Code section 13.12.

D. Service Extensions Required

All utilities must be installed with service laterals to serve all new lots being created in any subdivision project.

E. Acceptance by Utility

Utility improvements will not be accepted as complete by the University, until written correspondence has been received from each utility providing service to the subdivision, indicating that their respective facilities are completed to their satisfaction and "ready for service," or that sufficient financial arrangements have been made to assure same.

9. Survey

9.1 Street Monuments

Street monuments must be set to reference street centerlines at all intersections, angle points, beginning and ending of curves, radius point of cul-de-sacs, and at tract boundary as required by the University Engineer.

Monuments may not be set further than 500 feet apart along centerlines, and must be shown on the parcel or final map.

Monuments must be constructed and set per Engineering Standard 9020.

Set permanent monuments at angle, curve points, and intersections of street centerlines.

Any monument that is disturbed or destroyed must be replaced and corner record filed with County of San Luis Obispo.

Set monuments in streets in compliance with Engineering Standard 9020.

9.2 Tract Boundary Monuments

Tract boundary monuments must be set to reference tract boundary lines at all angle points, beginning and ending of curves, and intersections with street right-of-way lines.

Provide survey monuments for all parcels contained within map.

Tract boundary monuments must be set no further apart than 500 feet along boundary lines, and must be shown on the parcel or final map.

Tract boundary monuments must be constructed of iron pipe, no smaller than 1.5 inches in diameter, no shorter than 30 inches in length, capped and stamped with either the land surveyor's or registered engineer's number, and indicated by a marker stake extending above the ground surface.

9.3 Lot Stakes

Lot stakes must be set to reference lot lines at all angle points, and beginning and ending of curves, except where said point is to be set with a tract boundary monument.

Lot stakes must be constructed of ¾ inch plugged galvanized pipe at least 18 inches in length, or a #5 rebar with plastic cap. If a lot corner falls on concrete or rock, the corner must be set with a lead plug. All corners must be tagged or marked with either the land surveyor's or registered engineer's number.

All lot stakes must be set at ground surface, with white marker stakes located immediately adjacent. Offset staking or alternative staking will not be allowed without prior approval of the University Engineer.

9.4 Vertical Control (Benchmarks)

Points of known elevation must be set at approximately every 1000 to 1200 feet horizontally in new street systems, minimum of one point.

Points are to be set in curbs or other concrete facilities near street corners or ends of cul-de-sacs, where they can be easily located by description. A nail and tag or copper disc, or brass cap labeled "Benchmark" with the surveyor's license number, is to be set in the concrete.

Provide record showing the location, elevation, and elevation basis to the University Engineer for inclusion in the University's published Benchmarks.

10. Landscaping and Irrigation

10.1 General

Landscaping and Irrigation must conform to the provisions in Section 17.87 of the University Municipal Code and Engineering Standards. The provisions of the Engineering Standards apply to the following landscape projects:

1. New residential, commercial, institutional and multi-family development projects with an aggregate landscape area equal to or greater than 500 square feet subject to a building permit or development review.
2. Rehabilitated landscapes for residential, institutional, commercial and multi-family development projects with a landscape area equal to or greater than 2,500 square feet which are otherwise subject to a building permit or development review.

10.2 Submittals

10.2.1 Development Review

For projects that require development review (tentative parcel map, tentative tract, development plan or conditional use permit), project applicants must submit the following documentation:

1. A completed Maximum Applied Water Allowance (MAWA) for the conceptual landscape design. The MAWA estimate will be used as a maximum allowance for the project's building permit application.

2. A conceptual landscape design plan which demonstrates that the landscape will meet the landscape design specifications of the University Engineering Standards Uniform Design Criteria for Landscaping and Irrigation.
3. A conceptual irrigation design plan which notes the irrigation methods and design actions that will be employed to meet the irrigation specifications of the University Engineering Standards Uniform Design Criteria for Landscaping and Irrigation.
4. A grading plan which demonstrates the landscape will meet the specifications of the University Engineering Standards Uniform Design Criteria for Landscaping and Irrigation.

10.2.2 Building Application

Prior to the issuance of a building permit, project applicants must submit the following:

1. A completed Maximum Applied Water Allowance (MAWA) form based on the final landscape design plan. MAWA calculator is available at: www.slocity.org/government/department-directory/utilities-department/documents-and-files
2. A final landscape design plan that includes all the criteria required in the University Engineering Standards Uniform Design Criteria for Landscaping and Irrigation.
3. A final irrigation plan that includes all the criteria required in the University Engineering Standards Uniform Design Criteria for Landscaping and Irrigation.
4. A soils management report that includes at a minimum the criteria required in the University Engineering Standards Uniform Design Criteria for Landscaping and Irrigation.
5. A final grading plan that includes all the criteria required in the University Engineering Standards Uniform Design Criteria for Landscaping and Irrigation.
6. A hydrozone table with a summary of Estimated Total Water Use (ETWU) and the corresponding irrigation window. ETWU calculator is available at: www.slocity.org/government/department-directory/utilities-department/documents-and-files
7. Plans must comply with City Engineering Drafting Guidelines included in appendix.

10.2.3 Project Completion

Upon completion of the installation of the landscape and irrigation system and prior to the issuance of the Certificate of Occupancy, the project applicant must submit the following:

1. A Certification of Completion signed by the professional of record for the landscape and irrigation design certifying that the project was installed per the University approved landscape design, irrigation and grading plans and meets or exceeds an average landscape irrigation efficiency of 0.75. The University reserves the right to inspect and audit any irrigation system which has received an approval through the provisions of this chapter.
   www.slocity.org/government/department-directory/utilities-department/documents-and-files
2. A project applicant must develop and provide to the owner or owner representative and the University an irrigation schedule that assists in the water management of the project

and utilizes the minimum amount of water required to maintain plant health. Irrigation schedules must meet the criteria in the University Engineering Standards Uniform Design Criteria for Landscaping and Irrigation.

3. A regular maintenance schedule must be submitted by the project applicant with the Certificate of Completion that includes: routine inspections, adjustment and repairs to the irrigation system, aerating and dethatching turf areas, replenishing mulch, fertilizing, pruning and weeding. The maintenance schedule will be provided to the owner or owner representative.

10.3 Landscaping Design

10.3.1 Water Use

For the efficient use of water, a landscape must be designed and planned for the intended function of the project. For each landscape project, applicants must submit a landscape design plan in accordance with the following:

1. Any combination of plant materials that do not exceed the Maximum Applied Water Allowance (MAWA). The method to calculate the Maximum Applied Water Allowance and Estimated Total Water Use (ETWU) must be in accordance with the MAWA calculator. www.slocity.org/government/department-directory/utilities-department/documents-and-files
2. Plant factors used to calculate the MAWA must be derived from the most recent edition of the Department of Water Resources "Water Use Classification of Landscape Species (WUCOLS)".
3. Each hydrozone must have plant materials with similar water requirements and be identified as low, moderate or high water use on the plans.
4. Plants must be selected and planted appropriately based upon their adaptability to the climatic, soil, and topographical conditions of the project site, and water attributes.
5. Turf is not allowed on slopes greater than 25% (1-foot rise for every 4 feet of horizontal distance) where the toe of the slope is adjacent to an impermeable hardscape.
6. Turf must not be used in areas less than 8 feet by 8 feet in size, irregularly shaped areas, street medians, traffic islands, planter strips, bulbouts of any size or raised beds for maximum water efficiency and ease of maintenance.
7. Low and moderate water-use plants can be mixed, but the entire hydrozone will be classified as moderate water use for MAWA calculations.
8. High water-use plants must not be mixed in the same hydrozone with low or moderate water-use plants.
9. New trees must be clear from sewer and water services per engineering specifications.
10. Invasive plants as listed by the Cal-IPC are prohibited.
11. High use plants, characterized by a plant factor of 0.7 to 1.0, are prohibited in street medians.
12. Recirculating water systems must be used for water features.
13. The surface area of water features, including swimming pools, will be included in a high water-use hydrozone.

14. A landscape design plan for projects in fire-prone areas must address fire safety and prevention. A defensible space or zone around a building or structure is required per Public Resources Code Section 4219 (a) and (b). Avoid fire-prone plant materials and highly flammable mulches.

10.3.2 Irrigation Plan

The irrigation system and its related components must be planned and designed to allow for proper installation, management, and maintenance. Project applicants must submit an irrigation design plan that is designed and installed to meet irrigation efficiency criteria:

1. Landscape water meters must be installed for all non-residential irrigated landscapes of 1,000 square feet or more.
2. Soil types and infiltration rates must be considered when designing irrigation systems. All irrigation systems must be designed to avoid runoff, low-head drainage, overspray, or other similar conditions where water flows onto adjacent property, non-irrigated areas, walks, roadways, or structures.
3. Proper irrigation equipment and schedules, including features such as repeat cycles, must be used to closely match application rates to infiltration rates, to minimize or eliminate runoff.
4. Overhead irrigation spray (using manufacturer specified throw distances) is not be permitted within 24 inches of any non-pervious surface, to prevent runoff and overspray. Allowable irrigation within the setback from non-pervious surfaces may include drip, drip line, or other low flow or non-spray technology. These restrictions may be modified if the adjacent non-pervious surfaces are designed and constructed to drain entirely to landscaping.
5. Irrigation systems must be designed, maintained, and managed using such techniques as low-precipitation heads, drip irrigation, moisture sensors, check valves, matched precipitation rates of sprinkler heads and other emission devices, and other water-conserving techniques where appropriate.
6. Each valve must irrigate a hydrozone with similar site, slope, sun exposure, soil conditions, and plant materials with similar water use. A single valve must not irrigate hydrozones that mix high water-use plants with moderate or low water-use plants.
7. Irrigation systems must be designed, maintained, and managed to meet or exceed an average landscape irrigation efficiency of 0.75 where irrigation efficiency means the measurement of the amount of water beneficially used divided by the amount of water applied. Irrigation efficiency is derived from measurements and estimates of irrigation system characteristics and management practices.
8. Rain sensors, either integral or auxiliary, that suspend or alter irrigation operation during rainy weather conditions is required on all irrigation systems.
9. Head-to-head coverage is required unless otherwise directed by the manufacturer's specifications.
10. Low volume irrigation is required where plant height at maturity will affect the uniformity of an overhead system.

11. The irrigation system must be designed to ensure that the dynamic pressure at each emission device is within the manufacturer's recommended pressure range for optimal performance.
12. Manual shut-off valves (such as a gate valve, ball valve, or butterfly valve) is required, as close as possible to the point of connection of the water supply, to minimize water loss in case of an emergency (such as a main line break) or routine repair.
13. Automatic irrigation controllers utilizing either evapotranspiration or soil moisture sensor data is required for irrigation scheduling in irrigation systems for applicable projects in section 17.87.020 (A) (1) of the Municipal Code.
14. If the project is within the *Recycled Water Master Plan* area, the irrigation system must be designed and operated consistent with recycled water standards described in the University's *Procedures for Recycled Water Use*, including the requirement that sites utilizing recycled water include backflow protection on all potable service connections.
15. For City facilities, if the project is within the *Recycled Water Master Plan* area, drip irrigation and small pop-up sprayers may not be used in the irrigation system unless authorized by the Parks Maintenance Supervisor.
16. For City facilities, pull box spacing must not exceed 200', and conduit fill must not exceed 26%.
17. For City facilities, irrigation boxes must be placed in landscaped areas whenever possible. If irrigation boxes are set in hardscape areas, they must be concrete boxes. The boxes must be traffic rated if the area is open to public traffic or used by maintenance vehicles. Irrigation boxes in playing fields must be buried 4 inches below grade.
18. All irrigation emission devices must meet the requirements set in the American National Standards Institute (ANSI) standards, American society of Agricultural and biological Engineers/International code Council's (ASABE/ICC) 802-2014 "Landscape Irrigation Sprinkler and Emitter Standard. All sprinkler heads installed in the landscape must document a distribution uniformity low quarter of 0.65 or high using the protocol defined in ASABE/ICC 802-2014.

10.3.3 Soils Management Report

To reduce runoff and encourage healthy plant growth, soil amendment, mulching and soil conditioning recommendations must be prepared by a licensed landscape architect, licensed landscape contractor, licensed civil engineer or licensed architect. Prior to planting of any materials, compacted soils must be transformed to a friable condition.

1. If the characteristics of the project's soil are known, the minimum requirements of the report must include the following:
2. A minimum of 6 inches of non-mechanically compacted soil must be available for water absorption and root growth in the planted areas.
3. For landscape installations, compost at a rate of minimum of cubic yards per 1,000 square feet of permeable area must be incorporated to the depth of six inches into the soil. Soils with greater than 6% organic matter in the top six inches of soil are exempt from this requirement.

4. A minimum of 3 inches of mulch must be applied on all exposed soil surfaces of planting areas except in turf areas, creeping or rooting groundcovers or direct seeding applications. Plant mulch must be shredded redwood bark unless otherwise approved by the University Engineer.
5. If the characteristics of the project's soil are unknown, the project applicant must submit soil samples to a laboratory for analysis and recommendations.
6. Soil sampling must be conducted in accordance with laboratory protocol, including protocols regarding adequate sampling depth for the intended plants.
7. The soil analysis may include: soil texture; infiltration rate determined by laboratory test or soil texture infiltration rate table; pH; total soluble salts; sodium; percent organic matter; and recommendations.
8. The soil analysis report must be made available, in a timely manner, to the professionals preparing the landscape design plans and irrigation design plans to make any necessary adjustments to the design plans.
9. The project applicant must submit documentation verifying implementation of soil analysis report recommendations to the University with Certificate of Completion.

10.3.4 Grading Plan

For the efficient use of water, grading of a project site must be designed to minimize soil erosion, runoff, and water waste.

1. The project applicant must submit a landscape grading plan that indicates finished configurations and elevations of the landscape area including:
2. Height of graded slopes;
3. Drainage patterns;
4. Pad elevations;
5. Finish grade; and
6. Stormwater retention improvements, if applicable.
7. To prevent excessive erosion and runoff, grading must comply with the following to the maximum extent practicable:
8. Grade so that all irrigation and normal rainfall remains within property lines and does not drain onto non-permeable hardscapes;
9. Avoid disruption of natural drainage patterns and *undisturbed soil*;
10. Avoid soil compaction in landscape areas; and
11. Preserve natural drainage channels.

10.4 Miscellaneous City Facility Provisions:

10.4.1 Irrigation System Operational Requirements

Design must ensure areas of turf are not under watered, relative to the rest of the turf, resulting in brown patches. The designer may review the irrigation installation and make recommendations for corrective action on the part of the installer; however, if the system cannot, despite proper installation and adjustment of the irrigation, be operated to provide proper coverage,

the designer must redesign and direct revised installation at his/her cost until the system can be shown to operate properly via an audit and empirical data.

10.4.2 Hardscape

Walkways and pads for appurtenances in parks must be concrete or pervious concrete built in accordance with City Standards for sidewalk construction and graded to prevent water from ponding on the walkway or pad. Unless variances are justified and approved by the University Engineer, walkways must meet current ADA accessibility requirements.

Pads in sod areas, such as picnic table pads, must be round, oval or have rounded edges to allow mowing without damage to mow blades and pads.

10.4.3 Median islands

Median island noses must have a 5-foot section of standard sidewalk concrete at intersections as a pedestrian refuge. Island noses should not extend into intersection crosswalk areas. Island areas 4 feet or less must be hardscaped. All hardscaped surfaces within median islands, except for pedestrian areas, must be decorative.

Median island irrigation systems must be sized to planned street island build-out (multi-island plans), including mainline sizing, water and control connections, and control systems configuration and capacity.

Median islands, including traffic circles, and center cul-de-sac landscaping may be used for infiltration of stormwater where suited to the site conditions. Design must be such as to prevent damage to adjacent roadway sections from infiltration, to the satisfaction of the University Engineer.

10.4.4 Playgrounds and Miscellaneous areas

An engineered wood surfacing, meeting accessibility requirements, must be used under play equipment. Alternative surfaces must be submitted to the University Engineer for review and approval.

Benches and picnic tables must be of a low maintenance material such as rubber coated steel. No wood is allowed. Alternative materials must be submitted to the University Engineer for review and approval.

10.4.5 System Pressure

Where an existing meter or irrigation system is present, the designer must obtain the current line pressure to use in design. Where no existing system exists, the University of San Luis Obispo Utilities Department must be contacted to determine approximate existing system pressures.

For systems that will be temporarily connected to the potable water system and eventually connected to the recycled water system, or for areas that may be set up to use both systems, the designer must consider the pressure in both systems and design the irrigation system so that it will work with either pressure.

The designer must contact the responsible maintenance division for the landscaped area (City of San Luis Obispo Public Works for City projects or areas to be dedicated) to determine the watering window to be used for the area. The designer must use that window in determining the number of valves turned on at any given time and the resulting load on the system. Calculations of system capacities and any assumptions made about the system must be submitted for review and approval. Calculations submitted must clearly show an accounting for system losses and concurrent loading to prevent under-sizing of the system. Where systems do not operate as needed to provide even distribution of water, including problems resulting from an undersized service, the designer will be responsible to provide any needed redesign and to pay for necessary field corrections.

The irrigation design must include a pressure reducer or booster pump to be installed, if needed, based on the actual pressure in the new irrigation system. System must be designed for maximum efficiency.

10.4.6 Controller

Irrigation designers must contact the Parks Maintenance Supervisor to determine what, if any, telemetry control equipment will be required. Systems are to be designed to current City Standards for Controller equipment where an irrigated area is City owned or to be dedicated. If control is to be via phone line, the designer must coordinate with the University's telephone system representative or City project manager to arrange for hook up.

11. Subdivision Design Criteria and Improvement Standards

11.1 General requirement

The design criteria for subdivisions and required physical improvements must be in compliance with the University's grading ordinance, zoning regulations, subdivision standards, City Standard Specifications and Engineering Standards and other applicable regulations.

11.2 Improvements

Improvement work, including grading, must not commence until plans for all such work have been approved and permitted by the University, including required stormwater related plans and submittals. Improvements to be installed by the subdivider, in accordance with these standards, include the following:

1. The full width of each street must be improved by grading, base preparation, and paving. If a street constitutes a boundary of the subdivision or connects the subdivision with the rest of the University's street system, even though it is not within the area to be subdivided,

the full width of the roadway must be improved. The University may, depending on individual circumstances, require full right-of-way improvements, including curb, gutter, and sidewalk, on the side opposite the subdivision.

2. Streets must include any required curb, gutter, sidewalk, driveway ramps, curb ramps and associated landscaping (street trees, parkway, and medians) along both sides. Alternative pedestrian walkways and bikeways must be concrete or other accessible surface material approved by the University.
3. The subdivider must complete any railroad crossing necessary for the subdivision, including application to the California Public Utilities Commission.
4. Separate paths or bicycle / pedestrian areas may be required.
5. Bus stops and benches must be provided where the subdivision abuts existing or planned City bus routes and a stop is required for the use of the neighborhood.
6. Durable boundary monuments must be installed and shown on the final map.
7. Street trees must be provided as required by the tree regulations, as set forth in Chapter 12.24 of the University's Municipal Code.
8. Street name signs, traffic control, and warning signs must be installed. Traffic signals and traffic signal control conduits may be required by the University Engineer.
9. Utilities to be installed by the subdivider must include those listed in this standard. The development of these facilities may require financial contribution for previous improvements to the systems, as provided in Chapter 13.04 of the University's Municipal Code, in the most recent council resolution on utility connection charges, or in any agreement affecting a particular portion of a system. All new utility distribution facilities must be placed underground, except accessory facilities such as terminal boxes, meter cabinets, and transformers may be installed aboveground. The subdivider must make all necessary arrangements with the utility companies for the following facilities:
    a. A water system for domestic service and fire protection provided to each lot of the proposed subdivision or, for condominium projects, to each condominium unit
    b. Where identified as a recycled water service area in the Recycled Water Master Plan, recycled water lines installed to serve those areas
    c. A sewer system for domestic use provided to each lot of the proposed subdivision
    d. Stormwater management and drainage, water quality, erosion and flood control facilities
    e. Street lights and signals
    f. Electric power, gas, cable, and telephone services stubbed to each lot or, for condominium projects, to each condominium unit; and all facilities to distribute such services provided per the requirements of the responsible utility companies
10. All new utility distribution facilities must be placed underground, except accessory facilities such as terminal boxes, meter cabinets, and transformers may be installed aboveground. The subdivider must make all necessary arrangements with the utility companies for these facilities.
11. The subdivider must carry out protective measures as required by the University to assure the proper functioning and maintenance of other required improvements and properties

adjacent to the subdivision. Temporary protective improvements may be required prior to or concurrent with the construction of permanent improvements.

11.3 Lot Design

11.3.1 Multiple frontages

Single-family residential lots with frontage on more than one street are discouraged, except for corner lots or where topography makes a single frontage impractical. The University may require the release of access rights on one frontage which must be noted on the parcel or final map.

11.3.2 Lot lines

Lot lines should be at the top of slope banks.

Side lot lines should be perpendicular to the street on straight streets, or radial to the street on curved streets, unless another angle would provide better building orientation as documented in the submittal.

On corner lots, the lot lines adjacent to streets must be rounded with a radius adequate to provide for street improvements.

11.3.3 Flag lots (deep lot subdivision)

Flag lots may be approved for subdividing deep lots where development would not be feasible with the installation of a standard street, either alone or in conjunction with neighboring properties, or where justified by topographical conditions. Such subdivision must conform to Subdivision Regulations, Section 16.18.060 of the Municipal Code.

12. Construction of Private Development Projects

The section generally describes the requirements and responsibilities for all construction and maintenance projects that occur within the right-of-way. However, the following format and procedure are unique to improvements associated with private development projects within the right-of-way.

12.1 Before Construction

12.1.1 Pre-Construction Conference

A Pre-Construction Conference is required prior to commencing the work shown on the approved improvement plans. The Engineer of Work must arrange this, and notify the University. The conference agenda will typically review the following items, as appropriate:

1. Contact information
2. Construction Schedule
3. Potential Utility conflicts

4. Typical and Special Inspection requirements
5. Unique project safety requirements including:
    a. trench safety
    b. confined space safety
    c. Work Zone Safety
6. Traffic Control and accessibility
7. Environmental site constraints
8. Regulatory permit requirements
9. Storm water control and requirements
10. Accommodation and coordination with project neighbors
11. Any unique projects constraints

The conference must include the following attendees, as appropriate:

1. The Developer
2. The Engineer of Work
3. The Contractor
4. The Soils Engineer
5. Representatives of the affected utility providers
6. Representatives of the permitting agencies
7. Representatives of City
8. At least five working day advanced notice of the time and location of the conference must be provided to the University.

12.1.2 Contractor's Requirements

Contractors and subcontractors performing the work under these Standards must possess a valid State license to perform such work. The Contractor or his/her duly authorized representative must be available on the job site during the time when any work is in progress.

A. Trench Safety

All work must be performed in accordance with the requirements of the State of California Department of Industrial Relations. The Contractor must conform to the permit requirements of the Division of Industrial Safety and must obtain any necessary trenching permit directly from the Department of Industrial Relations. The Contractor's attention is directed to the provisions of Section 6705 of the Labor Code concerning trench excavation safety plans. Excavation for any trench 5-feet or more in depth must not begin until the Contractor has obtained a trenching permit from the California Department of Industrial Relations.

B. Agency Permits

All needed regulatory permits must be obtained by the developer prior to starting any work covered by or impacted by those permit(s). The developer must keep these permits current. Copies of the permit documentation must be kept on site for review by the University. Issuance

of an encroachment permit or other permits by the University does not relieve the developer from obtaining these permits.

C. Encroachment Permit

After approval of the improvement plans and prior to starting any work within the University right-of-way, the Developer must obtain an encroachment permit from the University. Copies of the encroachment permit must be kept on site for review by the University or other agency representatives.

12.2 During Construction

12.2.1 Inspection by Engineer of Work

The Engineer of Work has is responsibility for inspection during the construction of all improvements that are regulated by these Standards. The Engineer of Work, at a minimum, must inspect the following milestones during construction, and provide a written inspection report to the University:

1. Concrete form work
2. Hot Mix Asphalt paving operations
3. Initiating the placement of the roadway base course
4. Substantial completion of roadway base placement and compaction
5. Substantial completion of roadway subgrade excavation/fill placement
6. Trench bedding and compaction

Other required inspections may be determined necessary by the University.

12.2.2 Workplace and Worksite Conduct

1. It is expected that developers and their contractors will promote a businesslike workplace (including work sites) that assures courteous treatment for workers, fellow contractors, City employees, and the public. Harassment or discrimination based on race, religion, national origin, marital status, disability, age, sex or sexual orientation is not to be tolerated.
2. It is expected that the developer and contractors will promote good relations with the neighbors and public affected by a project. This typically requires regulating construction activity to minimize impacts to the neighborhood caused by noise, dust, construction debris, and traffic disruption. When access or traffic will be delayed, advanced notification must be provided to the affected neighbors as well as to local emergency responders.
3. It is incumbent on the contractor to control the work site and provide a safe working environment. Contractor must require employees to wear appropriate personal protective equipment while on the work site.
4. It is incumbent on the contractor to control the work site and ensure all erosion control measures, traffic control devices are in place and properly maintained. The work site must also be kept in clean and orderly.

12.2.3 Clean Up

During the progress of the work, the Contractor must keep the entire job site in a clean and orderly condition. Excess or unsuitable backfill material, broken pipe, or other waste material must be removed from the job site. Spillage resulting from hauling operations along or across existing streets or roads must be removed immediately by the Contractor. All gutters and roadside ditches must be kept clean and free from obstructions. Any deviation from this practice must have prior approval from the University.

12.3 Project Completion

Once the work on the project site is complete, including:

1. site cleanup,
2. dressing and hydroseeding graded slopes,
3. completion of all utility and drainage facilities
4. removal of temporary traffic control devices from public roads

the Project Engineer may initiate the final processing of the improvements.

12.3.1 Clean Up

Before final acceptance of the work, the Contractor must:

1. carefully clean up the work and premises
2. remove all temporary structures built
3. remove all surplus construction materials and rubbish of all kinds
4. leave the site in a neat condition.

12.3.2 Record Drawings

During the progress of the work, the Engineer of Work must maintain one set of prints of the improvement plans showing all as-built changes. Each as-built change must be approved by the University before being made. This set must be available on the job for inspection by the University at any time. Upon completion of the work, the Engineer of Work must make as-built changes on the original plans, and return them to the University prior to acceptance of the project.

12.3.3 Improvements to be Accepted for City Maintenance

For any public improvement which is to be accepted for City maintenance, the Engineer of Work must submit records of the improvements to be accepted, in AutoCAD and PDF format of all construction drawings.