

CHAPTER 900 LANDSCAPE ARCHITECTURE

Topic 901 - General

Index 901.1 - Landscape Architecture Program

The Landscape Architecture Program is responsible for the development of policies, programs, procedures, and standards for all aspects of the Roadside Program which consists of highway planting, replacement highway planting, mitigation planting, highway planting revegetation, highway planting restoration, roadside rehabilitation, roadside protection and restoration, roadside improvements, safety roadside rest areas, scenic highways, classified landscaped freeways, transportation art, gateway monuments, community identification, blue star memorial highways, and planting in conjunction with noise barriers.

This chapter provides boldface, underlined and permissive standards as defined in Index 82.1. The Chief, Division of Design is responsible for approving exceptions to all boldface standards unless delegated as noted in Index 82.2(1). District Directors are responsible for approving exceptions to all underlined standards as discussed in Index 82.2(2). All other guidance in this Chapter pertaining to the design of planting and irrigation systems as well as when noted in the text is the responsibility of the Landscape Architecture Program. See the Project Development Procedures Manual (PDPM) Chapter 29 regarding process and procedures for approval of deviations from Landscape standards.

901.2 Cross References

- Several highway landscape architectural terms are defined in Index 62.5 of this manual.
- The PDPM contains general definitions, policies, and procedures concerning planting and conservation of vegetation and explains procedures and responsibilities for developing highway planting projects.
- The Preliminary Environmental Analysis Report (PEAR), included in the Standard

Environmental Reference, contains guidelines and responsibilities for determining scenic resources during the project development process. <http://www.dot.ca.gov/ser/pear.htm>

- Chapter 500 of the Encroachments Permits Manual contains procedures and guidelines for planting design and administering planting by others, through permit projects.
- Chapters 4-20 and 4-21 of the Construction Manual discuss materials and methods involved in erosion control and planting and irrigation. Allowable options are described for materials and work methods called for in the project specifications as well as Landscape Architect involvement during construction.
- Chapter E of the Maintenance Manual contains instructions about the maintenance of highway planting and other roadside features. Chapter C2 of the Maintenance Manual contains instructions about the maintenance of native and naturalized roadside vegetation.
- The Landscape Architecture Program's website further explains the Department's policy and provides guidance for landscape architectural work, including water conservation. The website is located at: <http://www.dot.ca.gov/design/lap/>.

Topic 902 - Planting Guidance

902.1 General Guidance for Freeways and Expressways

This section provides standards and guidelines for the design of planting and irrigation systems.

Highway planting is vegetation placed for aesthetic, environmental mitigation, storm water pollution prevention, or erosion control purposes, and includes necessary irrigation systems, inert materials, and mulches.

In addition, highway planting is used to satisfy the need for headlight glare reduction, fire retardance, windbreak protection, or graffiti reduction on retaining walls and noise barriers.

- (1) *Design Considerations.* Design planting and irrigation systems to achieve a balance between aesthetics, safety, maintainability, cost-effectiveness, water and resource

conservation. Planting and irrigation design should respond to the following community goals:

- (a) **Aesthetics.** Select plants and replacement planting to integrate the facility with the adjacent community or natural surroundings; buffer objectionable views of the highway facility for adjacent homes, schools, parks, etc.; soften visual impacts of large structures or graded slopes; screen objectionable or distracting views; frame or enhance good views; and provide visually attractive interchanges as entrances to communities.

Select and arrange regionally appropriate drought tolerant native and non-native plants to be visually and culturally compatible with local indigenous plant communities and the surrounding landscape.

Place plants according to the perspective of the viewer. For example, compositions viewed by freeway motorists should be simplified and large scale. Compositions primarily viewed by pedestrians may be designed with greater detail.

Integrate the highway improvement within the existing environment using contour grading that preserves existing natural topographic features and plant material.

- (b) **Safety.** Planting and irrigation facilities are designed for the safety of both highway workers and the public.

To understand potential hazards to maintenance workers, designers should be familiar with Topic 706 as well as Chapter 8, "Protection of Workers", of the Maintenance Manual.

Select and locate plants to maintain sight distance and clear recovery zone distances. Planting, without exception, must not interfere with the function of safety devices (e.g., barriers, guardrail) and traffic control devices (e.g., signals and signs), shoulders and the view from the roadway of bicyclists and pedestrians.

Highway planting and irrigation work should incorporate design for safety concepts that include, but are not limited to, the following:

- **Access** - Provide access gates for maintenance personnel from local streets and frontage roads. Provide paved maintenance vehicle pullout areas away from traffic on high volume highways and other areas where access cannot be made from local streets and roads. Maintenance access roads provide access to the center of loop areas or other wide, flat areas.
- **Minimize Exposure to Traffic and Reduce the Need for Shoulder or Lane Closures** - Locate vegetation away from shoulder areas, gore areas, and narrow island areas between ramps and the traveled way to reduce the need for shoulder or lane closures to perform pruning or other maintenance operations. Narrow areas and areas beyond freeway gore entrances and exits should be paved. See Index 504.2(2) for further contrasting surface treatment guidance.
- **Median Planting** - Median planting should not be permitted on freeways. Exceptions for the planting of freeway medians are approved by the District Director if the planting can be maintained.

- (c) **Maintainability.** Planting and irrigation designs should minimize ongoing intensive maintenance activities through field observation and discussion with maintenance personnel during project development. Ongoing communication between designers, landscape specialists, landscape maintenance personnel, and construction inspectors will ensure that maintenance concerns are addressed.

Select and locate plants to reduce application of herbicides.

Specify plant establishment and irrigation test periods of sufficient time to identify

and resolve problems and minimize long term maintenance requirements.

- (d) **Cost-effectiveness.** The design should provide maximum long term benefit for the costs involved. Materials and methods specified should be commercial quality and closely matched to the project conditions.
- (e) **Water and Resource Conservation.** The use of potable water for irrigation is discouraged. Non-potable or recycled water should be used instead of potable water wherever possible.

Conserve water by using regionally appropriate drought tolerant native and non-native plants that will require little or no supplemental water at the completion of the plant establishment period. See Chapter 29 of the PDPM for plant establishment period requirements.

Conserve water by using wood or gravel mulches to reduce evapotranspiration.

Use “smart” irrigation controllers that automatically adjust water application based upon weather conditions.

902.2 Sight Distance and Clear Recovery Zone Standards for Freeways and Expressways

Sight distance and safety are of primary importance, and are not to be subordinate to aesthetics. Applicable minimum sight distance standards are set forth in Topic 201 Sight Distance and Topic 405 Intersection Design Standards.

Two types of plant setbacks affect the placement of landscape elements:

- To keep the continuous length of highway ahead visible to the driver (sight distance).
 - To keep the clear recovery zone free of physical obstructions.
- (1) *Sight Distance Plant Setbacks.* Sight distance limits are measured from the edge of traveled way to the outside edge of the mature growth. Plant setback is measured from the edge of traveled way to the face of tree trunk or face of shrub foliage mass. Care must be taken to

ensure that future growth will not obstruct sight distance.

Proposed mature planting should maintain sight distance required by the design speed of the facility. In cases where, due to geometric restrictions, the existing freeway facility does not provide 80 miles per hour sight distance, no further reduction should be caused by planting.

For interchanges, all planting must provide ramp and collector-distributor road sight distance equal to or greater than that required by the design speed criteria with a minimum provision of sight distance for 40 miles per hour. At points within an interchange area where ramp connections or channelization are provided, plantings must be clear of the shoulders and sight line shown in Figure 504.3I, Location of Ramp Intersections on the Crossroads.

Particular attention should be paid to planting on the inside of curves in interchange loops, in median areas, on the ends of ramps, and on cut slopes so that shoulders are clear and designed sight distances are retained for vehicles, bicycles and pedestrians. See Index 902.3.

Sight distance requirements restrict the height of plants or the horizontal distance of plants from the traveled way. Low growing plants may be planted within the plant setback distance as long as the requirements for sight distance are met as discussed in Index 201.6 and illustrated in Figure 201.6. Taller growing plants are to be placed beyond these plant setbacks. In interchange areas, generally, from the edge of traveled way, a 50-foot horizontal clearance within the loops is considered as the sight distance plant setback for trees and shrubs that will grow above a 2-foot height.

- (2) *Clear Recovery Zone.* The clear recovery zone provides an area for errant vehicles to potentially regain control. For tree setback purposes, large trees are defined as plants which at maturity, or within 10 years, have trunks 4 inches or greater in diameter, measured 4 feet above the ground. Examples

of large tree species are Coast Redwood (*Sequoia sempervirens*), Coast Live Oak (*Quercus agrifolia*) and Deodar Cedar (*Cedrus deodora*).

On freeways and expressways, including interchange areas, there should be 40 feet or more of clearance between the edge of traveled way and large trees; however, a minimum clearance of 30 feet must be provided. Special considerations should be given to providing additional clearance in potential recovery areas. The 30-foot distance is measured horizontally from the edge of traveled way to the face of the tree trunk. Large trees may be planted within the 30-foot limit where they will not constitute a fixed object; for example, on cut slopes above a retaining wall or in areas behind guardrail, which has been placed for reasons other than tree planting.

Exceptions to the 30-foot tree setback may also be considered on cut slopes which are 2:1 or steeper or where there are physical barriers such as retaining walls. The minimum tree setback in these cases should be 25 feet.

Offset distances greater than 30 feet should be provided at locations such as on the outside of horizontal curves and in the vicinity of ramp gores.

Large trees should not be planted in unprotected areas of freeway or expressway medians with the possible exception of separated roadways with medians of sufficient width to meet the plant setback requirements for tree planting.

Small trees are those with smaller trunks or plants usually considered shrubs, but trained in tree form which would not develop 4-inch diameter trunks within 10 years. Examples of small trees are Crape Myrtle (*Lagerstroemia indica*), and Bottle Brush trained as a standard (*Callistemon* sp.).

902.3 Planting Guidance for Large Trees on Conventional Highways

When proposing large trees for conventional highways the mature size, form, and growth characteristics of the species should be considered.

Select and locate large trees to maintain a minimum vertical clearance of 17 feet from the pavement to the lower foliage of overhanging branches over the traveled way and shoulder to provide visibility of highway signs, features, and appurtenances. Select and locate large trees to maintain a minimum vertical clearance of 8 feet from the sidewalk to the lower foliage of overhanging branches for pedestrian passage. Do not select tree species that will require regular pruning at maturity to maintain these clearances.

Large trees must not restrict sight distance requirements.

Large trees must not visually restrict existing signs and signals.

Large trees planted in conventional highways are to comply with the requirements in Table 902.3. All distances are measured from the frame of reference specified in Table 902.3 to the face of the tree trunk. See the District Landscape Architect for plant selection, plant setback, and spacing consistent with this guidance.

See Index 305.1(2) for median guidance on conventional highways.

902.4 Planting Procedures, Selection and Location

- (1) *Design Procedures.* An overview of the project development process is covered in the Project Development Procedures Manual.
- (2) *Plant Selection.* Select drought tolerant native or non-native plants that will survive if supplemental water is discontinued or becomes unavailable. Plants should be well suited to local environmental conditions such as sun exposure, aspect, climate, annual precipitation, temperature extremes, soil type, recycled water quality, and wind.

Plants should have a growth rate, longevity, size, and appearance appropriate for their intended use, and should not require ongoing maintenance. California plants that meet required planting criteria should be used to the greatest extent possible. Species availability and fire risk should also be taken into consideration.

Monoculture planting is discouraged.

**Table 902.3
Large Tree Setback Requirements on Conventional Highways**

ROADSIDE			
Condition	Posted Speed (mph)		
	≤ 35	40 – 45	> 45
With curb	<u>18" Min. from curb face</u>	30' Min from ETW	
With barrier	<u>Min. deflection distance from barrier face (barrier type specific)</u>	<u>Min. deflection distance from barrier face (barrier type specific)</u>	
Without curb or barrier	<u>30' Min from ETW</u>		
MEDIAN ^{(1), (2)}			
Condition	Posted Speed (mph)		
	≤ 35	40 – 45	> 45
With curb	5' Min. from curb face	Not Allowed	
With curb in Main Street context; where median width of 12' is not feasible and trees are a part of a community's transportation plan to improve livability that also includes transportation features for traffic calming through physical design such as modifying intersections or relocating traffic lanes to make space for bike lanes, sidewalks and landscaping. See the Department's "Main Street, California" document for more information.	18" Min. to 5' from curb face if approved by the District Director	Not Allowed	
With barrier	Concrete Barrier: 18" Min. from face of barrier Other Barrier: Min. deflection distance for barrier type, 18" Min.		Allowed if approved by the District Director
Without curb or barrier	Not Allowed		

Notes:

- (1) Trees in the median shall be located at least 20 feet from manholes.
- (2) Trees in the median shall be located at least 100 feet from the longitudinal end of the median.

Select diverse plant species with robust characteristics properly suited to the project environment.

Wherever feasible, trees should be used to create the main structure of the planting composition.

Trees generally recognized to be brittle, susceptible to disease, or that increase in size by suckering, should not be selected.

Plants with edible or attractive fruits, berries or nuts should not be selected.

When appropriate, planting projects must include California native wildflowers as an integral and permanent part of the planting design. Chapter 29 of the Project Development Procedures Manual discusses wildflower requirements.

- (3) *Plant Location.* When locating plants, the mature size, form, and characteristics of the species should be considered, particularly for safety of maintenance workers and the traveling public, and long-term maintenance costs.

Locate plants so that pruning will not be required. Do not plant trees under overhead utilities or structures.

Locate plants so that they will not obscure existing billboards, or on-premise business identification signs for a distance of 500 feet from the billboard sign.

Locate plants so they will not obscure pedestrians and bicyclists at intersections or other conflict points.

Planting designs that use permanent irrigation systems should group plants with similar water requirements together in hydrozones to conserve water.

Plants with thorns or known to be poisonous to humans and animals, (e.g., rose, oleander), should not be planted adjacent to sidewalks, bikeways, areas used for grazing animals, equestrian activities, with high public exposure, or where children have access to the planting. Designers should be aware of State and local restrictions on the planting of certain species in or adjacent to specified areas.

Contact District Landscape Architect for further information.

In areas subject to frost and snow, plantings should not be located where they will cast shade and create patches of ice on vehicle or pedestrian ways.

- (4) *Planting on or Near Walls.* Vine planting should be included with all sound barrier projects to reduce the potential for graffiti and to soften the appearance of the wall. If retaining walls or sound barriers are located within the clear recovery zone (see Index 902.2), plants may be placed behind the walls and be allowed to grow over (or through) the wall, or plants may be placed in front of the wall, but they must be behind a concrete safety shaped barrier that is placed to shield something other than plants. Plants are not permitted on concrete safety shaped barriers on the traffic side, unless an exception is granted from the Division of Traffic Operations and all of the following requirements are met:

- (a) Only vines which have a natural tendency to cling to noise barriers or retaining walls may be planted on the traffic side of barriers. Support structures on walls should not be used. The vines must readily adhere to the barriers. No shrubs or ground cover will be allowed. Vines such as Creeping Fig (*Ficus pumila*) and Algerian Ivy (*Hedera canariensis*) will not be allowed due to their habit of peeling off hard surfaces at maturity.
- (b) Plant basins must be depressed and minimal in size. Ground surface irregularities must be insignificant or nonexistent.
- (c) Each plant must be individually irrigated. The plants should not encroach onto the shoulder or create sight distance problems.

The Maintenance Unit should be consulted as vines planted on walls may require maintenance access for pruning. See Index 1102.7 for maintenance considerations in noise barrier design.

- (5) *Planting of Vines on Bridge Structures.* Vines should not be planted where they might grow over any portion of the bridge structure. When the regular inspection of bridge structures is required and where rapid visual inspection of these structures is required in areas of high seismic activity, the planting of vines on bridge structures or columns is not permitted. There are certain conditions such as low average daily traffic, high redundancy in the substructure, etc. where exceptions from Structure Maintenance may be granted, after all risk vs. benefit factors are considered, to plant vines.
- (6) *Planting in Vicinity of Airports and Heliports.* All plants must not exceed the height restriction standards contained in Topic 207 of this manual. Mature plant height must be used to determine if the plant(s) will be considered an obstruction to navigable airspace.

902.5 Irrigation Guidelines

- (1) *General.* Irrigation systems should be designed to conserve water, minimize maintenance, minimize worker exposure to traffic, and sustain the planting. The design should be simple, efficient, and straight forward.

Irrigation systems must comply with State and local water conservation requirements including the Model Water Efficient Landscape Ordinance (MWEL0).

Irrigation systems that use recycled, non-potable, or untreated water must comply with State and local water quality health standards and regulations.

Permanent irrigation systems must not use potable water if recycled or non-potable water is available. Temporary irrigation systems may use potable water if designed to be abandoned and removed at the completion of the plant establishment period. See Chapter 29 of the PDPM for plant establishment period requirements.

Water quality should be considered when selecting irrigation components. Design the irrigation system taking into consideration the

salinity level and increased particulate content often found in recycled and non-potable water sources.

Minimize exposure to traffic and reduce the need for shoulder or lane closures by locating irrigation system components away from shoulder areas, gore areas, and narrow island areas between ramps and the traveled way.

Design irrigation systems to take advantage of “smart” controllers and remote control devices that minimize worker exposure and conserve water.

Use standard, commercially available irrigation components, avoiding nonstandard features unless required to address unique site conditions.

Security measures, such as locking cabinets, enclosures and valve boxes should be provided.

Potential damage from pedestrians or vehicles should be considered when selecting and locating all irrigation components. Place irrigation components such as controllers, valves, backflow preventers, and booster pumps far away from gores, narrow areas, and decision points, preferably behind barriers or shielded by a structure.

- (2) *Valves and Sprinklers.* Irrigation systems should be designed for automatic operation. When systems are temporary or will be used infrequently, manual, battery, solar or timer-operated valves may be used.

Control valves are to be in manifolds where practical and a ball valve must be provided.

Cluster and locate valves adjacent to maintenance vehicle pullouts, access paths or in locations accessible from outside the right of way via access gates.

Place irrigation components that require regular maintenance, such as valves and controllers, outside the clear recovery zone or behind safety devices.

When possible, trees and shrubs that require permanent irrigation spaced greater than 10 feet on center should be watered individually.

Permanent or temporary overhead irrigation systems, e.g., impact or gear driven sprinklers, should be limited to irrigating low shrub masses, ground cover or establishing native grasses. Trees in overhead irrigated ground cover areas should receive supplemental basin water. Sprinklers should be appropriate for local wind and soil conditions. Sprinklers should be selected and placed to avoid spraying paved surfaces. Sprinklers, other than pop-up heads, subject to being damaged by vehicles, bicyclists, or pedestrians should be relocated or provided with sprinkler protectors, flexible risers, or flow shutoff devices. Sprinklers on fixed risers should not be placed adjacent to sidewalks and bikeways. Sprinkler protectors should be used on pop-up sprinklers and quick coupling valves adjacent to the roadway.

- (3) *Controllers.* Irrigation controllers should be “smart,” easily accessible, located in vandal resistant cabinets, protected from vehicular traffic, and in an area with good lighting. Install the irrigation controller cabinet with the back facing the direction of oncoming traffic in the nearest traffic lane. Controllers must not be located near shoulders, in or near dense shrubbery, or in the path of the spray of sprinklers.
- (4) *Backflow Preventers.* The use of reduced pressure principle backflow devices are required for highway planting projects. Master remote control valves should be used at all pressured water sources directly downstream of the backflow preventers. Backflow preventers should be located in enclosures.
- (5) *Booster Pump Systems.* When local agency water pressure is insufficient, booster pumps may be included in the irrigation design. Design of a booster pump system should be coordinated with DES-SD, Office of Electrical, Mechanical, Water and Wastewater Engineering (OEMW&W). After the irrigation system has been designed such that all branches have close to equal flowrate requirements, the booster pump system design request should be prepared including flowrate and discharge pressure needed for the pump,

the availability for power distribution, and maintenance access to the pump site. OEMW&W will either design the booster pump system, (including the equipment pad, enclosure, valves and piping, pump equipment, and pump control equipment) or recommend an off-the-shelf booster pump package.

Topic 903 - Safety Roadside Rest Area Standards and Guidelines

903.1 Minimum Standards

The following standards generally represent minimum values. When consistent with sound judgment and in response to valid concerns, variations may be considered. Standards lower than those indicated herein may not be used without approval of the Principal Landscape Architect, Landscape Architecture Program. See Chapter 29 of the Project Development Procedures Manual (PDPM) for process and procedures for approval of deviations from standards.

The Division of Design is responsible for approving nonstandard geometric design as discussed in Topic 82 and Index 901.1. The District Design Liaison and Project Delivery Coordinator should be involved in reviewing the geometric features for the design of the on and off ramps of safety roadside rest areas. Structural sections and drainage should be designed in accordance with the standards contained in this manual.

903.2 General

Safety roadside rest areas should be designed to provide safe places for travelers in automobiles, commercial trucks, recreational vehicles, and bicycles where not prohibited, to stop for a short time, rest and manage their travel needs. Safety roadside rest areas may include vehicle parking, bicycle parking, picnic tables, sanitary facilities, telephones, water, landscape tourist information, traveler service information facilities and vending machines. Safety roadside rest areas should be provided at convenient intervals along the State highway system to accommodate traveler needs.

Safety roadside rest areas should comply with State and Federal codes and regulations that address