

Design Standards

6.1. Geometric Design

6.1.1 Horizontal Curves

The following design standards should be considered for horizontal curves:

1. Minimum curve radii with and without superelevation are shown in Chapter 1, "Roadway & Alley Design," for the various classifications of streets. These radii are derived from the CalTrans Highway Design Manual's Maximum Comfortable Speed on Horizontal Curves chart.
2. Superelevation
 - a. Local streets and two-lane residential collectors should not generally be superelevated at curves.
 - b. Superelevation is allowed on other street classifications as required to maintain the design speed along curves and adhere to maximum comfortable speed criteria.
 - c. When superelevation is required, the minimum amount permitted is plus 2 percent. The maximum superelevation permitted, regardless of circumstances, is 4 percent for design speeds of 30mph and lower, 6 percent for urban classifications with design speeds between 35mph and 45mph, and 10 percent for rural classifications and for design speeds of 50mph and higher.
 - d. Superelevation must be designed to show length, transition, and crown runoff. Design must follow CalTrans standards as provided in its Highway Design Manual, Chapter 200.
 - e. Superelevation shall extend uniformly from the flow line of the gutter on the high side of the street to the lip of the gutter on the low side of the street, keeping the standard slope of the gutter on the low side unchanged. This shall also include the slope of median gutters, if any, as shown in The City of San Diego Standard Drawing SDG-154.
 - f. All streets not superelevated shall be crowned at 2 percent.
3. Sight distance on horizontal curves shall be determined from CalTrans Highway Design Manual Figure 201.6, "Stopping Sight Distance on Horizontal Curves."
4. Compound curves are prohibited.
5. Reversing Curves
 - a. Reversing curves are permitted; however, for all streets other than local streets, they must be separated by a tangent length adequate to provide safety of travel.

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- b. For non-superelevated reversing curves, the tangent length provided shall be compatible with probable driving speed, type of vehicle use, and individual curve radius and length.
 - c. Superelevated reversing curves shall be separated by tangents sufficient to contain all of the superelevation runoff required.
6. Knuckles may be approved on an exception basis for residential cul-de-sacs with 200 ADT or under, intersecting at right angles plus or minus 5 degrees. Knuckles should not be used in lieu of providing a 100-foot minimum curve radius required on residential cul-de-sacs.
 7. Sharp horizontal curves must not begin near the top of pronounced crest vertical curves or near the low point of pronounced sag vertical curves.

6.1.2 Vertical Curves

The following design standards should be considered for vertical curves:

1. Vertical curves shall be designed to the current CalTrans Highway Design Manual Stopping Sight Distance based on design speed.
2. For local streets, the minimum acceptable vertical curve is 10 feet of curve for each 1 percent difference in grade.
3. Vertical curves leading into intersections shall be designed such that the grade immediately approaching a cross gutter is no greater than 4 percent.
4. Sight distance on vertical curves shall be determined from CalTrans Highway Design Manual 201.4, "Stopping Sight Distance on Crest Vertical Curves" and Figure 201.5, "Stopping Sight Distance on Sag Vertical Curves."

6.1.3 Intersections

The following design standards should be considered for intersections:

1. Streets are to intersect at 90-degree angles or as close as practicable.
2. Two streets intersecting opposite sides of a third street are to have the same points of intersection or else their centerlines are to be separated by a minimum of 120 feet for local streets and a minimum of 200 feet for all other streets on the third street.
3. Median breaks for intersections along major streets with other streets of collector or higher classification shall be no closer than 0.25 miles.
4. Full access intersections of local streets with major streets should be kept to a minimum, and such intersections shall be at least 500 feet apart, measured between centerlines, and shall be farther apart where turn pockets dictate longer spacing. The need for left-turn storage may require a greater distance. Pedestrian access to transit and adjacent commercial uses should be considered in major street intersection spacing.
5. Local streets should not intersect primary arterials.
6. Maximum grade across intersections along local and two-lane sub-collector and two-lane collector streets shall not exceed 8 percent and along four-lane streets and greater shall not exceed 5 percent.

7. Curb return radius should accommodate the expected amount and type of traffic and allow for safe turning speeds at intersections. Curb return radius shall be installed in accordance with Table 6-1.

TABLE 6-1. CURB RETURN RADIUS

	Local Residential	Collector	Major
Local Residential	15 ft.	20 ft.	30 ft.
Collector	20 ft.	25 ft.	30 ft.
Major	30 ft.	30 ft.	30 ft.

Note: Curb return radius for all other intersections not covered in Table 6-1 shall be determined by the appropriate reviewer.

8. Sight distance at intersections must consider the following factors: grades, curvature, and superelevation.
 - a. The minimum corner sight distance at an intersection of a street (public or private) or multiple dwelling residential/commercial/industrial driveway with a collector or higher classification street shall be in conformance with AASHTO Standards.
 - b. Adequate sight distances at intersections and along horizontal curves must be maintained. A sight distance easement that requires fences, monuments, signs, landscaping, walls, and slopes or any other obstruction at and beyond the ROW line to be eliminated, kept below 36 inches, or set back is only acceptable when relocation of the intersection or redesign of the curve does not permit adequate sight distance.
9. The City Engineer or designee may prohibit parking at critical locations.
10. The City Engineer or designee may control access along major streets at critical locations.

6.1.4 Transitions

The following design standards should be considered for transitions:

1. No pavement widening transition is required to increase the number of travel lanes beyond that needed for drainage flow.
2. When reducing the number of through travel lanes, the paved section shall undergo a transition as follows:
 - a. For $V \geq 45$ mph, $L = W \times V$
 - b. For $V \leq 40$ mph, $L = W \times V^2/60$

(where V = design speed, in miles per hour; W = width of roadway transition, in feet; L = transition length, in feet)

6.1.5 Cul-de-Sacs

The following design standards should be considered for cul-de-sacs.

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6.1.5.1 Objectives

1. Cul-de-sacs can be used to minimize encroachments into steep topography or other sensitive environmental features. However, when utilizing cul-de-sacs, care should be taken to design an interconnected street pattern within a residential neighborhood in order to provide, to the maximum extent feasible, direct pedestrian/bicycle routes to local destinations.
2. In an effort to encourage walking, bicycling, and transit as a viable means of transportation within residential neighborhoods, cul-de-sacs may be utilized within a subdivision so long as the development does not result in a circuitous street system that unnecessarily inhibits pedestrian circulation, discourages transit service, or causes added traffic impacts to other residences within the neighborhood.

6.1.5.2 Connections/Access

1. When a cul-de-sac exceeds 150 feet in length and/or pedestrian or bicycle circulation is being or will be significantly impacted and the traffic levels on neighboring streets are being or will be degraded, additional design features should be considered including (but are not limited to):
 - a. Providing for pedestrian and bicycle connections through the cul-de-sac, or
 - b. Provide for pedestrian and bicycle connections through the interconnection of the bulb of the cul-de-sac with an adjacent local street. These options should be considered in order to provide access to adjacent streets or to adjacent land uses such as open space, parks, trails, or commercial areas.
2. The design of pedestrian and bicycle access ways should address the following to provide for the safety of users:
 - a. Length should be kept to a minimum.
 - b. Adequate lighting should be provided.
 - c. Landscaping, fences, grade differences, or other obstructions should not hinder visibility into the access way from adjacent streets and properties.
 - d. Surrounding land uses should be designed to provide surveillance opportunities from those uses into the access way, such as with the placement of windows.
 - e. Emergency vehicle access should be provided in cases where external surveillance is inadequate.

6.1.5.3 Industrial and Commercial Areas

1. Turnaround curb radius shall be 55 feet.
2. Such cul-de-sacs shall be limited to 500 feet in length from property line of the intersecting street to end of the bulb unless there are clearly defined topographic conditions requiring greater lengths. In such instances, intermediate turnarounds or secondary emergency vehicle only access may be required.

6.1.5.4 Residential Areas

1. Cul-de-sacs serving more than four dwelling units or over 150 feet in length require a turnaround. Cul-de-sacs of 150 feet or less shall be developed such that access can be provided without backing onto streets intersecting the cul-de-sacs.
2. Turnaround curb radius shall be 50 feet.
3. Turnaround curb radius may be reduced to 35 feet if cul-de-sac length is less than 150 feet, measured to the end of the bulb.
4. Residential cul-de-sacs are limited to a maximum of 200 ADT unless there are clearly defined topographic constraints that require greater volumes. Intermediate turnarounds shall have a 50-foot radius. In all cases, intermediate turnarounds and/or special design may be required to accommodate access by emergency vehicles and/or emergency evacuations.

6.2. Street Element Design

Most design details, location requirements, pavement computations, and construction methods are included in the latest edition of City of San Diego Standard Drawings, "Greenbook", and "Whitebook".

6.2.1 Street Requirements

Curb-to-curb width is the distance from face-of-curb to face-of-curb, as shown in the San Diego Regional Standard Drawings.

6.2.2 Drainage

Street drainage is covered in detail in the Drainage Design Manual and Storm Water Standards.

6.2.3 Medians

The following design standards should be considered for medians:

1. All center medians shall be raised, bounded by 6-inch B-2 concrete curbs and surfaced with stamped concrete or concrete as called for in the City of San Diego Standard Drawings.
2. Landscaped medians shall conform to the City of San Diego Standard Drawings. Maintenance for landscaped medians shall be provided for through a maintenance assessment district or by other agreement with the City of San Diego.
3. All median noses shall be painted yellow.

6.2.4 Pavement

The following design standards should be considered for pavement:

1. Streets shall be paved with asphalt concrete over cement-treated base, concrete, or full-depth asphalt concrete in accordance with City of San Diego Standard Drawings or with a comparable structural section approved by the City Engineer or designee.
2. PCC pavement is required for streets with grades greater than 12 percent.

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3. The same pavement section is required in shoulders as well as driving lanes, except for rural road classifications.
4. Concrete bus pads are required for all bus stops along transit corridors and shall consist of 9 inches of PCC pavement. Refer to the Metropolitan Transit Development Board “Designing for Transit” Guidelines for other dimensions.
5. Raised pavement markers are required for all streets of collector or greater classification. Installation and criteria must be according to the latest edition of the California Manual on Uniform Traffic Control Devices (CA MUTCD).
6. Stamped concrete or other types of decorative paving will be permitted in the traveled roadway of a public and/or private street, provided all of the following conditions are met:
 - a. At signalized intersections to designate pedestrian crosswalks (brick pavers, but not stamped concrete, may be used);
 - b. The street grade is 8 percent or less; and
 - c. Maintenance is assured by either an encroachment removal agreement or by inclusion in an assessment district.

Construction plans shall be prepared by a Registered Civil Engineer and shall indicate the location, color, type of material, and stamping pattern. Decorative paving may be allowed at other locations through the deviation from standard process process (see Appendix G).

7. Stamped concrete or other types of decorative paving will not be permitted at uncontrolled intersections to designate pedestrian crosswalks or at locations where it might appear to be a pedestrian crosswalk, in cross-gutters or gutters, or to be used to delineate pedestrian ramps. Stamped concrete and other types of decorative paving are permitted at other locations designated and marked as pedestrian crosswalks.
8. Engineers are cautioned that use of stamped concrete in residential areas may cause adverse community reaction due to noise where the roadway is immediately adjacent to dwelling units.

6.2.5 Rolled Curbs

Rolled curbs are not permitted on publicly dedicated streets, except that rolled or mountable curb may be permitted in situations such as pop-outs or roundabouts. Rolled curb may be used on private driveways where the grade does not exceed 5 percent.

6.2.6 Right-of-Way (ROW)

The portion of the right-of-way beyond curbs shall slope upward away from the street at 1.5 percent grade.

6.2.7 Sidewalks

6.2.7.1 Widths

The following design standards should be considered for sidewalk widths:

1. Minimum widths are set forth in Chapter 5, "Parkway Configurations," for various street classifications.
2. The width of a contiguous sidewalk is measured from the back of the curb.
3. Sidewalk widths are intended to be clear widths. Where fire hydrants, street furniture, or other above-ground appurtenances reduce such width, additional sidewalk should, if feasible, be constructed around the obstacles.
4. Where feasible, the location of transit stops and shelters shall be determined and the sidewalk width shall be 10 feet where shelters are proposed. Other bus stop locations shall provide 8 feet of sidewalk. The wider sidewalk widths for bus shelters shall extend for 25 feet parallel to the curb measured from the bus stop sign. This will provide adequate clearance to accommodate bus lifts for persons with disabilities. Refer to MTS Designing for Transit for additional information.
5. Sidewalks with continuous gradients shall have resting areas 5 feet in length at intervals of 400 feet maximum. The resting area shall be at least as wide as the walk. The slope of the resting area in all directions shall be 1.5 percent.
6. If the clear width of the sidewalk is less than 5 feet, then level passing spaces shall be provided at intervals of 200 feet maximum. Passing spaces shall be either:
 - a. A space 60 inches minimum by 60 inches minimum; or
 - b. An intersection of two walking surfaces providing a T-shaped space, where the base and arms of the T-shaped space extend 48 inches minimum beyond the intersection. For an illustration of T-shaped spaces, see Chapter 2, "Pedestrian Design," section 2.1.2, "Sidewalks."

6.2.7.2 Locations

The following design standards should be considered for sidewalk locations:

1. Sidewalk areas within curb returns are to be completely paved at all collector, major, and primary arterial intersections, and at other intersections where significant pedestrian volumes are anticipated.
2. A variation or transition in sidewalk location from that recommended above shall be considered to achieve consistency with existing adjacent sidewalks.
3. Transitions should be four-to-one.

6.2.7.3 Curb Ramps

The following design standards should be considered for sidewalk curb ramps:

1. All sidewalk installations (including replacements) are to include curb ramps (installation or replacement) at curbed intersections, T intersections, and alley aprons.
2. Two curb ramps per corner are required at new intersections. The curb ramps shall be in line with the direction of crosswalks.
3. All crosswalks at intersections (marked or unmarked) shall have a curb ramp at each end.

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4. A single curb ramp may be installed at the center of each sidewalk corner of an intersection that is going to be retrofitted.
5. Sidewalks and curb ramps are to be designed and installed per the City of San Diego Standard Drawings.

6.2.7.4 Innovative Sidewalks

Innovative sidewalks may be considered for area enhancement and to avoid existing features such as trees. They may be approved on an individual basis provided they are located within the street ROW and maintenance of the area between the sidewalk and curb is provided by special assessment district or other agreement with the City of San Diego. All other requirements shown in Standard Drawings, such as 1.5 percent fall, between property line and face of curb, should be complied with. Sidewalks and the pedestrian path shall be parallel to the curb to the greatest extent possible.

6.2.7.5 Construction

The following design standards should be considered for sidewalk construction:

1. Sidewalks shall be constructed in accordance with City of San Diego Standard Drawings.
2. Utility access panels within sidewalks must be slip resistant and flush mounted, and they must not include holes greater than 0.25 inches.
3. Throughout the city, contractors stamp the work with their names and the date of construction on the sidewalk. In addition to the contractors' stamp, the name of the street is often imprinted into the curb. In many of the city's older neighborhoods these street names may not be the current names of the streets. However, these markers are an indicator of the age of a particular neighborhood and provide a sense of continuity and history for the residents. When existing sidewalks are being repaired or replaced, care must be taken to retain in place these stamps and imprints or to place them near the new sidewalk work.

6.2.8 Landscape Requirements

Street trees are urban infrastructure whose value is recognized in many of the City's land use policy documents. These documents call for street tree plantings to achieve various goals, including:

- Establishing and preserving neighborhood character
- Encouraging commercial revitalization
- Creating a comfortable pedestrian environment
- Reduce the urban heat island effect
- Capture and reduce storm water runoff
- Sequester carbon and reduce pollution.

Requirements for street trees and other landscaping in the ROW, refer to the citywide Landscape Regulations (San Diego Municipal Code Section 142, Chapter 14, Article 2, Division 4) and the associated Land Development Manual-Landscape Standards.

The citywide Landscape Regulations address requirements such as the quantity, distribution, size, selection, and approval of plant material, including street trees. The Landscape Standards establishes standards, guidelines, and criteria for all landscaping in the public ROW such as locational criteria (distance of trees from the face of curb for certain street classifications and speeds, and from traffic signals, signs, and underground facilities), plant selection, maintenance, median landscaping, irrigation, and electrical services.

For all street trees and landscape plantings in roadway islands, watering and maintenance will be assured through an agreement with the City, such as a street tree permit, encroachment removal and maintenance agreement, or maintenance assessment district.

6.2.9 Driveways

The following design standards should be considered for driveways:

1. Access to private property from public and private streets shall be by standard concrete driveways. Curb returns with curb ramps are required at signalized driveways. Driveway width shall be consistent with the Land Development Code. Driveways shall be designed such that access can be provided without backing onto streets that are collector or higher. Driveways shall be designed and constructed per the City of San Diego Standard Drawings.
2. No driveway access is normally permitted to a primary arterial. Should a lot have frontage only on a primary arterial, driveway access limited only to right turns in and out will be permitted at locations and under conditions specified by the City Engineer and may require a dedicated lane.
3. Median breaks for driveway access to major streets will not normally be permitted unless all of the following conditions exist:
 - a. The property to be served is a major traffic generator and has a continuous frontage of 1,200 feet or more along the major street and is situated between streets that intersect the major street from the side occupied by the property.
 - b. The median opening is not less than 600 feet from an intersection with a major or collector street.
 - c. The median opening is not less than 400 feet from an intersection with a local street. The need for left-turn storage may require a greater distance.
 - d. The median opening is greater than 600 feet from any other existing or proposed mid-block median opening.
 - e. All costs (e.g., base material, surfacing, traffic safety street lighting, traffic signals, reconstruction or utility relocation) required by a mid-block opening will be borne by the requesting party.

6.2.10 Guardrail and Other Safety Devices

The following design standards should be considered for guardrails and other safety devices:

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1. All guardrail installations must be done in conformance with the latest edition of the State of California Traffic Manual, the AASHTO Roadside Design Guide, the City of San Diego Standard Drawings.
2. Guardrails may be required at certain locations for safety purposes in accordance with guidelines in the State of California Traffic Manual.
3. Reflectors and other safety structures may be required when necessary for public safety.
4. When guardrails are warranted at fire hydrant locations, guardrails shall be installed in a manner so as to not interfere with the operation of such hydrants.

6.2.11 Street Name Signs

Metal street name signs on metal posts are required at each intersection, at any point of street name change, and at midpoint in blocks over 2,000 feet in length, in conformance with City of San Diego Standard Drawings. New street names and street name changes shall follow the procedures contained in the San Diego Municipal Code Chapter 12, Article 5, Division 11. A private street sign within public ROW shall be the same color as public street signs, with the letters *PVT* or the word *Private* written on it in place of the City logo.

6.2.12 Intersection Control

Where two or more streets intersect, some form of traffic control is usually needed to define the ROW of the vehicles entering the intersection. This control can take the form of yield signs, stop signs on the minor street, all-way stop control, a traffic signal, or a roundabout.

When deciding what type of control an intersection should have, follow CalTrans Intersection Control Evaluation (Traffic Operations Policy Directive 13-02). When expansion or addition of one type of traffic control is considered, this evaluation ensures a comparison with other types of traffic control and the no-build scenario on the basis of system impacts, safety and mobility benefits for all modes, and life-cycle costs.

Stop signs and all-way stop controls are installed according to City Council Policy 200-8. Traffic signals are installed according to City Council Policy 200-6, except that references within Council Policy 200-6 to the Caltrans Traffic Manual should be read as referring to the latest version of the CA-MUTCD. These Council policies prescribe warrants based on City, State of California, and federal standards. The warrants take into consideration vehicular and pedestrian volumes, accident history, traffic safety, the transportation system, and other relevant factors.

For efficient signal coordination, intersections controlled by traffic signals should be spaced approximately one-fourth mile to one-half mile apart.

Roundabouts are an intersection control device that reduces intersection conflict points and can reduce speeds without significantly increasing travel time.

6.2.13 Roundabouts

Roundabouts are significantly different from traffic circles. While traffic circles are appropriate on 25 mph or slower local streets, roundabouts can handle as much traffic as comparable to traffic signals. Where space is constrained and speeds are 30 mph or slower and few trucks need to turn at the intersection, mini-roundabouts could be used in place of traffic circles. The defining elements of roundabouts, include splitter islands, truck aprons, and separated pedestrian crossings, can be found in National Cooperative Highway Research Program (NCHRP) Report 672 Section 1.2 and 1.3. Signs, striping, and markings at roundabouts are to comply with the CA MUTCD. Other suggested references are as follows:

- <http://www.dot.ca.gov/hq/oppd/hdm/pdf/english/chp0400.pdf>
- http://onlinepubs.trb.org/onlinepubs/nchrp/nchrp_rpt_672.pdf

6.2.14 Street Furniture

The following design standards should be considered for street furniture:

1. Street furniture and above-ground appurtenances placed in the public ROW shall conform to the requirements set forth in the ADA, California Title 24 regulations, the San Diego Municipal Code and applicable policies, regulations, and standards.
2. Maintenance shall be assured by either an Encroachment Maintenance and Removal Agreement or by inclusion in a maintenance assessment district.
3. Street furniture and above-ground appurtenances shall be located in a fashion that preserves the safety, integrity, and layout of the pedestrian passageway and assures that the right of the public to use the public sidewalk is not unreasonably restricted.
4. Bicycle racks, where placed in the public ROW, should be sited in a well-lit area as close to building entrances and regular foot traffic as possible without restricting or encroaching onto pedestrian-accessible routes. The rack must support the bicycle frame (not the wheel) at two points of contact and permit the use of a U-shaped lock to secure the frame and one wheel. The rack must be positioned to provide 2 feet by 6 feet of space per bicycle.

6.3. Private Streets and Private Drives

6.3.1 Private Streets

The following design standards should be considered for private streets:

1. Private streets may be utilized where there is a homeowners association established that will maintain the street system.
2. The entrance to private streets shall advise the public of the non-dedicated status of the street system and shall have an entrance design that visibly reinforces the private access. At a minimum, absent other design features, this design shall consist of signage designating the street as private. Such entrances must be provided with adequate visitor parking and turnaround facilities.

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3. Private streets shall be designed and constructed to the same structural, geometric, lighting, and drainage standards as dedicated streets. Private streets with parking on both sides of the street shall have a minimum curb-to-curb width of 34 feet.
4. General utility easements will be required over private streets. Width of easement should be consistent with street ROW.
5. The private street name sign shall be in accordance with the City of San Diego Standard Drawings.

6.3.2 Private Drives

The following design standards should be considered for private drives:

1. Private drives, where permitted in lieu of either dedicated or private streets, must be designed to allow direct access to all developed areas of the project.
2. Private drives serving as fire lanes shall be designed with a turning radius of 50 feet.
3. Minimum private drive width shall be consistent with the Land Development Code.
4. Private drives shall be designed and constructed per the City of San Diego Standard Drawings.

6.3.3 Walkways

A system of improved all-weather walkways must be provided connecting each dwelling unit to street sidewalks within and adjacent to the development and to major points of pedestrian attraction within the development.

6.3.4 Parking on Private Streets and Drives

The following design standards should be considered for parking on private streets and drives:

1. Parking shall meet the requirements established by the applicable zone as contained in the Land Development Code, the ADA, and California Title 24 accessibility regulations.
2. An unobstructed minimum distance of 25 feet from the circulation drive curb to the structure or carport area and not less than 20 feet from the back of sidewalk shall be provided.
3. Parking bays, both parallel and perpendicular, may be utilized on low-volume residential streets. Such facilities would normally be included within the ROW or private street easement and would be maintained as part of the street. Where a sidewalk is located on the same side of the roadway as the parking bay, a continuous walkway must be maintained either by restricting parking within five feet of the extended curb line or by providing an improved walkway around the parking bay. All parking bays shall accommodate full-size vehicles.