Table A.7
Typical Walking Times

Times of Day	Percent of Respondents
Weekday Mornings	31%
Weekend Mornings	18%
Weekday Mid-Days	19%
Weekend Mid-Days	10%
Weekday Evenings	14%
Weekend Evenings	8%

Source: Alta Planning + Design; March 2008

As illustrated in **Table A.8**, pedestrians use a wide array of sidewalks, trails and beach areas for walking but few people have access to or take advantage of paved off-street walkways according to survey respondents.

Table A.8
Most Frequently Used Walking Facilities

Facility	Percent of Respondents
Sidewalk (major streets)	31%
Trail	20%
Paved off-street walkways	4%
Sidewalk (back streets)	22%
Beach/Bay	23%

Source: Alta Planning + Design; March 2008

Survey respondents were also asked to identify obstacles that prevent them from walking in Carlsbad more frequently. The primary preventative factors according to respondents are: Time, concerns about safety and lack of sidewalks, paths or trails. **Table A.9** details issues that inhibit survey respondents' walking regularity.

Table A.9
Factors Discouraging Walking

Issue	Percent of Respondents
Concerns about safety	21%
Poor conditions of sidewalks	8%
Time	40%
Unreliable weather or darkness	3%
Lack of sidewalks, paths or trails	18%
Large distances between destinations	10%

Source: Alta Planning + Design; March 2008

Table A.10 lists a series of questions intended to solicit additional information regarding respondents' perceptions of the pedestrian environment in Carlsbad.

Table A.10
Pedestrian Experiences and Perceptions

Condition	Strongly Agree	Agree	Disagree	Strongly Disagree	No Response
"I feel safe from cars."	17%	42%	22%	11%	8%
"I feel safe from crime."	26%	53%	10%	2%	9%
"It is easy to cross the streets."	18%	43%	26%	2%	11%
"The sidewalks are in good condition."	20%	60%	10%	1%	9%
"The sidewalks are wide enough."	22%	44%	21%	4%	9%
"The sidewalks are clean."	17%	60%	11%	3%	9%
"There is enough lighting."	13%	43%	23%	6%	15%
"There is enough shade on my walk."	12%	37%	29%	8%	14%
"My walk is interesting."	28%	53%	9%	1%	9%

Source: Alta Planning + Design; March 2008

One of the central purposes of surveying Carlsbad community members was to identify specific pedestrian issues important to the public and the locations of those issues in order to help inform recommended project improvements. **Table A.11** summarizes the concerns identified through surveying and other extended outreach activities.

Table A.11
Specific Pedestrian Issues

Location	Pedestrian Problem (as Paraphased from Survey)
La Costa Valley dirt trails	The trails flood. There is runoff.
Location not specified	Need more street lighting.
Areas around the beach	Not enough sidewalks.
Trails around the lagoon	Dog excrement on the trails.
Major roads	Not enough room to run with a stroller.
Beach access from Tamarack Avenue	Not enough parking. There is no landscaping on slopes.
Most walking trails	There is dog excrement on the trails.
Carlsbad Boulevard	Needs more street lighting.
Intersection of Poinsettia Lane and Avenida Encinas	Drivers turn without regard to people in the crosswalks at this intersection.
All around old Carlsbad	Cars exceed speed limits.
On Aviara Parkway	Illegal car racing.
On Tamarack Avenue east of Pontiac	Illegal car racing.
Areas around the beach	Need more street lighting.
Beach access near Tamarack Avenue	There are too many squirrels at this beach access location.
Intersection of Carlsbad Boulevard and Palomar Airport Road	Poor walking environment.
All streets	Motorists stray into pedestrian walkways.
El Camino Real	Different traffic problems.
Intersection of College Boulevard and Palomar Airport Road	Motorists do not stop at the light.
Sycamore Avenue	Cars exceed speed limits.
From Tamarack Avenue to Chinquapin Avenue	There is not a trail by the Coaster tracks.
Along Coast Highway	No street lights at crosswalks.
Intersection of Tamarack Avenue and the Coaster tracks	There is no crosswalk from the paths (crossing Tamarack Ave).
Tamarack Avenue	There are no bicycle lanes.
Around Jefferson Elementary School	Street traffic is unsafe for children.
Near Jefferson Elementary School	Difficult to walk on sidewalks on trash days.
Intersection of Avenida La Posta and Rancho Santa Fe	Vehicles run at high speeds when kids get out of school.

Table A.11
Specific Pedestrian Issues

Location	Pedestrian Problem (as Paraphased from Survey)
Calle Acervo in front of Olivenhain Pioneer Elementary School	Poor walking environment.
Calle Acervo	Traffic congestion when school starts. Vehicles exceed speed limits. Vehicles run stop signs.
Calle Acervo	Traffic congestion between Junior High and Olivenhain Pioneer Elementary School. School hours aren't staggered.
Intersection of Calle Acervo and La Costa Avenue	People drive on their way to work at the same time that children are crossing the street.
Avenida La Costa Avenue	Used as a cut through street. Vehicles exceed speed limits.
Calle Acervo	Sidewalks are needed along Calle Acervo. Pedestrian problems when school starts and dismissals.
Around La Costa Canyon High School	Four schools are so close together that it causes traffic problems when kids are walking from school.
Outside Olivenhein Pioneer Elementary, Calle Acervo and Cordova	Cars drive at high speeds. Cyclists ride on sidewalks.
Calle Acervo / Camino de los Coches	Heavy high school traffic before and after school hours.
Calle Acervo at Olivenhain Pioneer Elementary	Cars drive too fast during school hours.
Calle Acervo / Rancho Santa Fe Road	Vehicular congestion at intersection and pedestrians cannot cross the street.
Santa Fe Trails between Paseo Taxco and Calle Acervo	A trail in the canyon would be a magnet for kids to go down there and cause trouble.
Calle Acervo driveway from Olivenhain Pioneer Elementary	Drivers do not respect stop signs at the school driveway when crossing guard is not present.
Intersection of Rancho Santa Fe and La Costa Ave.	Vehicles exceed speed limits and drivers block intersection.
Calle Acervo in front of Olivenhain Pioneer Elementary	Cars drive too fast and do not respect stop signs. Too many kids and cars at the same time cause a problem for pedestrians.
Surrounding Olivenhain Pioneer Elementary School	Schools should stagger start and stop times of school. Cars drive too fast.
In front of Olivenhain Pioneer Elementary School	Drivers do not respect stop signs. Excessive traffic.
Calle Acervo	Cars drive too fast.
In front of Olivenhain Pioneer Elementary school	It is hard to cross the intersection in front of Olivenhain Pioneer Elementary School.
Rancho Santa Fe Road and La Costa Ave.	It is hard to cross La Costa and Rancho Santa Fe Road intersection.
Calle Acervo and Avenida Pantera	Cars drive too fast around high school area. Sidewalks are too narrow to walk and bike when kids are going to school.
Calle Acervo	Cars do not respect stop signs around Olivenhain Pioneer Elementary School. The sidewalk ends by Henry´s shopping center near the Coffee Bean and walkers cannot continue walking.
Calle Acervo close to Olivenhain Pioneer Elementary School	Traffic problems.
La Costa Canyon High School and Calle Acervo	Traffic problems.

Table A.11
Specific Pedestrian Issues

Location	Pedestrian Problem (as Paraphased from Survey)
Downtown Village Area	Longer street lights are needed. Sound indicators when light is changing would be helpful.
Around the beach	More shade is needed.
Poinsettia Avenue, East of El Camino Real	More shade is needed. Excessive snakes.
Carlsbad State Beach	Crossings and trails are needed.
Coast Highway	Unsafe to cross the streets.
Camino de los Coches and La Costa Avenue.	Vehicles drive too fast, specially the ones from the new housing development.
Rancho Santa Fe Rd and Olivenhain Road	Traffic congestion. The area is too noisy. Vehicles drive too fast. More trails are needed.
La Costa Canyon High School	Need a person to guard when kids are crossing the school crosswalk before and after school.
Carlsbad Beach boardwalk area	Need wider boardwalk area to be shared between young bikers and walkers.
Magnolia Avenue and Jefferson Street	Dangerous crosswalks; cars do not stop at stop signs or for pedestrians in crosswalks.
Intersection of Harding Street and Pine Avenue	Cars do not stop at the intersection. Concerned because it is a park.
Sierra Morena Avenue around Chestnut Avenue	Vehicles drive too fast.
In front of 4240 Hillside Drive	40 to 60 feet of missing sidewalk is needed.
La Costa area near Alga Road and El Fuerte Street	Flat areas are needed because it is too difficult to walk on steep hills.
South Carlsbad	Non or limited beach path.
Carlsbad Boulevard, south of Tamarack Beach on the west side of roadway	Bridge sidewalk is very narrow. Street lighting is needed on crosswalks.
Most of Carlsbad	Needs off sidewalk paved trails for jogging strollers similar to La Costa Trials.
Jefferson Street toward the Beach	The access is too busy.
Chestnut Avenue	Safe passage over tracks is desirable.
Intersection of Harding Street and Oak Avenue	Cars don't always stop even though there are cross walks and dips.
Carlsbad Village	Too many cars and not enough pedestrian areas.
Park between Hillside Drive and Kelly Drive	Cars travel at excessive speed.
Park between Hillside Drive and Kelly Drive	Pedestrian paths needed. The area has sidewalks only.
Batiquitos Lagoon	Need to expand path.
Grand Avenue around State Street	Vehicles often do not stop at crosswalk.
Any intersection in the Village	Turning cars rarely wait for pedestrians crossing who have the light.

Table A.11
Specific Pedestrian Issues

Location	Pedestrian Problem (as Paraphased from Survey)
Chestnut Avenue	Chestnut Avenue should go across the train tracks to connect both sides of the tracks.
Park between Neblina Drive and Kelly Drive	No trail or sidewalk on south side of street.
Most areas	Most areas are too hilly.
Madison Street and Magnolia Avenue	Cars go about 40 mph around the corner. Residents cannot get out of driveways.
Chestnut Avenue at the railroad tracks	Pedestrian bridge is needed to access beach area.
Carlsbad Boulevard between Pine Avenue and Tamarack Avenue	Need flashing illumination in crosswalks.

Source: Alta Planning + Design, Fall 07 Pedestrian Master Plan Surveys

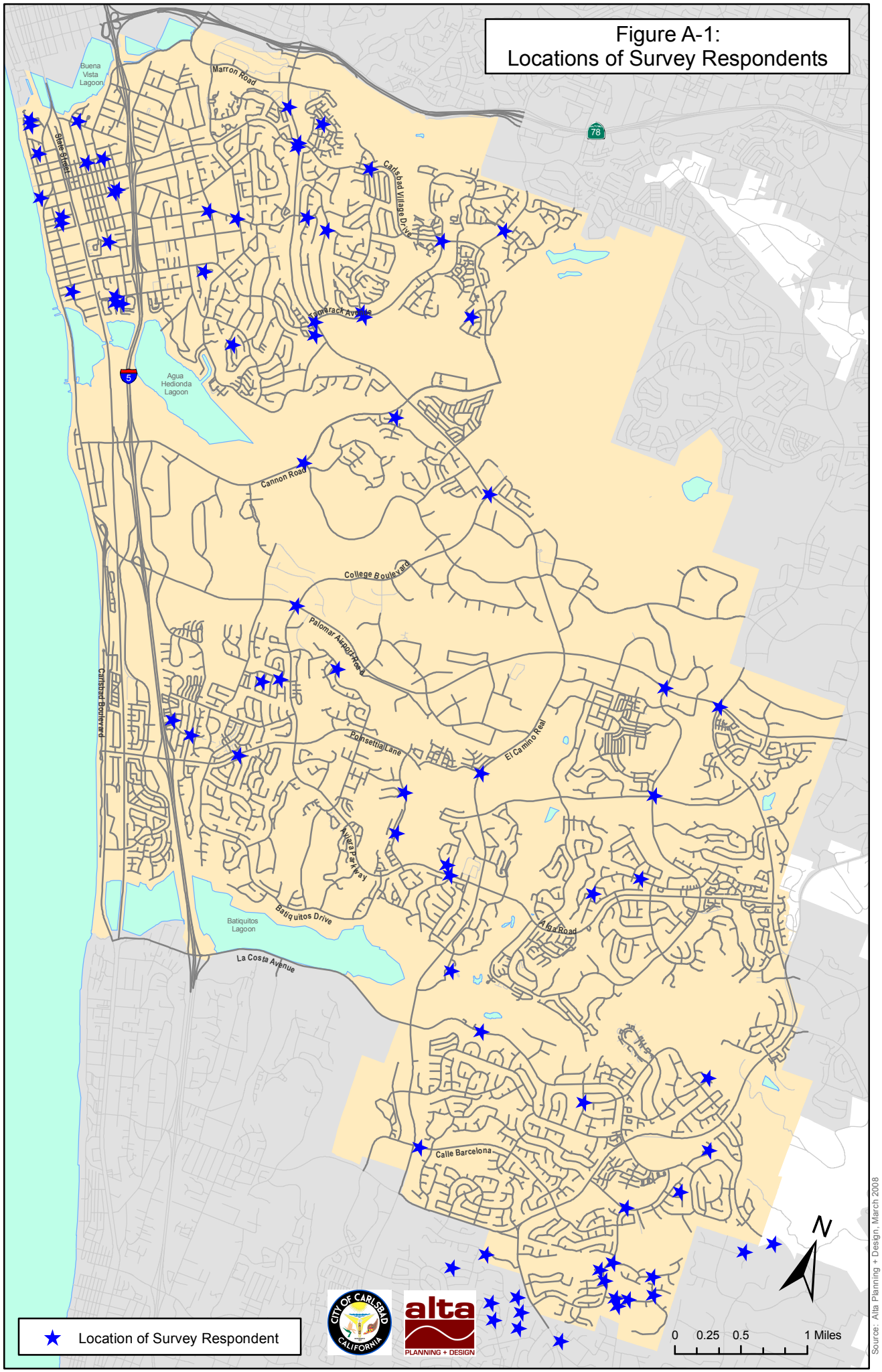


Figure A-1:
Locations of Survey Respondents
Buena Vista Lagoon
Marron Road
Carlsbad Village Drive
Tamarack Avenue
Agua Hedionda Lagoon
Cannon Road
College Boulevard
Palomar Airport Road
Carlsbad Boulevard
Poinsettia Lane
El Camino Real
Aviara Parkway
Batiquitos Drive
Batiquitos Lagoon
La Costa Avenue
Alga Road
Calle Barcelona
Location of Survey Respondent
0 0.25 0.5 1 Miles
N
Source: Alta Planning + Design, March 2008

Appendix B

Citywide Project Improvement Costs by Project Type

(Sidewalk Infill, Truncated Domes, Audible Signals, High Visibility Crosswalks, Signage)

Table B.1
Roadways without Sidewalks and Length of Sidewalk Infill

Roadway without Sidewalk	Segment	Length of Missing Sidewalks*
Acuna Court	northern terminus to El Fuerte Street	356
Adams Street	Basswood Avenue to Tamarack Avenue	1,843
Adams Street	Harrison Street to Park Drive	5,726
Alder Avenue	Monroe Street to eastern terminus	1,960
Alga Road	Cazadero Drive to Costa Alta Drive	4,872
Almaden Lane	Greenview Drive to Zamora Way	1,532
Almaden Lane	Alga Road to Greenview Way	3,630
Anna Drive	Gayle Way to Janis Way	1,160
Arbuckle Place	Madison Street to Jefferson Street	220
Argonauta Street	western terminus of Obelisco Circle to eastern terminus of Obelisco Circle	72
Argonauta Street	Argonauta Way to Balilonia Street	414
Argonauta Way	Luciernaga Street to southern terminus	794
Armada Drive	Fleet Street to Lego Drive	240
Avenida Encinas	Palomar Airport Road to Embarcadero Lane	3,374
Aviara Parkway	Camino de las Ondas to Poinsettia Lane	1,730
Balilonia Street	Argonauta Street to El Fuerte Street	38
Basswood Avenue	Eureka Place to Highland Drive	2,424
Basswood Avenue	Donna Drive to Ridgecrest Drive	540
Beech Avenue	Carlsbad Boulevard to Washington Street	160
Beech Avenue	Ocean Street to Garfield Street	72
Belle Lane	Basswood Avenue to Eastern Terminus	358

Table B.1
Roadways without Sidewalks and Length of Sidewalk Infill

Roadway without Sidewalk	Segment	Length of Missing Sidewalks*
Black Rail Road	Ocean Crest Avenue to Avena West Court	704
Buena Vista Circle	northern terminus to Laguna Drive	2,016
Buena Vista Way	Jefferson Street to Davis Avenue	532
Buena Vista Way	Pio Pico Drive to James Drive	354
Buena Vista Way	Valley Street to Crest Drive	1,664
Butters Road	western terminus to eastern terminus	1,016
Caleta Court	Estrella de Mar Road to southern terminus	1,134
Camden Circle	northern terminus to Ridgecrest Drive	304
Camino Alvaro	Olivenhain Road to Rancho Santa Fe Road	534
Camino Serbal	western terminus to Avenida Helecho	746
Camino Vida Roble	Palomar Oaks Way to Palomar Airport Road	14
Camino Vida Roble	Corte del Nogal to Las Palmas Drive western terminus	542
Camino Vida Roble	Corte del Abeto to Yarrow Drive	1,694
Camino Vida Roble	Las Palmas Drive eastern terminus to El Camino Real	2,576
Candil Place	Bolero Street to eastern terminus	668
Cannon Road	Legoland Drive to Faraday Avenue	972
Cannon Road	Frost Avenue to College Boulevard	8,092
Caracol Court	Estrella de Mar Road to southern terminus	818
Carlsbad Boulevard	northern Carlsbad boundary to Mountain View Drive	1,942
Carlsbad Boulevard	Tamarack Avenue to Cannon Road	576
Carlsbad Boulevard	Cannon Road to Manzano Drive	4,996
Carlsbad Boulevard	Manzano Drive to Palomar Airport Road	54
Carlsbad Boulevard (west side of roadway)	Manzano Drive to Island Way	11,312
Carlsbad Boulevard (east side of roadway)	Palomar Airport Road to Island Way	6,124

Table B.1
Roadways without Sidewalks and Length of Sidewalk Infill

Roadway without Sidewalk	Segment	Length of Missing Sidewalks*
Carlsbad Boulevard (east side of roadway)	Island Way to Poinsettia Lane	4,418
Carlsbad Boulevard	Poinsettia Lane to Avenida Encinas	7,146
Carlsbad Boulevard	Avenida Encinas to Carlsbad southern boundary	7,098
Cazadero Drive	Abejorro Street to Corintia Street	702
Cerezo Drive	Carlsbad Boulevard to El Arbol Drive	1,186
Charter Oak Drive	Seacrest Drive to Ridgecrest Drive	1,642
Chinquapin Avenue	Stella Maris Lane to Highland Drive	492
Cipriano Lane	northern terminus and Forest Avenue	550
College Boulevard	Rift Road to Cannon Road	3,984
Corte de Abeto	northern terminus to Camino Vida Roble	2,376
Corte de La Pina	Yarrow Road to Cosmos Court	1,616
Corte del Cedro	northern terminus to Corte de la Pina	1,778
Corte del Nogal	Camino Vida Roble to eastern terminus	2,862
Crest Drive	Forest Avenue to Buena Vista Way	3,236
Cynthia Lane	western terminus to eastern terminus	1,748
Davis Avenue	Knowles Avenue to Laguna Drive	1,342
Davis Avenue	Buena Vista Way to Knowles Avenue	1,284
Davis Place	Western Terminus to Davis Avenue	252
Dolphin Court	northern terminus to Loker West Avenue	430
Donna Drive	Falcon Drive to Basswood Avenue	724
Donna Drive	Basswood Avenue to Janis Way	542
Donna Drive	Lee Court to Chestnut Avenue	383
El Arbol Drive	Cannon Road to Cerezo Drive	974
El Camino Real	northern Carlsbad boundary to South Vista Way	466

Table B.1
Roadways without Sidewalks and Length of Sidewalk Infill

Roadway without Sidewalk	Segment	Length of Missing Sidewalks*
El Camino Real	Kelly Drive to Crestview Drive	3,763
El Fuerte Street	Chorlito Street to Cacatua Street	1,502
El Fuerte Street	Corintia Street to Balilonia Street	96
El Fuerte Street	Balilonia Street to Bolero Street	462
Elmwood Street	Knowles Avenue to Laguna Drive	1428
Embarcadero Lane	Avenida Encinas to Avenida Encinas	646
Estrella de Mar Road	Alga Road to Arenal Road	7,102
Falcon Drive	northern terminus to Westwood Drive	1,682
Forest Avenue	Highland Drive to Crest Drive	1,740
Garfield Street	Ocean Street to Normandy Lane	166
Garfield Street	Normandy Lane to Pacific Avenue	282
Garfield Street	Redwood Avenue to Chinquapin Avenue	1,158
Garfield Street	Chinquapin Avenue to Date Avenue	224
Garfield Street	Date Avenue to Olive Avenue	558
Gayle Way	Monroe Street to Donna Drive	645
Geode Lane	Titanite Place to Quartz Way	540
Grand Avenue	Hope Avenue to eastern terminus	108
Gregory Drive	Cynthia Lane to Knowles Avenue	656
Guevara Road	Highland Drive to eastern terminus	870
Haymar Drive	El Camino Real to northern Carlsbad boundary	56
Haymar Drive	western terminus to eastern terminus	7,846
Hemlock Avenue	Garfield Street to eastern terminus	120
Highland Drive	Guevara Road to Forest Avenue	660
Highland Drive	Elmwood Street to Carlsbad Village Drive	1,807

Table B.1
Roadways without Sidewalks and Length of Sidewalk Infill

Roadway without Sidewalk	Segment	Length of Missing Sidewalks*
Hillcrest Circle	Seacrest Drive to eastern terminus	284
Home Avenue	Hope Avenue to eastern terminus	504
Impala Drive	Palmer Way to Orion Street	1,908
Janis Way	Ann Drive to Avondale Circle	708
Jefferson Street	northern Carlsbad boundary and Marron Road	1,316
Jefferson Street	Marron Road to Las Flores Drive	6,448
Jefferson Street	Tamarack Avenue to Chinquapin Avenue	600
Juniper Avenue	Garfield Street to eastern terminus	1,418
Karren Lane	Monroe Street to eastern terminus	232
Knowles Avenue	Jefferson Street to Davis Avenue	588
Knowles Avenue	Lewis Lane to eastern terminus	58
Knowles Avenue	Pio Pico Drive to Gregory Drive	336
Knowles Avenue	Gregory Drive to Elmwood Street	1,774
Laguna Drive	Pio Pico Drive to Elmwood Street	1,378
Las Palmas Drive	Camino Vida Roble to Camino Vida Roble	1,872
Laurie Circle	Ann Drive to Eastern Terminus	278
Levante Street	Rush Rose Street to El Camino Real	640
Lincoln Street	Oak Avenue to Pine Avenue	366
Lincoln Street	Pine Avenue to Walnut Avenue	180
Lincoln Street	Walnut Avenue to Chestnut Avenue	412
Llama Court	western terminus to Llama Street	680
Los Robles Drive	Cannon Road to Manzano Drive	4,220
Mac Arthur Avenue	Sunnyhill Drive to Skyline Road	1,260
Maezel Lane	Northern Terminus to Basswood Avenue	798

Table B.1
Roadways without Sidewalks and Length of Sidewalk Infill

Roadway without Sidewalk	Segment	Length of Missing Sidewalks*
Mangua Place	Bolero Street to southern terminus	1,500
Mar Azul Way	Estrella de Mar Road to southern terminus	1,118
Marmol Court	western terminus to El Fuerte Street	312
Mc Kinley Street	Pine Avenue and Basswood Avenue	1,406
Meadowlark Lane	northern terminus to Ridgecrest Drive	464
Monroe Street	Park Drive to Sunnyhill Drive	482
Mountain View Drive	Ocean Street to Carlsbad Boulevard	622
Normandy Lane	Garfield Street to Mountain View Drive	778
Oak Avenue	Lincoln Street to Washington Street	80
Oak Avenue	Pio Pico Drive and James Drive	3,260
Obelisco Circle	Argonauta Street to Obelisco Place	38
Obelisco Circle	Obelisco Place to Obelisco Court	3,652
Obelisco Place	Obelisco Circle to western terminus	552
Ocean Street	Garfield Street to Cypress Avenue	162
Olivenhain Road	Olivenhain Road split to Rancho Santa Fe Road	1,722
Pacific Avenue	Ocean Street to Mountain View Drive	1,382
Palomar Airport Road	Carlsbad Boulevard (North Bound) to Avenida Encinas	1,312
Pine Avenue	Pio Pico Drive to Basswood Avenue	300
Pine Avenue	Basswood Avenue and Highland Drive	2,660
Pio Pico Drive	northern terminus to Las Flores Drive	2,235
Piragua Street	Cadencia Street to Esfera Steet	600
Playa Road	Estrella de Mar Road to southern terminus	1,082
Poinsettia Lane	Aviara Parkway to Brigantine Drive	3,046
Poinsettia Lane	Brigantine Drive to Black Rail Road	54

Table B.1
Roadways without Sidewalks and Length of Sidewalk Infill

Roadway without Sidewalk	Segment	Length of Missing Sidewalks*
Poinsettia Lane	Skimmer Court to El Camino Real	384
Poinsettia Lane	Alicante Road to Quartz Way	2,604
Priestly Drive/La Place Court	Rutherford Road to southern terminus	58
Rancho Santa Fe Road	Olivenhain Road to Camino Alvaro	1,278
Ridgecrest Drive	Basswood Avenue to Charter Oaks Drive	5,256
Roosevelt Street	Laguna Drive to Beech Avenue	102
Seacrest Drive	Ridgecrest Drive to Ridgecrest Drive	3,358
Shore Drive	Carlsbad Boulevard to Carlsbad Boulevard	2,038
South Buena Vista Circle	Buena Vista Circle to Buena Vista Circle	1,148
South Vista Way	northern Carlsbad boundary to El Camino Real	40
Spruce Street	Yourell Avenue to Forest Avenue	10
Spuce Road	northern terminus to Forest Avenue	504
State Street	Carlsbad Boulevard to Laguna Drive	924
Sunny Creek Road	Badger Lane to eastern terminus	19,208
Teirra Del Oro Street	northern terminus to southern terminus	1,296
Turtle Street	Niki Lynn Place to Buena Vista Way	926
Valley Place	Valley Street to eastern terminus	376
Valley Street	Buena Vista Drive to Carlsbad Village Drive	928
Venado Street	Cadencia Street to Esfera Steet	634
Via Borregos	Xana Way to southern terminus	312
West Oaks Way	western terminus to Palomar Oaks Way	3,626
Wilson Avenue	Forest Avenue to Buena Vista Way	3,232
Woodland Way	Chestnut Avenue southern terminus	664
Woodvale Drive	Park Drive to West Haven Drive	700

Table B.1
Roadways without Sidewalks and Length of Sidewalk Infill

Roadway without Sidewalk	Segment	Length of Missing Sidewalks*
Yarrow Drive	Palomar Airport Road to Camino Vida Roble	3,794
Yourell Avenue	Pio Pico Drive to Highland Drive	1,896
	Total Cost: 275,620 feet of missing sidewalk @ $45/LF = $12,402,900	

Source: Alta Planning + Design; March 2008

Note:

* The length of missing sidewalks was calculated by multiplying the length of the roadway segment with no sidewalks times two. This accounts for sidewalk construction along both sides of the roadway.

Table B.2
Recommended Intersections For Installation of Truncated Domes

Alicante Road / Alga Road	Carlsbad Village Drive / Tamarack Avenue
Alicante Road / Poinsettia Lane	College Boulevard / Aviara Parkway / Palomar Airport Road
Avenida Encinas / Cannon Road	College Boulevard / Cannon Road
Avenida Encinas / Palomar Airport Road	College Boulevard / Faraday Avenue
Avenida Encinas / Poinsettia Lane	El Camino Real / Aviara Parkway / Alga Road
Aviara Parkway / Poinsettia Lane	El Camino Real / Calle Barcelona
Camino de los Coches / La Costa Avenue	El Camino Real / Camino Vida Roble
Camino Junipero / La Costa Avenue	El Camino Real / Cannon Road
Camino Vida Roble / Palomar Airport Road	El Camino Real / Carlsbad Village Drive
Carlsbad Boulevard / Avenida Encinas	El Camino Real / College Boulevard
Carlsbad Boulevard / Cannon Road	El Camino Real / La Costa Avenue
Carlsbad Boulevard / Carlsbad Village Drive	El Camino Real / Marron Road
Carlsbad Boulevard / Palomar Airport Road	El Camino Real / Palomar Airport Road
Carlsbad Boulevard / Poinsettia Lane	El Camino Real / Poinsettia Lane
Carlsbad Boulevard / Tamarack Avenue	El Camino Real / Tamarack Avenue
El Fuerte Street / Alga Road	Monroe Street / Carlsbad Village Drive
El Fuerte Street / Faraday Avenue	Monroe Street / Marron Road
El Fuerte Street / Palomar Airport Road	Paseo del Norte / Cannon Road
El Fuerte Street / Poinsettia Lane	Paseo del Norte / Palomar Airport Road
Hidden Valley Road / Palomar Airport Road	Paseo del Norte / Poinsettia Lane
Melrose Drive / Alga Road	Rancho Santa Fe Road / Calle Barcelona
Melrose Drive / Palomar Airport Road	Rancho Santa Fe Road / Camino de los Coches
Melrose Drive / Poinsettia Lane	Rancho Santa Fe Road / Camino Junipero
Total Cost: 46 intersections x 4 truncated domes at each intersection x $400 each = $73,600	

Source: Alta Planning + Design; March 2008

Table B.3
Recommended Locations for Installation of Audible Signals

Alicante Road / Alga Road	El Camino Real / College Boulevard
Alicante Road / Poinsettia Lane	El Camino Real / Faraday Avenue
Avenida Encinas / Cannon Road	El Camino Real / La Costa Avenue
Avenida Encinas / Palomar Airport Road	El Camino Real / Marron Road
Avenida Encinas / Poinsettia Lane	El Camino Real / Palomar Airport Road
Aviara Parkway / Poinsettia Lane	El Camino Real / Poinsettia Lane
Camino de los Coches / La Costa Avenue	El Camino Real / Tamarack Avenue
Camino Junipero / La Costa Avenue	El Fuerte Street / Alga Road
Camino Vida Roble / Palomar Airport Road	El Fuerte Street / Faraday Avenue
Carlsbad Boulevard / Avenida Encinas	El Fuerte Street / Palomar Airport Road
Carlsbad Boulevard / Cannon Road	El Fuerte Street / Poinsettia Lane
Carlsbad Boulevard / Carlsbad Village Drive	Hidden Valley Road / Palomar Airport Road
Carlsbad Boulevard / Palomar Airport Road	Melrose Drive / Alga Road
Carlsbad Boulevard / Poinsettia Lane	Melrose Drive / Palomar Airport Road
Carlsbad Boulevard / Tamarack Avenue	Melrose Drive / Poinsettia Lane
Carlsbad Village Drive / Tamarack Avenue	Monroe Street / Carlsbad Village Drive
College Boulevard / Aviara Parkway / Palomar Airport Road	Monroe Street / Marron Road
College Boulevard / Cannon Road	Paseo del Norte / Cannon Road
College Boulevard / Faraday Avenue	Paseo del Norte / Palomar Airport Road
El Camino Real / Aviara Parkway / Alga Road	Paseo del Norte / Poinsettia Lane
El Camino Real / Calle Barcelona	Rancho Santa Fe Road / Calle Barcelona
El Camino Real / Camino Vida Roble	Rancho Santa Fe Road / Camino de los Coches
El Camino Real / Cannon Road	Rancho Santa Fe Road / Camino Junipero
El Camino Real / Carlsbad Village Drive	Rancho Santa Fe Road / La Costa Avenue
Total Cost: 48 intersections x 4 audible signals at each intersection x $800 each = $153,600	

Source: Alta Planning + Design; March 2008

Table B.4
Recommended Locations for Upgrading Crosswalks to High Visibility Ladder Crosswalks

Intersection or Roadway Segment
Paseo del Norte / Elder Court
Harding Street / Oak Street
Harding Street / Pine Avenue
Grand Avenue between State Street and Roosevelt Street
Total Cost: 4 intersections x 4 High Visibility Crosswalks each x $1,200 each = $192,000

Source: Alta Planning + Design; March 2008

Table B.5
Recommended Locations for Signage Upgrades at Uncontrolled Intersection Crosswalks

Uncontrolled Intersection	Type of Signage Improvement	Number of Signs
Paseo del Norte / Elder Court	Requires MUTCD compliant Arrow sign	1
Jefferson Street / Chestnut Avenue	Requires six MUTCD Pedestrian Crossing signs	6
Harding Street / Oak Street	Requires MUTCD compliant Arrow sign (pushing for stop sign)	1
Harding Street / Pine Avenue	Requires two MUTCD Pedestrian Crossing signs	2
State Street mid-block between Carlsbad Village Drive and Grand Avenue	Requires MUTCD compliant Arrow sign Sign placement should be closer to pedestrian crossing	2
Monroe Street / Magnolia Avenue	Requires MUTCD compliant Arrow sign	1
Garfield Street / Pacific Avenue	Requires MUTCD Pedestrian Crossing signs	2
		Total Cost = 15 signs @ $300 each = $4,500

Source: Alta Planning + Design; March 2008

Appendix C
Project Prioritization Outcomes

Table C.1
Priority Corridors

Ranking	Corridor	Segment	Average Suitability Model Score*
1	Jefferson Street	Las Flores Drive to Highland Drive	221
2	Chestnut Avenue	Carlsbad Boulevard to El Camino Real	217
3	Pio Pico Drive	Las Flores Drive to Tamarack Avenue	212
4	Harding Street	Grand Avenue to Carol Place	211
5	Las Flores Drive / Highland Drive	Jefferson Street to Tamarack Avenue	210
6	Grand Avenue	Carlsbad Boulevard to eastern terminus	209
7	Tamarack Avenue	Carlsbad Boulevard to El Camino Real	208
8	Roosevelt Street	Laguna Drive to Magnolia Avenue	204
9	Monroe Street	Plaza Drive to Alder Avenue	203
10	Carlsbad Village Drive	Carlsbad Boulevard to Tamarack Avenue	201
11	Oak Avenue	Ocean Street to eastern terminus	199
12	Camino de los Coches	La Costa Avenue to Rancho Santa Fe Road	198
13	Marron Road	Jefferson Street to Avenida de Anita	196
14	Paseo del Norte	Poinsettia Lane to Cannon Road	195
15	Madison Street	Laguna Drive to Chestnut Avenue	194
16	Magnolia Avenue	Village Drive to Monroe Street	188
17	State Street	Laguna Drive to Oak Avenue	187
18	Poinsettia Lane	Carlsbad Boulevard to Aviara Parkway	186
19	Palomar Airport Road	Carlsbad Boulevard to Armada Drive	185
20	Aviara Parkway / Alga Road	Ambrosia Lane to El Fuerte Street	184
21	Lincoln Street	Carlsbad Boulevard to Chestnut Avenue	180

Table C.1
Priority Corridors

Ranking	Corridor	Segment	Average Suitability Model Score*
22	Carlsbad Boulevard	northern Carlsbad boundary with Oceanside to southern Carlsbad boundary with Encinitas	178
23	Valley Street	Buena Vista Way and Tamarack Avenue	176
24	La Costa Avenue	El Camino Real to Rancho Santa Fe Road	173
25	El Camino Real	northern Carlsbad boundary with Oceanside to Manchester Avenue	172
26	Rancho Santa Fe Road	southern Carlsbad boundary with Encinitas to La Costa Avenue	170
27	Calle Acervo	Camino de los Coches to Rancho Santa Fe Road	154

Source: Alta Planning + Design; March 2008

Note:

* The corridor's average pedestrian need model score was found by creating a point layer of "stations" every 750 feet along the identified corridor, then sampling the pedestrian need model scores from the respective corridor's station points, then averaging these scores across the length of each corridor.

Table C.2
Priority Intersections

Ranking	Intersection	Suitability Model Score
1	Jefferson Street / Laguna Drive	255*
2	Carlsbad Boulevard / Grand Avenue	
3	Carlsbad Boulevard / Carlsbad Village Drive	
4	Carlsbad Boulevard / Chestnut Street	
5	Highland Drive / Carlsbad Village Drive	
6	Monroe Street / Carlsbad Village Drive	
7	Monroe Street / Marron Road	
8	Paseo del Norte / Palomar Airport Road	
9	Rancho Santa Fe Road / Camino de los Coches	
10	La Costa Avenue / Rancho Santa Fe Road	
11	Jefferson Street / Carlsbad Village Drive	247
12	El Camino Real / Kelly Drive	246
13	Carlsbad Boulevard / Cannon Road	245
14	Jefferson Street / Las Flores Drive	244*
15	Carlsbad Boulevard / Tamarack Avenue	
16	Valley Street / Chestnut Street	243
17	El Camino Real / Chestnut Street	236*
18	Tamarack Avenue / Carlsbad Village Drive	
19	Paseo del Norte / Poinsettia Lane	234
20	Pio Pico Drive / Tamarack Avenue	232
21	State Street / Grand Avenue	230
22	State Street / Carlsbad Village Drive	228*

Table C.2
Priority Intersections

Ranking	Intersection	Suitability Model Score
23	Roosevelt Street / Carlsbad Village Drive	
24	Madison Street / Carlsbad Village Drive	
25	Harding Street / Carlsbad Village Drive	
26	El Camino Real / Marron Road	
27	El Camino Real / Aviara Parkway/Alga Road	
28	Washington Street / Carlsbad Village Drive	219*
29	Roosevelt Street / Chestnut Street	
30	Monroe Street / Basswood Avenue	
31	Highland Drive / Chestnut Street	
32	Calle Acervo / Camino de los Coches	218
33	Roosevelt Street / Grand Avenue	207*
34	Madison Street / Oak Avenue	
35	Harding Street / Oak Avenue	
36	Pio Pico Drive / Carlsbad Village Drive	
37	Highland Drive / Tamarack Avenue	
38	Armada Drive / Palomar Airport Road	
39	Monroe Street / Chestnut Street	206
40	Valley Street / Magnolia Avenue	195
41	Highland Drive / Buena Vista Way	194
42	Roosevelt Street / Laguna Drive	193*
43	Madison Street / Laguna Drive	
44	Harding Street / Chestnut Street	
45	Park Drive / Tamarack Avenue	
46	El Fuerte Street / Alga Road	185

Table C.2
Priority Intersections

Ranking	Intersection	Suitability Model Score
47	Jefferson Street / Oak Avenue	183*
48	Madison Street / Chestnut Street	
49	Paseo del Norte / Cannon Road	178
50	El Camino Real / Camino Vida Roble	173
51	Sunnyhill Drive / Tamarack Avenue	172
52	Roosevelt Street / Oak Avenue	171*
53	Valley Street / Basswood Avenue	
54	Pio Pico Drive / Chestnut Street	168*
55	Rancho Santa Fe Road / Calle Barcelona	
56	Jefferson Street / Grand Avenue	166
57	El Camino Real / Calle Barcelona	163
58	Washington Street / Grand Avenue	156
59	El Camino Real / Tamarack Avenue	151
60	State Street / Laguna Drive	146
61	Madison Street / Grand Avenue	144
62	Carlsbad Boulevard / Poinsettia Lane	143
63	Paseo del Norte / Camino de las Ondas	138
64	El Camino Real / Carlsbad Village Drive	128
65	El Camino Real / Palomar Airport Road	114
66	Aviara Parkway / Poinsettia Lane	98

Source: Alta Planning + Design; March 2008

Note:

* Pedestrian need model scores for those intersections with identical values at the intersection point locations were found by querying the four raster cells at each intersection's approach in ArcView, and then averaging these values. In the cases where one intersection's pedestrian need model score averaged to the same value as another, a subsequent set of criteria were examined, including number of nearby accidents, number of schools within a quarter mile, and residential density within a quarter mile.

Appendix D
Pedestrian Design Guidelines

D.1 Rationale for the Design Guidelines

Pedestrian design guidelines are one effective strategy for improving the overall urban and suburban environment for walking. Other strategies such as enforcement of existing traffic laws, and public information and education are addressed in Chapter 8. The following guidelines recommended for use by the City of Carlsbad primarily address issues of pedestrian safety. The guidelines do not thoroughly address issues of urban design, design character, or the many other amenities that make streets and sidewalks attractive places to travel and spend time as a pedestrian. It is clear that safety concerns can significantly influence a person's decision to walk or use other modes of transportation, thus design guidelines for creating a safe pedestrian environment are an important step for all communities.

Even though pedestrians are legitimate roadway users, they may be overlooked in the quest to build more sophisticated transportation systems. Whether building new infrastructure or renovating existing facilities, it should be assumed that people will walk, and plans should be made to accommodate pedestrians. Where people aren't walking, it is often because they are prevented or discouraged from doing so. Either the infrastructure is insufficient, has serious gaps, or there are safety hazards.

These design guidelines present many design and infrastructure improvements that will help the City of Carlsbad to assist the pedestrian through new trends in roadway design to better accommodate their needs and build a stronger walking community.

The guidelines included in this chapter are supplemental to the City of Carlsbad's currently adopted development policies, as well as State and Federal standards. **The purpose of this chapter is not to replace City standards, but to provide general design guidelines for pedestrian facilities that go above the minimum standards. Implementation of guidelines shown herein requires the approval of the City Engineer.**

D.2 State and Federal Guidelines

The design of many streetscape elements is regulated by state and federal law. Traffic control devices must follow the procedures set forth in the Manual of Uniform Traffic Control Devices (MUTCD), while elements such as sidewalks and curb cuts must comply with guidelines implementing the Americans with Disabilities Act (ADA).

D.2.1 Manual of Uniform Traffic Control Devices

The City of Carlsbad follows the procedures and policies set out in the CA MUTCD (state) and MUTCD (federal). Traffic control devices include traffic signals, traffic signs, and street markings. The manual covers the placement, construction, and maintenance of devices. The CA MUTCD emphasizes uniformity of traffic control devices to protect the clarity of their message. A uniform device conforms to regulations for dimensions, color, wording, and graphics and minimizes confusion or misunderstanding on the part of the roadway user. Uniformity also means treating similar situations in the same way.

D.2.2 Americans with Disabilities Act

Title II of the Americans with Disabilities Act (ADA), signed into law in 1990, is a civil rights act that prohibits public entities from discrimination on the basis of disability. Newly constructed facilities must be free of architectural barriers that restrict access or use by individuals with disabilities. Cities in California uses two technical standards for accessible design: the Americans with Disability Act Accessibility Guidelines (ADAAG), adopted by the Department of Justice for places of public accommodation and commercial facilities covered by Title 3 of the ADA, and the California Title 24 State Accessibility Standards, State Architectural Regulations for Accommodation of the Physically Handicapped in Public Facilities.

D.3 Principles for Pedestrian Design

The following design principles represent a set of ideals which should be incorporated, to some degree, into every pedestrian improvement. They are ordered roughly in terms of relative importance.

1. **The pedestrian environment should be safe.**

   Sidewalks, walkways, and crossings should be designed and built to be free of hazards and to minimize conflicts with external factors such as noise, vehicular traffic, and protruding architectural elements.

2. **The pedestrian network should be accessible to all.**

   Sidewalks, walkways, and crosswalks should ensure the mobility of all users by accommodating the needs of people regardless of age or ability.

3. **The pedestrian network should connect to places people want to go.** The pedestrian network should provide continuous direct routes and convenient connections between destinations, including homes, schools, shopping areas, public services, recreational opportunities and transit.

4. **The pedestrian environment should be easy to use.**

   Sidewalks, walkways, and crossings should be designed so people can easily find a direct route to a destination and will experience minimal delay.

5. **The pedestrian environment should provide good places**.

   Good design should enhance the look and feel of the pedestrian environment. The pedestrian environment includes open spaces such as plazas, courtyards, and squares, as well as the building facades that give shape to the space of the street. Amenities such as seating, street furniture, banners, art, plantings, shading, and special paving, along with historical elements and cultural references, should promote a sense of place.

6. **The pedestrian environment should be used for many things.**

   The pedestrian environment should be a place where public activities are encouraged. Commercial activities such as dining, vending, and advertising may be permitted when they do not interfere with safety and accessibility.

7. **Pedestrian improvements should preserve or enhance the historical qualities of a place and the City.**

   Carlsbad's history must be preserved in the public space. Where applicable, pedestrian improvements should restore and accentuate historical elements of the public right-of-way. Good design will create a sense of time that underscores the history of Carlsbad.

8. **Pedestrian improvements should be economical.**

   Pedestrian improvements should be designed to achieve the maximum benefit for their cost, including initial cost and maintenance cost as well as reduced reliance on more expensive modes of transportation. Where possible, improvements in the right-of-way should stimulate, reinforce, and connect with adjacent private improvements.

D.4 Sidewalk Corridor Guidelines

The width and zone guidelines presented in this sidewalk section would apply to sidewalks in new development areas, redevelopment areas, and in areas where street reconstruction is planned. For the entire above listed project types, sufficient right of way must exist for implementation of the appropriate sidewalk width guideline.

D.4.1 Sidewalk Corridor Width – Urban Setting

Proposed sidewalk guidelines apply to new development and depend on available street width, motor vehicle volumes, surrounding land uses, and pedestrian activity levels. Standardizing sidewalk guidelines for different areas of the City, dependent on the above listed factors, ensures a minimum level of quality for all sidewalks.

The City of Carlsbad currently requires 5-foot wide sidewalks. These dimensions conform to the Americans with Disabilities Act Accessibility Guidelines (ADAAG) that call for minimum 4-foot wide sidewalks for passage, not sidewalk width recommendations.

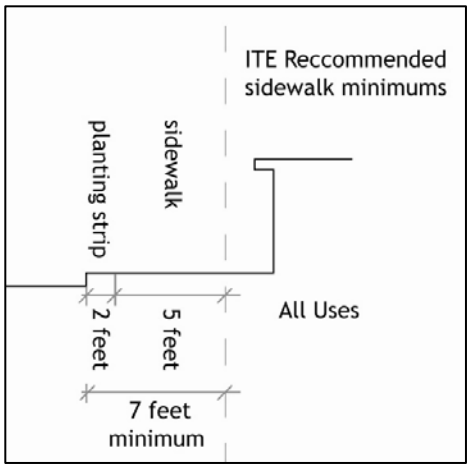


Figure D-1
ITE Recommended Sidewalk Widths

The Institute of Transportation Engineers (ITE) recommends planning all sidewalks to include a minimum width of 5 feet (60 inches) with a planting strip of 2 feet (24 inches) in both residential and commercial areas (see Figure D-1). Carlsbad has not adopted the ITE recommendation but does have locations where a planting strip is provided.

D.4.2 Sidewalk Zones

Sidewalks are the most important component of Carlsbad's pedestrian circulation network. Sidewalks provide pedestrian access to virtually every activity and provide critical connections between other modes of travel, including the automobile, public transit, and bicycles. The Sidewalk Corridor is typically located within the public right-of-way between the curb or roadway edge and the property line. The Sidewalk Corridor contains four distinct zones: the Curb Zone, the Furnishings Zone, the Through Pedestrian Zone, and the Frontage Zone as displayed in Figure D-2.

Curb Zone

Curbs prevent water in the street gutters from entering the pedestrian space, discourage vehicles from driving over the pedestrian area, and make it easy to sweep the streets. In addition, the curb helps to define the pedestrian environment within the streetscape, although other designs can be effective for this purpose. At the corner, the curb is an important tactile element for pedestrians who are finding their way with the use of a cane. Straight curbs rather than rolled curbs are strongly recommended because it eliminates the potential for cars to park on the sidewalk or partially obstructing the sidewalk.

Furnishings Zone

All streets require a utility zone to accommodate above ground public infrastructure, signage, and street trees. Locating this infrastructure in the furnishings zone prevents it from encroaching on the through passage zone, where it is likely to cause accessibility issues. The furnishings zone also creates an important buffer between pedestrians and vehicle travel lanes by providing horizontal separation. Elements like utility poles, sign posts, and street trees improve pedestrian safety and comfort by further separating the sidewalk from moving vehicles. Guidelines for furnishings zone widths are presented in Figure D-2.

Through Passage Zone

Most residential areas in Carlsbad are low to medium density and therefore have low pedestrian volumes, compared to more urban areas. A five foot through passage zone is recommended for these conditions. Some commercial areas, school zones, and other public areas generate greater pedestrian volumes where a wider through zone should be considered. Figure D-2 presents recommended standards for the through zone width for each of the predominant land uses in Carlsbad.

Frontage Zone

The frontage zone is the space between the pedestrian through zone and the adjacent property line. Pedestrians tend to avoid walking close to barriers at the property line, such as buildings, storefronts, walls or fences, in the same way that they tend to avoid walking close to the roadway. In most cases the frontage zone should be at least 12 inches. However, if the sidewalk is adjacent to a wide open or landscaped space, such as in residential areas where fences are not typically found or not allowed,

the frontage zone can be eliminated. Guidelines for frontage zone widths are presented in Figure D-2. As shown in the figure, a frontage zone may not be required in many residential areas of Carlsbad due to presence of deep front yard setbacks and the prevailing development standard that does not include front yard fencing.

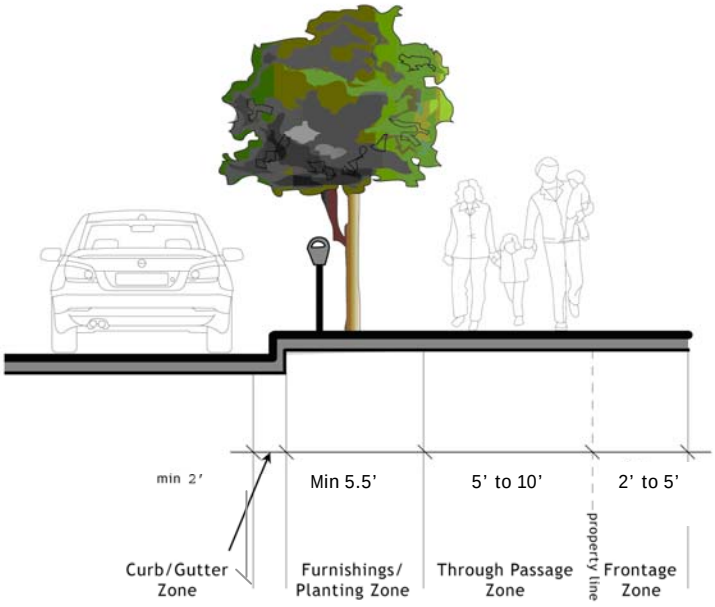


Figure D-2
Sidewalk Zones

D.4.3 Furnishings Zone

Figure D-3
Furnishing Zone

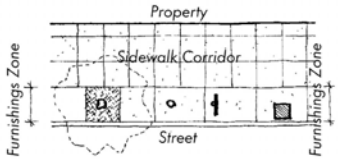
The Furnishings Zone buffers pedestrians from the roadway and is the place for elements such as street trees, poles, parking meters, and street furniture.

The Furnishings Zone buffers pedestrians from the adjacent roadway, and is also the area where elements such as street trees, signal poles, utility poles, street lights, controller boxes, hydrants, signs, parking meters, driveway aprons, grates, hatch covers, and street furniture are properly located. This is the area where people alight from parked cars.

Wherever it is wide enough, the Furnishings Zone could include street trees. In commercial areas, this zone may be paved, with tree wells and planting pockets for trees, flowers, and shrubs. In other areas, this zone generally is not paved except for access walkways, but is landscaped with some combination of street trees, shrubs, ground cover, lawn, or other landscaping treatments.

Separating pedestrians from travel lanes greatly increases their comfort as they use the Sidewalk Corridor. This buffer function of the Furnishings Zone is especially important on streets where traffic is heavy, yet along many of these streets the existing Sidewalk Corridor is narrow. Where possible, additional width should be given to this zone on streets with traffic speeds over 35 mph (55 km/h).

Figure D-4
Furnishing Zone Alignment



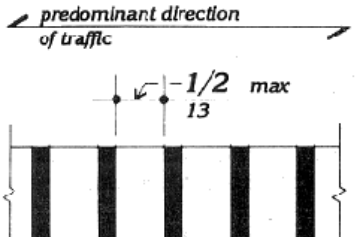
Typical alignment of the Furnishings Zone within the Sidewalk Corridor

Grates

All grates within the sidewalk shall be flush with the level of the surrounding sidewalk surface, and shall be located outside the Through Pedestrian Zone. Ventilation grates and tree well grates shall have openings no greater than 1/2 in (13 mm) in width.

Designers should use tree well grates in High Pedestrian Use areas.

Figure D-5
Ventilation Grates



Access Hole Covers

Access hole covers should be located within the Furnishings Zone. Access hole covers must have a surface texture that is rough, with a slightly raised pattern. The surface should be slip-resistant even when wet. The cover should be flush with the surrounding sidewalk surface.

Street Furniture

Street furniture includes benches, mailboxes, trash and recycling receptacles, bike racks, newspaper boxes, drinking fountains, information boards, kiosks, parking meters, artwork, public phones, signs, bus shelters, and other items used by pedestrians. These features humanize the scale of a street and encourage pedestrian activity. Street furniture should be placed in the furnishings zone to maintain through passage zones for pedestrians and to provide a buffer between the sidewalk and the street. For bus shelters on crowded sidewalks, bus bulb-outs are recommended for providing additional space. (See the explanation of bulb-outs on pages 17 and 24.) Bus shelters should also have clearly displayed bus schedules and city maps for way-finding. Pedestrian facilities around all street furniture should meet accessibility requirements and pedestrian walk clearance zones.

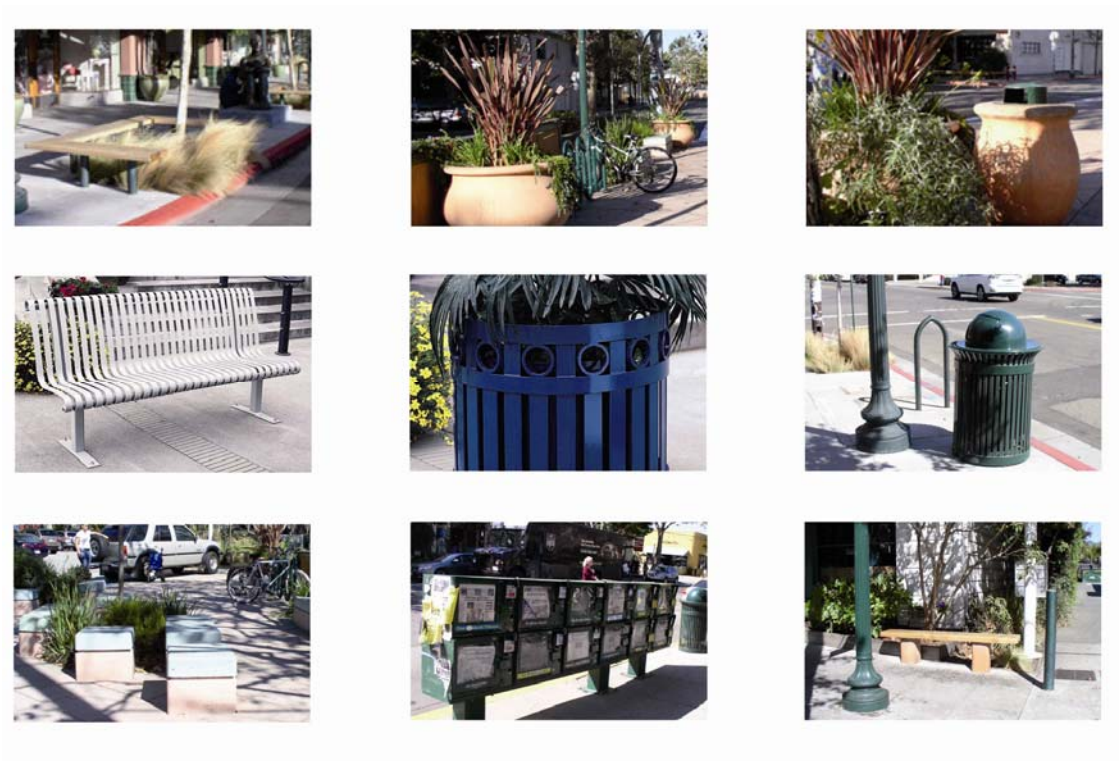


Figure D-6
Examples of Street Furniture

Utility Poles and Structures

The City's underground and overhead network of utility services greatly impacts sidewalks. Utility poles, traffic signals, and fire hydrants should be installed outside the pedestrian travel zone. Electrical boxes should be located on utility and traffic signal poles so they do not create unexpected hazards to pedestrians. Utility vaults and access boxes should be located outside the pedestrian travel zone and be constructed from non-slip materials that are flush with the sidewalk, in conformance with ADA requirements.

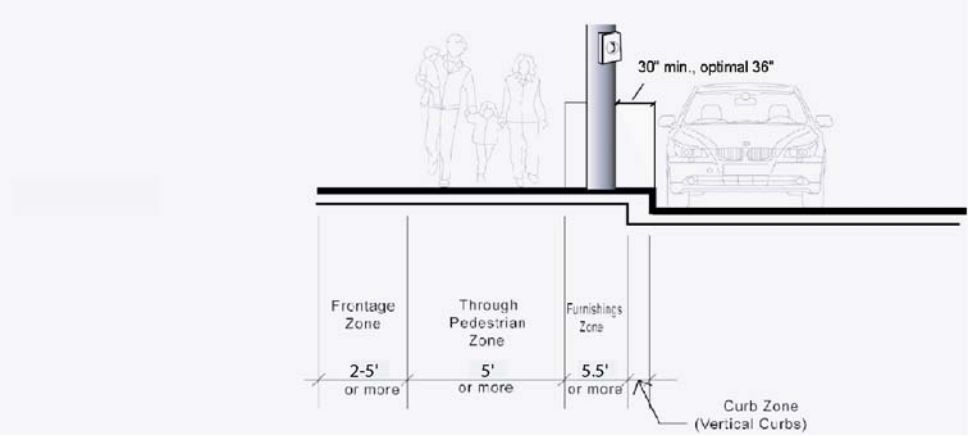


Figure D-7
Utility Poles and Structure Placement

D.4.4 Through Pedestrian Zone

The Through Pedestrian Zone is the area intended for pedestrian travel. This zone should be entirely free of permanent and temporary objects.

For sidewalk infill projects in areas with some existing sidewalks, the new sidewalk should match the existing width or meet the recommended width whichever is larger.

Driveway aprons should not intrude into the Through Pedestrian Zone.

ADA Accessibility Guidelines specify that the minimum clearance required for through passage is 36 inches. A minimum clearance of 32 inches is allowed, but only up to a length of 24 inches.

Surfaces

Walking surfaces shall be firm and stable, resistant to slipping, and allow for ease of passage by people using canes, wheelchairs, or other devices to assist mobility.

Sidewalks are generally constructed of Portland cement concrete. Brick or concrete unit pavers may also be considered, at the discretion of the City Engineer, particularly in the Furnishings Zone or around mature trees where sidewalk lifting is a problem.

The surface of concrete sidewalks should be scored to match historic patterns within a neighborhood or district where appropriate.

The Through Pedestrian Zone is the area of the Sidewalk Corridor intended for pedestrian travel.

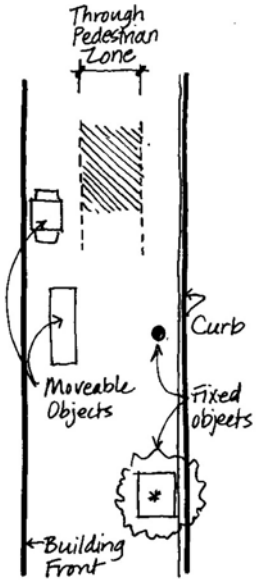
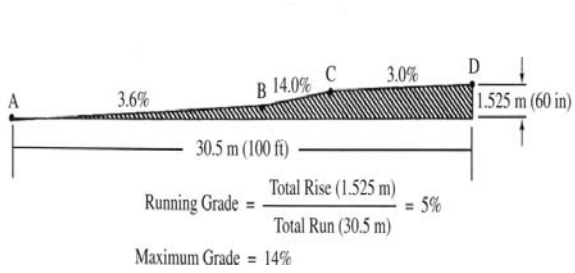


Figure D-8
Through Pedestrian Zone

Typical alignment of the Through Pedestrian Zone within the Sidewalk Corridor.

Table D-2
Pedestrian Zone Materials

Concrete	
Where to Use	Preferred material for use on standard city sidewalks.
Maintenance Life	75 years plus
Concrete Pavers	
Where to Use	Acceptable material for use on sidewalks where aesthetic treatment is desired, at the discretion of the City Engineer. May be best suited for the Furnishings Zone as streetscape accent where pedestrian through travel is not expected.
Maintenance Life	20 years plus
Decomposed Granite (DG)	
Where to Use	For use on pedestrian trails.
Maintenance Life	5 years
Asphalt	
Where to Use	Preferred material for use on any widened shoulder alternative pathway. Acceptable but not preferred as a material for separated alternative pathways or connector paths. Asphalt patch may be used for use for City standard sidewalk only for temporary repair.
Maintenance Life	10 years plus



Grade

The grade of a sidewalk is important because of control, stability, and endurance. Gentle grades are preferred to steep grades so as to make it possible for people to go up hill, and so that they don't lose control on the downhill

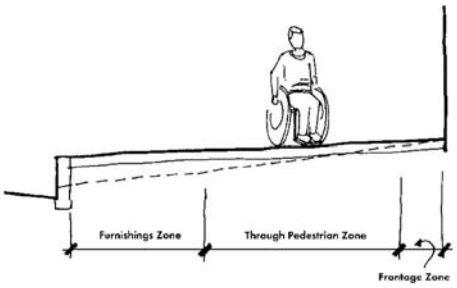
- Grade is the slope parallel to the direction of travel.
- Running grade is the average grade along a continuous path.
- Maximum grade covers a limited section of sidewalk that exceeds the running grade. It is measured over 24 in (0.610 m). The above figure illustrates running grade and maximum grade. Rate of change of grade is the change of grade over a distance of 24 in (0.610 m) intervals.
- Counter slope is the grade running opposite to the running grade.
- New sidewalks must be built to comply with these grade requirements and approval of the City Engineer. However, in a steep area with existing roadways, exceptions are allowed. Staircases and/or elevators can provide an alternative.

Cross Slope

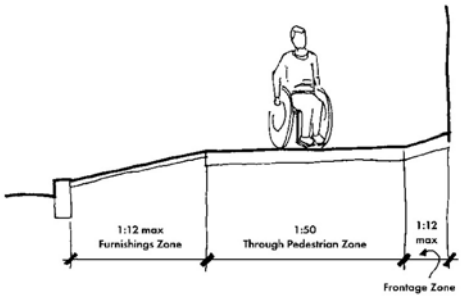
Cross-slope affects the stability of wheelchairs, walking aids, and people who have difficulty walking but don't use aids. All sidewalks require some cross-slope for drainage, but cross-slope that is too great presents problems for disabled users. The recommended cross-slope for sidewalks is 2%. The preferred cross slope for the entire paved sidewalk corridor is 1:50. If a greater slope is anticipated because of unusual topographic or existing conditions, the designer should maintain the preferred slope of 1:50 within the entire Through Pedestrian Zone, if possible.

This can be accomplished either by raising the curb so that the cross-slope of the entire sidewalk can be 1:50, or by placing the more steeply angled slope within the Furnishings Zone and/or the Frontage Zone.

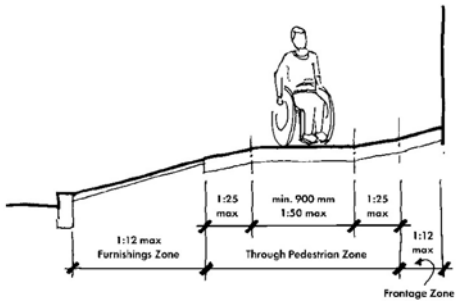
If the above measures are not sufficient and additional slope is required to match grades, the cross slope within the



Raising the curb is one approach to maintaining the preferred cross slope.



The Furnishings Zone and the Frontage Zone may be sloped more steeply, provided the preferred cross slope is maintained in the Through Pedestrian Zone.



If necessary, the Through Pedestrian Zone may contain slopes up to 1:25, provided a 900 mm (3'-0") wide area with a cross slope of no more than 1:50 is maintained within the zone.

Figure D-9
Cross Slope

Through Pedestrian Zone may be as much as 1:25, provided that a 3 ft (900 mm) wide portion within the Through Pedestrian Zone remains at 1:50 cross slope, as shown in the illustration.

Temporary uses such as sidewalk cafes may occupy the Frontage Zone, providing the Through Pedestrian Zone remains clear.

Elements such as standpipe systems may project into the Frontage Zone. Care must be taken to assure compliance with the ADA.

D.4.5 Frontage Zone

The Frontage Zone is the area between the Through Pedestrian Zone and the property line. This zone allows pedestrians a comfortable "shy away" distance from the building fronts, in areas where buildings are at the lot line, or from elements such as fences and hedges on private property.

Where no Furnishings Zone exists, elements that would normally be sited in that zone, such as transit shelters and benches, telephone kiosks, signal and street lighting poles and controller boxes, traffic and parking signs, and utility poles, may occupy the Frontage Zone. In some cases, easements or additional right-of-way may be required to allow for these items. For residential and mixed-use building built to the right-of-way line, these elements should not be sited in the Frontage Zone, as they could block access to an existing or future building.

Private temporary uses such as sidewalk cafes (where allowed by Code) may occupy the Frontage Zone, so long as the Through Pedestrian Zone is maintained.

Encroachments

Fences and walls, when permitted, should be at least 1 ft (300 mm) behind the back of the sidewalk (or the future sidewalk, if none exists). Encroachments into the right-of-way should not be permitted where the existing sidewalk corridor is less than the recommended width. Property owners should check with the City Planning Department in identifying property lines.

D.5 Railroad Crossings

At-grade railroad tracks can be hazardous for pedestrians to cross. Improvements can be made to alert pedestrians that they are crossing tracks and that there is an oncoming train. Truncated domes help alert pedestrians as they are walking to cross the tracks with some caution. There are also other improvements that can help warn pedestrians of railroad crossings, such as signage. Railroad crossing warning signs can be placed near the sidewalk/railroad crossing. Another improvement is an arm that crosses the sidewalk when a train is approaching like arms that lower to stop vehicles approaching at-grade crossings. **Figure D-10 Railroad Arm on Sidewalk** shows how these railroad arms are attached to the same pole as the arm to stop vehicles and they cross the sidewalk, warning pedestrians of a train.

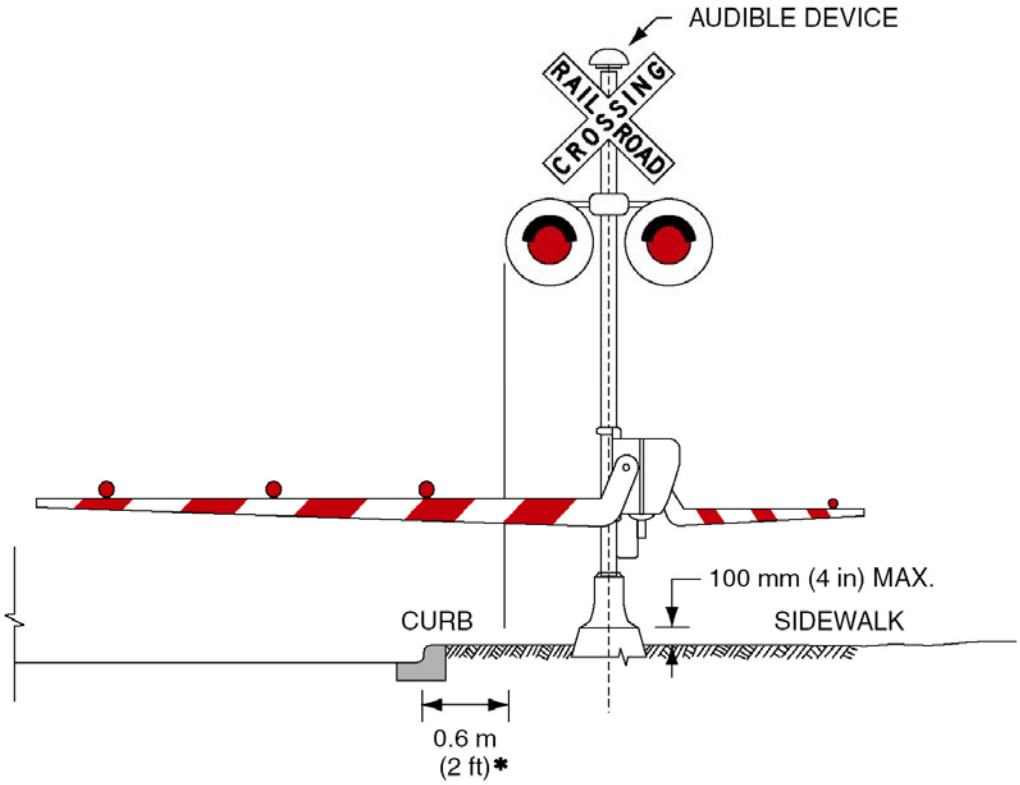


Figure D-10
Railroad Arm on Sidewalk

D.6 Sidewalk Lighting

Improving street lighting makes locations appear more inviting and will encourage people to use pedestrian areas at night. An increase in the number of people using a particular area reinforces general safety by eliminating opportunities for crimes to occur.

Street lighting is designed to serve a variety of purposes. Some designers use lamp styles to provide a sense of neighborhood continuity or preserve the atmosphere of an historic district. Others use lights to improve visibility for motorists at a particular intersection.

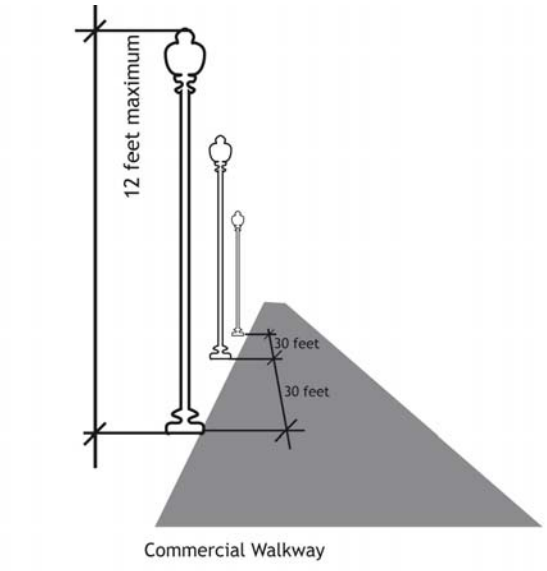


Figure D-11
Lighting Placement

Pedestrian scale lighting is addressed specifically in this section, as typical roadway right-of-way lighting designed to benefit motorists is of little value to pedestrians. From the pedestrian's point of view, frequent lampposts of lower height and illumination are preferred over fewer lampposts that are taller and brighter.

Pedestrian scale lighting should be used in areas of high pedestrian activity and where feasible based on available right of way, utilities and cost. Pedestrian scale lighting is a significant capital improvement and operating and maintenance expense and should be planned only where it will have a maximum benefit. The areas in Carlsbad that may benefit from increased pedestrian lighting surround uses active in the evening such as entertainment districts that include theatres, restaurants and bars or parks with evening programs. Pedestrian scale lighting may also benefit the pedestrian districts where they do not exist already.

Pedestrian scale lighting may be installed between existing lampposts to obtain the frequencies given in the table above. They must be located at least ten feet from the full growth canopy of adjacent trees.

The City has minimum lighting standards included in the Municipal Code. This section is intended to provide guidelines for additional lighting to create a more pedestrian friendly environment.

D.7 Bicycle Parking

Many errands are multi-modal, involving walking and some other transport including vehicles, transit, or bicycle. Placing bicycle parking adjacent to store fronts, shopping centers or post offices may encourage people to bicycle to places that are too far to walk and too close for driving. To facilitate walking-bicycling trips, bicycle parking spaces can be installed in any of the zones identified except the "Through Passage Zone". If installed in the curb zone, racks must be a minimum of 3.5 feet from the curb and cannot obstruct the path of travel. On narrow sidewalks, bicycle parking is oriented so the locked bicycle is parallel to the pedestrian traffic flow. On streets with very wide sidewalks, bicycle parking may also be oriented with locked bicycles perpendicular to the right-of-way as long as they do not project into the pedestrian travel zone. Private property owners are also encouraged to provide bicycle parking for use by the public on their land within the "Frontage Zone". Such parking should be installed so that locked bicycles do not project into the sidewalk. Bicycle parking rings on posts are designed to prevent bicycles from falling and becoming an obstacle to walking.

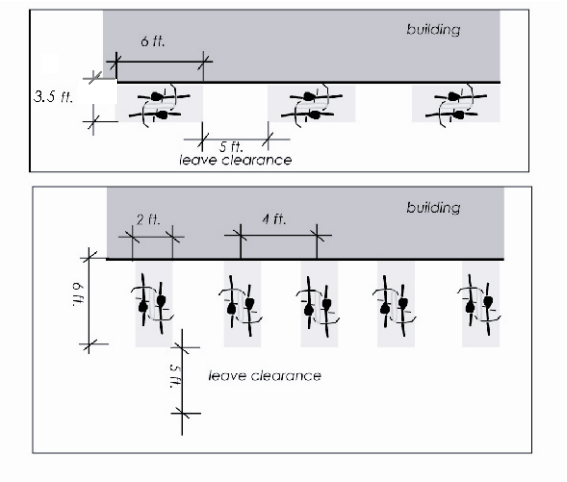


Figure D-12
Typical Bicycle Parking Facility Dimensions

D.8 Transit Stops

Bus bulb-outs can provide safe access for transit passengers. Bus bulb-outs should be designed such that pedestrians in wheelchairs can access the bus shelter and board the bus. At transit stops where neither a bus turnout nor bus bulb-out can be accommodated buses are often unable to pull directly adjacent to the curb to deploy a lift. Curb ramps in such locations allow wheelchair users to board the bus from the street; if a bus stop is not adjacent to a corner curb ramp, a curb ramp at the bus stop should be provided.

ADA Guidelines define the amount of space necessary next to bus shelters to facilitate the lift operations for passengers in wheelchairs. The ADA minimum requirements for this space are 60 inches wide (as measured along curb or roadway edge) by 96 inches deep (as measured from the curb or roadway edge). ADA Guidelines also state that a passing space of 60 inches is required for passing space adjacent to any sidewalk amenities.

D.9 Crosswalks

D.9.1 Definition

The California Vehicle Code Section 275 defines a crosswalk as either:

(a) That portion of a roadway included within the prolongation or connection of the boundary lines of sidewalks at intersections where the intersecting roadways meet at approximately right angles, except the prolongation of such lines from an alley across a street.

(b) Any portion of a roadway distinctly indicated for pedestrian crossing by lines or other markings on the surface.

Notwithstanding the foregoing provisions of this section, there shall not be a crosswalk where local authorities have placed signs indicating no crossing.

At intersections, a crosswalk is effectively a legal extension of the sidewalk across the roadway. Crosswalks are present at all intersections, whether marked or unmarked, unless the pedestrian crossing is specifically prohibited by the local jurisdiction. At mid-block locations, crosswalks only exist if they are marked.

According to the California MUTCD, crosswalk markings provide guidance for pedestrians who are crossing roadways by defining and delineating paths on approaches to and within signalized intersections, and on approaches to other intersections where traffic stops. Crosswalk markings also serve to alert road users of a pedestrian crossing point across roadways not controlled by highway traffic signals or STOP signs. At non-intersection locations, crosswalk markings legally establish the crosswalk.

As noted in the FHWA report "Safety Effects of Marked Versus Unmarked Crosswalks at Uncontrolled Locations," the California MUTCD does not provide specific guidance relative to the

site condition (e.g., traffic volume, pedestrian volume, number of lanes, presence or type of median) where marked crosswalks should or should not be used at uncontrolled locations. Nor does the MUTCD give specific guidance on the application of crosswalk enhancement features such as high-visibility striping, advanced warning signage, or flashing beacons. While the California MUTCD allows the use of these devices, decisions on their specific applicability to a given location have historically been left to the judgment of the local traffic engineers. This section summarizes the various types of crosswalk-related markings, signage and enhancement treatments available for use in the city of Carlsbad, discusses policies and procedures already in use for implementation of some of these devices, and provides more specific guidance and recommendations to assist city traffic engineers with future implementation.

D.9.2 Crosswalk Markings

Marked crosswalks serve to alert road users to expect crossing pedestrians and to direct pedestrians to desirable crossing locations. The City of Carlsbad utilizes two different marking styles for pedestrian crosswalks: the standard "transverse" style, consisting of two parallel lines; and the "ladder" style consisting of the two parallel lines with perpendicular ladder bars striped across the width of the crosswalk.

Crosswalks should extend across the full width of intersections, or to the edge of the intersecting crosswalk, to encourage pedestrians to cross perpendicular to the flow of traffic. Crosswalk markings can be applied with paint, or thermoplastic. At controlled crosswalk locations (STOP signs or traffic signals), crosswalk markings by themselves are considered sufficient treatment, given the presence of a traffic control to stop vehicles. At uncontrolled crosswalk locations (either uncontrolled intersections or mid-block locations), marked crosswalks can be enhanced with crosswalk signage, advance warning signage or flashing beacons -- these additional crosswalk enhancements are discussed in more detail below.

The decision on whether to install standard or ladder crosswalk markings depends upon a variety of factors such as the number of pedestrians crossing, traffic speeds/volumes, number of lanes to cross, presence of nearby schools or senior centers, and history of collisions. In general, standard transverse markings are considered appropriate at controlled intersections, minor uncontrolled intersections, and other crossing locations with low traffic volumes/speeds, short crossing distance, and good visibility. High visibility ladder markings are generally applied at uncontrolled or midblock locations, especially on major streets with high pedestrian volumes, heavy traffic volumes and speeds, and more than one lane each direction.

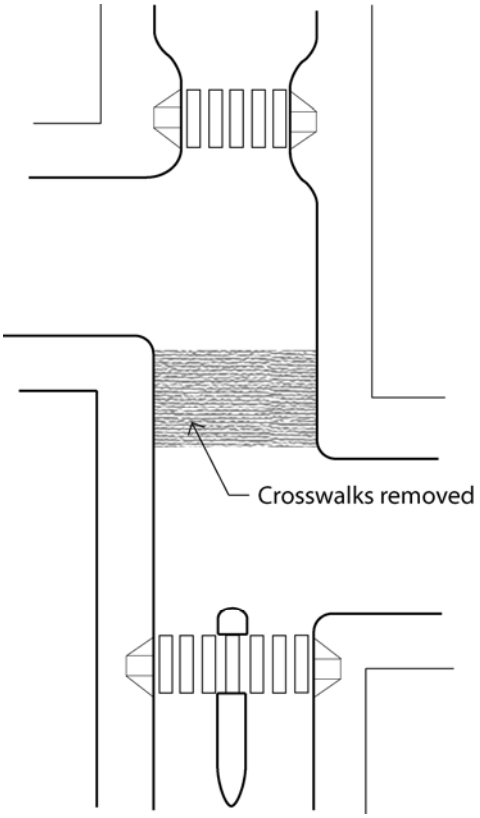
Table D.3
Crosswalk Markings Used in Carlsbad

Style	Sample
Standard – Two solid white lines, 12 to 24 inches wide, spaced at least 6 feet apart (refer to CA MUTCD Sec. 3B.17). Also called "transverse."	
Ladder – Adds cross bar "rungs" to the standard crosswalk marking described above. Width of ladder lines should be 1 foot, with minimum spacing of ladder lines 1.5 feet.	
School Crosswalks – Crosswalks within the designated school zone must be painted yellow, per California MUTCD. Can be marked either standard or ladder. The school zone can be set a distance up to 500 feet from the school boundary.	

Crosswalk Striping at Major Intersections

Crosswalks should be striped with transverse lines at all controlled intersection legs, at minimum. At major intersections, where pedestrian activity is high or where significant pedestrian-vehicle conflicts may occur or visibility of the crosswalk is a concern, ladder style crosswalks should be used.

Crosswalk Striping at "T" Intersections or Offset Intersections of Major Arterials and Residential Streets



Source: Portland Pedestrian Design Guide

Figure D-13
Offset Intersection

Carlsbad has many locations where major arterials intersect one or more minor residential streets on only one side, forming a "T" shaped intersection or a series of offset intersections. At locations where STOP or traffic signal controls are provided for each intersection leg, the provision of marked crosswalks should follow the guidelines for major intersections above. At locations where one or more intersection legs is uncontrolled, however, engineering judgment should be used in deciding whether or not to mark a crosswalk. Providing two marked crosswalks in close succession on an uncontrolled arterial roadway, for example, may reduce rather than enhance safety for pedestrians. In some locations, removing marked crosswalks on the inner portion of two offset intersection legs and enhancing the outer two marked crosswalks (through signage or traffic calming measure) may be the best solution, as shown in **Figure D-13**.

Wherever land uses adjacent to the major arterial of an offset or "T" intersection are expected to generate significant pedestrian traffic, at least one marked pedestrian crosswalk should be provided for each intersection. The decision to mark a crosswalk should be related to the presence of pedestrian-generating activity centers along a particular roadway; in some locations it is necessary to provide frequent marked pedestrian crosswalks, while in others it may be appropriate to space marked crosswalks further apart.

Crosswalk Striping at Minor Intersections

At minor intersections, the use of standard transverse lines to mark the crosswalk is generally appropriate. Crosswalks should be aligned with curb ramps such that wheelchair users do not need to leave the crosswalk to access the sidewalk on either side of the roadway. Crosswalks should only be marked at uncontrolled locations following an appropriate engineering study.

Crosswalk Markings in School Zones

To alert drivers to the presence of a school, crosswalks within the designated school zone must be striped yellow rather than white. A school zone can be designated up to 500' in advance of the school boundary. Special signage should also be located near school crossings in accordance with the guidelines provided in Chapter 7 of the California MUTCD. This document provides guidelines for enhancing crossings where one of the major concerns is the presence of school-aged children.

D.9.3 Crosswalk Warning Signage and Pavement Markings

The California MUTCD provides guidance on the installation of warning signage and pavement stencils at and in advance of uncontrolled crosswalks. These signs are only for use at uncontrolled locations, because at STOP, YIELD, or signalized locations the presence of the traffic control serves to regulate the crosswalk at those intersections. Signage and stencils to supplement crosswalks are not required, and in fact the California MUTCD notes that such signs should be installed in locations where crossing activity is unexpected or not readily apparent.

W11-2

In advance of the crosswalk, the Pedestrian Crossing sign plate is installed (W11-2). At the crosswalk location itself, the Pedestrian Crossing sign plate plus a downward arrow is installed to show the exact location of the crosswalk. White "PED XING" pavement markings may be placed in each approach lane to a marked crosswalk, except at intersections controlled by traffic signals or STOP or YIELD signs.

S1-1

W16-7p

School Crosswalk Warning Assembly B (CA)

Special signage is required at and in advance of school crosswalks, also describe in the California MUTCD. Unlike the crosswalk warning signage for a normal (white) crosswalk, school crosswalk signage is mandatory. At each yellow school crosswalk, the School Crosswalk Warning Assembly B shall be installed, consisting of a School Warning plate (S1-1) plus downward arrow. In advance of each yellow school crossing, a School Advance Warning Assembly D shall be used, consisting of a school crossing plate plus "AHEAD." Yellow "SLOW SCHOOL XING" markings can be used in advance of uncontrolled school crosswalks, placed at least 100 feet in advance of the crosswalks.

D.9.4 High Visibility Signage

One way of increasing the visibility of pedestrian-related signage is through the use of a Fluorescent Yellow-Green (FYG) background. Use of this FYG signage is approved by the California MUTCD for use on pedestrian, bicycle and school signs. When the FYG background is used for corridor or school-area signing, a systematic approach should be used, so that the mixing of standard yellow and fluorescent yellow-green is avoided.

D.9.5 Stop and Yield Lines

The use of Stop Lines (commonly referred to as limit lines or stop bars) and Yield Lines is guided by California MUTCD Sec. 3B.16. Stop lines are solid white lines 12 inches to 24 inches wide that indicate where traffic must stop at STOP-controlled or signalized locations. Stop lines are only required at controlled locations where no marked crosswalk exists; where a crosswalk is present, the crosswalk itself can function as the stop line. Jurisdictions are permitted by the MUTCD to install a stop line in advance of a marked crosswalk if they desire. Installing stop lines in advance of crosswalks can help to discourage vehicle encroachment into the marked crosswalk, particularly in right-turn-on-red situations where vehicles often creep forward to get better visibility. One solution to this issue is to stripe a stop line on the left lanes farther back than the right lanes, allowing better visibility to the left for right-turning vehicles. This also allows more clearance for vehicles turning from perpendicular streets. A supplement to Stop Lines is "STOP HERE ON RED" signage with a down arrow indicating the stop line as the proper location for vehicles to stop in advance of the intersection.

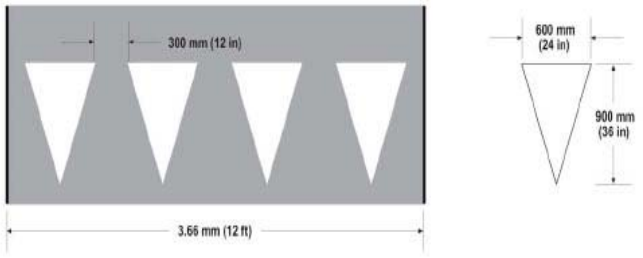


Figure D-14
Yield Line Specifications

Yield lines (also called yield teeth or shark's teeth) indicate the point at which traffic should yield at uncontrolled locations, and are composed of white triangles 3 feet high by 2 feet wide, spaced 1 foot apart, as shown in **Figure D-14**. In California, vehicles are required to "YIELD" to pedestrians in uncontrolled crosswalks, and yield lines can be used to indicate the appropriate location for vehicles to stop in advance of an uncontrolled crossing location. These markings are most effective in mid-block locations, where there is no intersection to give a motorist cues on the location to wait for a crossing pedestrian. The California MUTCD notes that yield line placement should be 20 to 50 feet back of uncontrolled mid-block intersections. On multi-lane roadways, yield lines can be used to counter the "multiple-threat" collision, which refers to the situation where a car in one lane stops and screens the pedestrian from the view of the adjacent lane. Installing yield lines 40-50 feet back (two car lengths) gives both pedestrians and motorists a better view of each other during the crossing. "YIELD HERE FOR PEDESTRIANS" signs with a down arrow can be used at the yield lines to indicate the proper location for vehicles to yield in advance of the crosswalk.

The City of Carlsbad has used Stop Lines or Yield Lines at several locations that have a marked crosswalk. At locations that have a history of vehicle encroachment into the crosswalk or vehicles failing to stop for pedestrians on right-turn-on-red, the City may consider installing stop lines at least 4 feet back from the crosswalk. At mid-block pedestrian crosswalks with flashing beacons, the City may consider the installation of stop lines at least 40 feet in advance of the signal indication. At uncontrolled mid-block crosswalk locations the City may consider installation of yield lines at least 40 feet in advance of the crosswalk.

D.9.6 Pedestrian Warning Signage for Signalized Intersections

As noted under the discussion of crosswalk signs and markings, crosswalk warning signs are not permitted at crosswalks controlled by a traffic signal, as the traffic control itself serves to regulate vehicles at the intersection. At signalized intersections, particularly where right turn on red is permitted, installing stop lines as described above may be one way of reducing encroachment of vehicles into the pedestrian crosswalk. Another solution to remind drivers who are making turns to yield to pedestrians is installation of a "TURNING TRAFFIC MUST YIELD TO PEDESTRIANS" (R10-15) sign.

D.9.7 In-Street Yield to Pedestrian Signs

In-Street Yield to Pedestrian Signs are flexible plastic signs installed in the median to enhance a crosswalk at uncontrolled crossing locations. These signs communicate variations of the basic message 'State Law: Yield to Pedestrians'. The signs can be supplemented with a "SCHOOL" plate at the top for use at school crosswalks. If used near schools, these signs are sometimes installed on a portable base and brought out in the morning and back in at the end of each day by school staff, which may reduce the chance that the sign will become less visible to motorists by being left out all the time. For permanently installed signs, maintenance can be an issue as the signs may be run over by vehicles and need to be replaced occasionally. Installing the signs in a raised median can help extend their lifetime.

D.9.8 Special Crosswalk Pavement Treatments

For aesthetic reasons, crosswalks are sometimes constructed with distinctive paving materials such as colored pavement or special decorative pavers meant to look like brick. Brick should be avoided for use in crosswalks, as it tends to wear down quickly, becoming uneven and slippery causing difficulties for pedestrians, especially persons with disabilities. Any use of unique materials or colored pavement should use concrete pavers or asphalt, and textures should maintain a smooth travel surface and good traction. It is important to note that these decorative pavement treatments do not enhance the visibility of the crosswalk location, in many cases make the crossing more difficult for persons with disabilities to navigate, make the crosswalk less visible to motorists at night. Regardless of any colored or unique pavement treatment used, marked crosswalk locations should always be marked with parallel transverse lines.

D.9.9 Pedestrian Signals

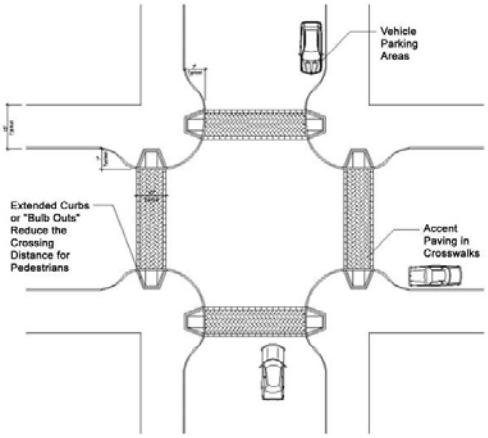
Traffic control signals minimize conflicts between motorists and pedestrians by giving clear direction about the proper use of the right-of-way. Section 4E of the California MUTCD outlines

the standards for the use and design of pedestrian signals, including the warrants for locations where pedestrian signals may be provided. All new pedestrian signal installations shall consist of pedestrian signal head with international symbols, rather than textual "walk" and "don't walk" messages. Engineering judgment should be used in determining the specifics of pedestrian signal design at different crossing locations.

D.10 Engineering Treatments for Crosswalks

D.10.1 Curb Extensions

Curb extensions, also called "bulb-outs" to describe their shape, are engineering improvements intended to reduce pedestrian crossing distance and increase visibility. Curb extensions can either be placed at corners or at mid-block crosswalk locations, and generally extend out about 6 feet to align with the edge of the parking lane. In addition to shortening the crosswalk distance, curb extensions serve to increase pedestrian visibility by allowing pedestrians to safely step out to the edge of the parking lane where they can see into the street, also making them more visible to oncoming drivers. At corners, curb extensions serve to reduce the turning radius, and provide space for perpendicularly-aligned curb ramps. Where bus stops are located, bulb-outs can provide additional space for passenger queuing and loading.



Despite their advantages, curb extensions can require major re-engineering of the street and are not appropriate for all situations. Installing curb extensions where there are existing storm drain catch basins can require costly drainage modifications. Curb extensions may not be possible in some locations due to existing driveways or bus pull-out areas. Curb extensions need to be designed to avoid conflict with bicycle facilities, and should never extend into a bicycle lane.

Given their relatively high cost and challenges of implementation, curb extensions are not recommended as a tool for widespread implementation along every street in the city. Each potential curb extension location must be evaluated on a case-by-case basis, taking into account factors such as crossing volumes, parking lane widths, infrastructure challenges such as drainage or driveways, turning impacts to large vehicles, and locations of bus stops. The Carlsbad Fire Department restricts curb extensions to only one of the two intersecting streets.

D.10.2 Median Refuge Islands

On wide, multi-lane roadways, pedestrians can benefit from median refuge islands, which offer a place to wait after crossing only half of the street. Refuge islands increase the visibility of pedestrian crossings, and decrease pedestrian collisions by reducing pedestrian/vehicle conflicts, motor vehicle

speeds, and exposure time for pedestrians.[7] They also allow pedestrians to consider cross traffic from one direction at a time, making it easier to find a gap and simplifying crossing.

The MUTCD defines an island as an area between traffic lanes for control of vehicular movements or for pedestrian refuge. Under the MUTCD definition, a refuge island can be delineated by curbs (raised), pavement markings (painted), or other devices. The MUTCD does not give any specific guidance on minimum dimensions of a refuge island

The FHWA document "Pedestrian Accommodations at Intersections" advises that a refuge island should be a minimum of 4 feet wide and 12 feet long (or the width of the crosswalk, whichever is greater).[8] The ADA Access Board's Draft Guidelines on Accessible Public rights-of-way has a section on median islands.[9] These guidelines have not yet been adopted, and as such are not ADA requirements at this time. However, the guidelines are under consideration for adoption in the future, and cities may wish to look at these guidelines as best practices for compliance with future ADA standards.

The following right-of-way guidelines are recommended by the Access Board's Draft Guidelines[10]:

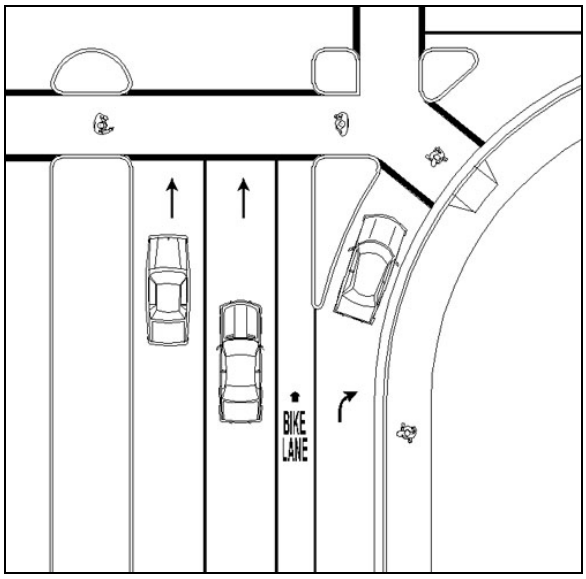
- Medians and pedestrian refuge islands in crosswalks shall contain a pedestrian access route, including passing space connecting to each crosswalk.
- Regarding a minimum width for refuge islands, the guidelines state that medians and pedestrian refuge islands shall be 1.8 m (6.0 ft) minimum in length in the direction of pedestrian travel.
- The guidelines permit both ramped up and cut-through design of refuge island, and advise that there are many factors to consider when deciding whether to ramp or cut-through a median or island. Those factors may include slope and cross slope of road, drainage, and width of median or island. They note that "curb ramps in medians and islands can add difficulty to the crossing for some users."
- Medians and refuge islands are also required to have detectable warnings at cut-through islands.

For pedestrian refuge islands at intersections, installing a median nose can help to provide additional protection for pedestrians. Median noses can also reduce vehicles encroaching into the refuge area when making left turns. However, median noses may not be feasible to install due to turning movement restrictions they can cause from side streets. Neither the MUTCD nor the ADA Access Board Guidelines have any requirement for median noses to be installed at intersection refuge islands. The City of Carlsbad should consider median nose installation on a case-by-case basis.

[7] FHWA 2002b, p. 72
[8] Pedestrian Accommodation and Intersections, FHWA, http://safety.fhwa.dot.gov/ped_bike/univcourse/swless15.htm
[9] http://www.access-board.gov/PROWAC/draft.htm#305
[10] Access Board, Draft Accessibility Guidelines for Public Rights of Way, Section R305.4

D.10.3 Channelized Right-Turn Slip Lanes

A right turn slip lane, often delineated by paint or a concrete island, separates the right turn movement from through and left-turning vehicles, as shown in **Figure D-15.**



Source: Improving Pedestrian Access to Transit:

An Advocacy Handbook

Figure D-15
Slip Turn Crossing Treatment

Slip turn lanes can present difficulties to pedestrians because drivers tend to look left and concentrate on merging with oncoming traffic and may not see pedestrians entering the crosswalk. In high-traffic areas, inadequate gaps in right-turning traffic may exist, making crossing a slip turn lane difficult for pedestrians. The non-standard corner geometry introduced by slip lanes is extremely difficult for the blind to negotiate.

The closing of a slip turn lane solves the problems discussed above and also serves to shorten the pedestrian crossing distance. Further, the area can be made an attractive corner for pedestrians through the use of street furniture, benches, and small-scale plantings. Where slip turns cannot be removed due to traffic capacity considerations, several options exist for enhancing pedestrian safety. Signalizing the right turn movement creates gaps for pedestrians and may be the safest alternative. Passive crossing treatments, such as warning signage, or a raised crosswalk connecting the sidewalk with a refuge island, may also improve conditions for pedestrians.

D.10.4 Safety Barrels and Bollards

Safety barrels and bollards can be effective in preventing vehicles from entering the pedestrian right-of-way. They are also an inexpensive way to test more permanent intersection improvements such as curb extensions. The placement of these vertical elements must ensure that they do not block the travel path of pedestrians, particularly those who are sight or mobility impaired. The creative use of bollards to create combination curb bulbs/bicycle parking areas can be effective in improving pedestrian safety while enhancing the aesthetic quality of an intersection and providing bicycle parking

D.10.5 Multi-Use Trail Intersections

Multi-use trails provide pedestrian and bicycle travel ways that are separated from automobile traffic. Trail crossings must be safe for pedestrians and bicyclists alike, and should also provide convenient connections to the City's street network. In general, trail crossings should be treated just like other intersection types, oriented at 90 degree angles whenever possible ensuring safety for all trail and road users. In addition to typical intersection lighting, signage, and traffic control features, trail

crossings should include design features that warn both trail and roadway users of the crossing. Restricting parking near trail crossings, as at typical intersections, enhances sight distance.

D.11 Traffic Signal Enhancements

This section discusses specific pedestrian enhancements for use at signalized intersection locations.

D.11.1 Countdown Pedestrian Signals

Countdown pedestrian signals provide information on the amount of time remaining in the pedestrian change interval, which can assist pedestrians in making safe crossing judgments. Guidance on the use of these devices is now included in the California MUTCD.

D.11.2 Signal Timing

Traffic signal timing can have an effect on the ability of slower-moving pedestrians to safely cross the street. The length of the pedestrian clearance phase is determined by calculating a clearance interval, which is the length of time it takes a person to walk from the curb on one side to the center of the farthest travel lane on the other. The standard walking speed used to calculate pedestrian clearance intervals recommended by the California MUTCD and used in Carlsbad, is 4 feet per second. However, where there are populations of pedestrians who walk more slowly, a lower walking speed should be considered in determining the pedestrian clearance time. Particularly where there are seniors or persons with disabilities, the MUTCD recommends a walking speed of 2.8 feet per second. Where signalized crossings are in close proximity to locations such as senior centers, senior housing, elementary schools, or centers generating significant volume of pedestrians with disabilities, the city of Carlsbad should consider utilizing a walking speed of 2.8 ft/sec to allow for longer crossing times. This recommendation may also be applied to locations adjacent to elementary schools, as young children commonly walk more slowly.

D.11.3 Signal Activation

Fully-actuated signals are highly responsive to local traffic variations because they detect vehicles and pedestrians as they arrive in the intersection on any approach. On fully-actuated signals, pedestrians are required to push the button to actuate the WALK phase in any direction.

Special pedestrian phases can also be used to provide more crossing time for pedestrians at certain intersections. These include:

- Extended phase – At intersections with an extended phase, pedestrians who push the pedestrian crossing button get more time to cross the street than is provided during the normal signal phase.
- Leading Pedestrian Interval (LPI) – At intersections where there are conflicts between turning vehicles and pedestrians, pedestrians are given a "walk" designation a few seconds before the associated green phase for the intersection begins.

D.11.4 Pedestrian Pushbutton Detectors

Pedestrian pushbutton detectors allow for actuation of pedestrian signals, and should be located at all intersection corners where pedestrian actuation is used. As required by the California MUTCD, pedestrian pushbutton detectors must be accompanied by signs explaining their use. Pedestrian pushbutton detectors should be easily accessible for those in wheelchairs and for the sight-impaired, located approximately 3.5 ft. off the ground on a level surface. Pedestrian pushbuttons should not be used in locations where the pedestrian phase is set on a fixed cycle and cannot be actuated. One exception to this is the use of pushbuttons to activate audible pedestrian signals at non-actuated locations.

Pedestrian Signal Actuation

There are several simple design considerations that greatly enhance the safety and comfort of pedestrians at signalized intersections:

- In areas with high pedestrian use (over 100 persons per hour), incorporate a pedestrian phase into the signal sequence instead of an on-demand signal phase,
- Place pedestrian push-buttons in locations that are easy to reach and ADA compliant, facing the sidewalk and clearly inline with the direction of travel (this will improve operations, as many pedestrians push all buttons to ensure that they hit the right one);
- Adjust the signal timing to accommodate the average walking speeds of anticipated intersection users (longer crossing times for intersections near schools and community centers, etc.), or to limit the time a pedestrian has to wait

Accessible Pedestrian Signals – Verbal/Vibrotactile Tone

- When verbal messages are used to communicate the pedestrian interval, they shall provide a clear message that the walk interval is in effect, as well as to which crossing it applies.
- The verbal message that is provided at regular intervals throughout the timing of the walk interval shall be the term "walk sign," which may be followed by the name of the street to be crossed.
- A verbal message is not required at times when the walk interval is not timing, but, if provided: 1) It shall be the term "wait" and: 2) It need not be repeated for the entire time that the walk interval is not timing.
- Accessible pedestrian signals that provide verbal messages may provide similar messages in languages other than English, if needed, except for the terms "walk sign" and "wait." A vibrotactile pedestrian device communicates information about pedestrian timing through a vibrating surface by touch.
- Vibrotactile pedestrian devices, where used, shall indicate that the walk interval is in effect, and for which direction it applies, through the use of a vibrating directional arrow or some other means.

D.12 Curb Ramps

According to ADA regulations, all streets with sidewalks and curbs or other barriers must have curb ramps at intersections (U.S. Access Board 1999, p. 58). The City of Carlsbad requires curb ramp installation at all street intersections. New curb ramps must comply with the requirements of the State of California Code of Regulations Title 24 and the Americans with Disabilities Act Accessibility Guidelines.

Curb ramps should be oriented to direct pedestrians to the opposite corner and to provide a direct connection between the sidewalk through the Passage Zone and the crosswalk. Curb ramps should be designed such that wheelchair users can transition from the sidewalk to the crosswalk without having to enter travel lanes.

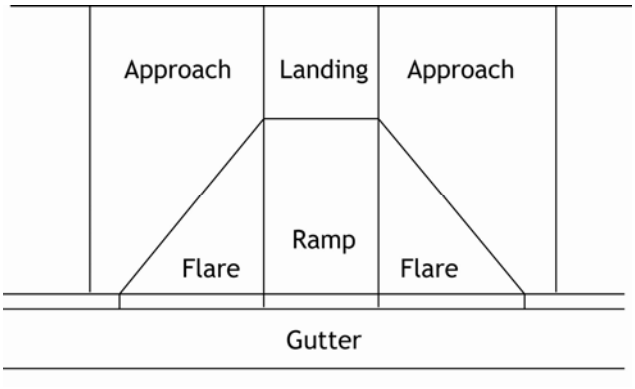


Figure D-16
Curb Ramp Components

Curb ramps consist of the following basic components, described in **Table D-4** and depicted in **Figure D-16**.

Table D-4
Curb Ramp Components

Landing	The level area at the top of a curb ramp facing the ramp path. Landings allow wheelchairs to enter and exit a curb ramp, as well as travel along with sidewalk without tipping or tilting.
Approach	The portion of the sidewalk on either side of the landing. Approaches provide space for wheelchairs to prepare to enter landings.
Flare	The sloped transition between the curb and sidewalk. Flares provide a sloped transition between the sidewalk and curb ramp to help to prevent pedestrians from tripping over an abrupt change in level.
Ramp	The sloped transition between the sidewalk and street where the grade is constant and cross slope at a minimum. Ramps are the main pathway between the sidewalk and street.
Gutter	The trough that runs between the curb or curb ramp and the street, designed to serve as a conduit for storm water flow or other drainage.

Typical Diagonal Curb Ramp in Carlsbad

D.12.1 Recommended City Curb Ramp Guidelines

Curb ramps are necessary for people who use wheelchairs to access sidewalks and crosswalks. They help people with other mobility impairments to transition easily between sidewalks and crosswalks. Curb ramps also help people with strollers or rolling carts. ADA requires installation of curb ramps in new sidewalks, as well as retrofitting of existing sidewalks. The three most common curb ramp designs, perpendicular, parallel, and diagonal, and the situations in which each should be used, are described below. Other curb ramp types, including built-up ramps and depressed corners, are also addressed. Table D-5 provides a summary of accessible curb ramp design standards.

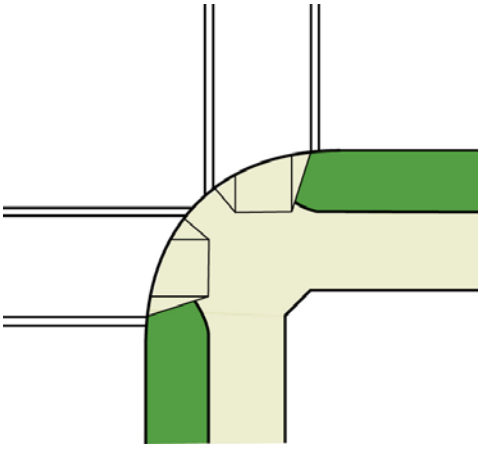


Figure D-17
Perpendicular Curb Ramp Design

Perpendicular Curb Ramps

Perpendicular curb ramps allow for a convenient, direct path of travel with a 90-degree angle to the curb. Perpendicular curb ramps are oriented such that users enter the street traveling perpendicular to vehicular traffic. Perpendicular curb ramps maximize access for pedestrians at intersections. They reduce the overall distance required to cross the street when compared with diagonal ramps. However, perpendicular curb ramps require more space than single diagonal ramps.

Perpendicular curb ramps without level landings are difficult for wheelchairs to negotiate, and should not be installed. Where sidewalks are narrow, there may not be space for two perpendicular curb ramps and their landings. Adding curb extensions can create additional space to accommodate two perpendicular ramps and landing areas.

Diagonal Curb Ramps

Diagonal curb ramps are usually similar in design to perpendicular curb ramps, but are placed at the apex of the corner and oriented such that users enter the street traveling diagonally to the path of vehicle travel. Diagonal curb ramps require less space than dual perpendicular curb ramps, but also require users to take a longer, circuitous travel path to the other side than a perpendicular ramp. They cause the user to travel towards the center of the intersection before maneuvering left or right to cross the street.

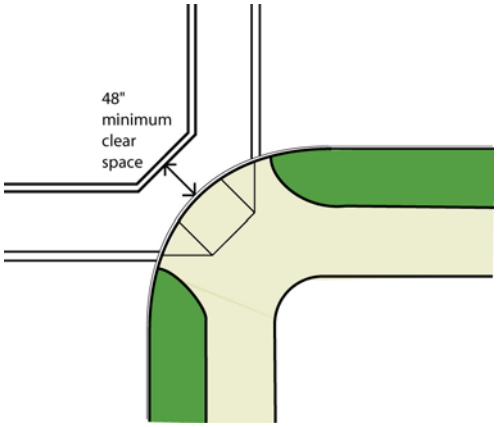
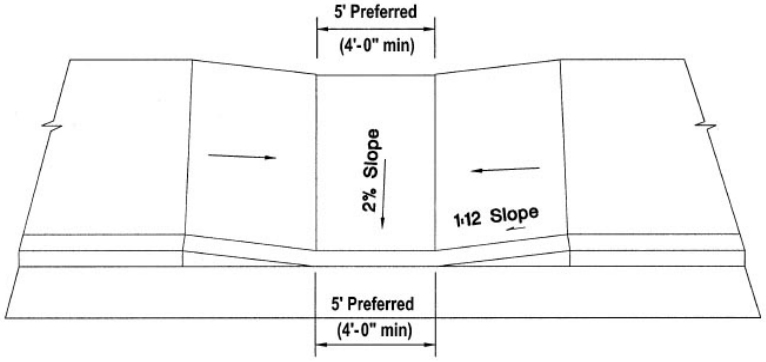


Figure D-18
Diagonal Curb Ramp Design

Diagonal curb ramps cost less than perpendicular ramps since they are single ramps, and hence the City can install more diagonal curb ramps than perpendicular curb ramps. Diagonal curb ramps are generally desirable on streets with little motor vehicle traffic where the advantage of installing more curb ramps compensates for the drawbacks.

Parallel Curb Ramps

Parallel curb ramps are two opposing ramps that slope down parallel to the direction of pedestrian travel. They are generally used on narrow sidewalks where inadequate space exists to install other ramp types. Parallel curb ramps can be useful in locations with high curbs, as the ramps can be extended to ensure a gentle ramp grade without concern for right-of-way limitations. However, parallel curb ramps require pedestrians who are continuing along the sidewalk to ramp down and up. Where space exists in a planting strip, parallel curb ramps can be designed in combination with perpendicular ramps to reduce the ramping for through pedestrians.



Source: Georgia Pedestrian Facilities Guidebook

Figure D-19
Parallel Curb Ramp Design

Depressed Corners

Depressed corners gradually lower the level of the sidewalk through a slope that meets the grade of the street. Depressed corners offer the same advantages of perpendicular curb ramps. However, they are generally not recommended since they make it difficult for people who are visually and cognitively impaired to distinguish the transition from the sidewalk and street. They can confuse

guide dogs as well. Turning motor vehicles, especially large trucks, may also intrude onto depressed corners. For these reasons, where depressed corners exist, they should be retrofitted with bollards or other intermittent barriers to prevent vehicles from traveling on the sidewalk. Detectable warnings should also be placed at the edge of the sidewalk.

Table D-5
Comparison of Minimum Curb Ramp Dimensions

Curb Ramp Type	Characteristic	ADAAG Standards	US Access Board Guidelines	Title 24 Standards	Other
Perpendicular Diagonal	Maximum slope of ramps	8.33%; if space prohibits this, 8.33% to 10% with a maximum rise of 150 mm (6 in); or 10% to 12.5% with a maximum rise of 75 mm (3 in)	7.1% + or – 1.2%		
	Maximum cross-slope of ramps	2%			
	Maximum slope of flared sides	10%			
	Minimum ramp width	0.915 m (36 in)	1.22 m (48 in)	1.22 m (48 in)	
	Minimum landing length	0.915 m (36 in); if landing is less than 1.22 m (48 in)			
	Minimum landing width		1.22 m (48 in)		
	Maximum gutter slope		5%		Gutter should be designed to not retain water
	Changes in level		flush		
	Truncated domes		610 mm (24 in)		
	Maximum slope of ramps	8.33%; if space prohibits this, 8.33% to 10% with a maximum rise of 150 mm (6 in); or 10% to 12.5% with a maximum rise of 75 mm (3 in)			
	Maximum cross-slope of ramps	2%			
	Maximum slope of flared sides	10%			
	Minimum ramp width	0.915 m (36 in)	1.22 m (48 in)	1.22 m (48 in)	
	Minimum landing length	0.915 m (36 in); if landing is less than 1.22 m (48 in)			
	Minimum landing width		1.22 m (48 in)		
	Maximum gutter slope		2%		Gutter should be designed to not retain water
	Changes in level		none		
	Minimum clear space		1.22 m (48 in)		
Parallel and combination	Maximum slope of ramps	8.33%; if space prohibits this, 8.33% to 10% with a maximum rise of 150 mm (6 in); or 10% to 12.5% with a maximum rise of 75 mm (3 in)	7.1%		
	Maximum cross-slope of ramps	2%			
	Maximum slope of flared sides	10%			
	Minimum ramp width	0.915 m (36 in)	1.22 m (48 in)	1.22 m (48 in)	
	Minimum landing length	0.915 m (36 in); if landing is less than 1.22 m (48 in)			
	Minimum landing width		1.22 m (48 in)		
	Maximum landing slope		2%		

Table D-5
Comparison of Minimum Curb Ramp Dimensions

Curb Ramp Type	Characteristic	ADAAG Standards	US Access Board Guidelines	Title 24 Standards	Other
	Maximum gutter slope		5%		Gutter should be designed to not retain water
	Changes in level		none		
	Truncated domes (parallel); detectable warnings (combination)		610 mm (24 in)		
Curb extensions and built-up curb ramps	Maximum slope of ramps	8.33%; if space prohibits this, 8.33% to 10% with a maximum rise of 150 mm (6 in); or 10% to 12.5% with a maximum rise of 75 mm (3 in)	7.1% + or – 1.2% (curb ext.); 7.1% (built-up)		
	Maximum cross-slope of ramps	2%	2% + or – 0.9% (curb ext.); 2% (built-up)		
	Maximum slope of flared sides	10%			
	Minimum ramp width	0.915 m (36 in)	1.22 m (48 in)	1.22 m (48 in)	
	Minimum landing length	0.915 m (36 in); if landing is less than 1.22 m (48 in)			
	Minimum landing width		1.22 m (48 in)		
	Maximum gutter slope		5%		Gutter should be designed to not retain water
	Changes in level		flush (curb ext.); none (built-up)		
	Detectable warnings		610 mm (24 in)		

D.13 Raised Sidewalks

The purpose of these facilities is to eliminate grade changes from the pedestrian path and give pedestrians greater prominence as they cross the street.

When implementing these measures:

- Use detectable warnings at the curb edges to alert vision-impaired pedestrians that they are entering the roadway.
- Approaches to the raised crosswalk may be designed to be similar to speed humps.

This type of facility is least acceptable to the Carlsbad Fire Department and its use requires extensive evaluation of the specific location and its impacts to emergency response times.

D.14 Turning Radius

A corner's turning radius determines how fast a driver can comfortably make a turn. A tighter turn or shorter radius forces drivers to slow down allowing them to see pedestrians better and stop more quickly. Intersection corners with short radii increase safety for pedestrians at intersections by creating more sidewalk space and less roadway space. A decreased curb radius also allows for curb ramps that are aligned parallel to crosswalks. A 10' turning radius is recommended for streets without curbside parking. For streets with curbside parking, a 20' radius is recommended. Streets with significant volumes of truck or large vehicle traffic should be analyzed and may require larger corner radii.

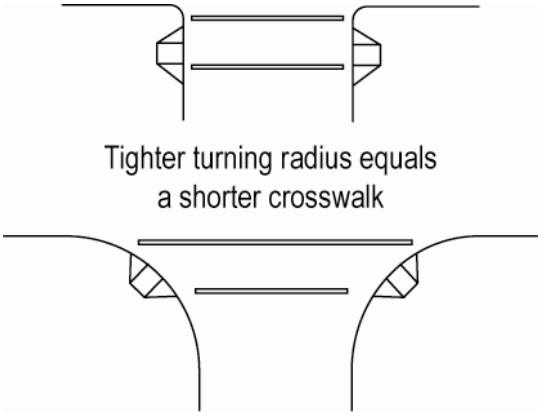


Figure D-20
Turning Radius