Complete Street Design Guidelines

January 2013

TOWN OF WINDSOR



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Prepared for the TOWN OF WINDSOR

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Introduction

Background

Street design is a key determinant in a community's livability. Streets are the public spaces that connect our homes, schools, businesses, civic buildings, recreation areas, daily necessities, and virtually all other destinations. They form the great majority of the circulation system. Streets provide access but they also define a sense of place, individual neighborhoods, and ultimately the community.

Land development and street improvement projects within the last ten years have placed a greater emphasis on the design of facilities serving pedestrians, bicyclists, and transit users, a design approach also known as 'complete streets'.

"Complete Streets" can be defined as follows: A design principle which balances the safety and convenience of everyone using the road. The existing street design standards do not fully reflect complete streets concepts, and a collaborative effort was undertaken by Public Works Engineering and Planning Department staff to create a common set of guidelines. With the help of a traffic engineering consultant, new guidelines have been developed that incorporate the complete streets principles.



This segment of Windsor River Road exemplifies a Complete Street design

Purpose

These street design guidelines have been created primarily for the engineers and planners who create street designs or check the designers' work. They are also intended to implement the relevant policies and objectives of the Town of Windsor General Plan (General Plan). By incorporating the concepts put forth in these guidelines into street designs, all users in Windsor, including pedestrians, bicyclists, transit riders, and drivers of passenger cars, busses and trucks, will be accommodated. This is a departure from the more vehicle-oriented policies of the past. The *California Complete Streets Act of 2008* mandates that complete streets concepts be adopted by jurisdictions and transportation agencies in their general plans. It follows that these street design guidelines will serve several purposes:

- Provide designers with the information they need to complete their designs and provide staff with the criteria they will use to review project submittals.
- Establish one set of street design guidelines so that everyone involved in Windsor street designs is utilizing the same principles and standards of design rather than differing or conflicting guidelines.
- Implement the General Plan policies relative to the design and function of streets within the Town of Windsor.
- Incorporate "Complete Streets" concepts into public and private street designs to create equality in travel for all users, including pedestrians, bicyclists, transit riders, and motorists.

Relation to Local and State Policies and Standards

Town of Windsor Street Design Standards

Portions of two street documents are to be replaced by these *Complete Street Design Guidelines*. The T*own of Windsor Design Standards*, prepared by Calthorpe/Solomon Associated Planners and Architects and date December 1997 (Calthorpe guidelines), provide guidance for street design in Chapter 2, "Street Standards and Guidelines." These *Complete Streets Design Guidelines* are intended to replace Chapter 2. Additionally, a portion of the *Town of Windsor (Public Works Department) Design and Construction Standards* will be replaced. References to street classifications, lane widths and sidewalk dimensions in *Section V, Street Standards,* will no longer be used.



Washington Thorn trees planted on Arata Lane

Town of Windsor General Plan

"Complete Streets" concepts are articulated in the Town of Windsor General Plan: "The circulation system is concerned with the safe, efficient movement of people and goods. The circulation system should accommodate all modes of travel, including motorized vehicles, pedestrians and bicycles. At the same time the system must meet the needs of those who use the street, those who live or work along the street, those who own property fronting the street, and the government or other agency that must construct and maintain the street." Application of these *Complete Street Design Guidelines* will implement General Plan policies A.7, A.8, D.1.1, D.1.2, D.2.1, D.2.2, D.2.3, D.2.4, D.2.5, and D.3.1.



Windsor Road offers well-designed facilities for all travel modes

California Complete Streets Act of 2008

State of California Assembly Bill 1358, also known as the *California Complete Streets Act of 2008,* requires that cities and counties plan for a balanced, multimodal transportation network that meets the needs of all users of streets by incorporating relevant policies on complete streets concepts into the next revision of their general plan circulation element. At such time as the Circulation Element of the Windsor General Plan is revised, policy references to these guidelines and their associated principles will serve as the Town's Complete Streets policies and meet the requirements of the *California Complete Streets Act of 2008* and the *One Bay Area Grant* requirements.



Bicyclists, like motorists on Windsor River Road, are provided exclusive travel lanes

Street Context

It is important to develop well-defined associations between the physical design and the desired traffic operations of the street. These associations are more readily understood by looking at the context that the street fits in: the General Plan intentions for a street, the land uses adjacent to the street, the traffic characteristics intended for the street, and how all the physical attributes work to create the operational character of the street. If all these things are taken into consideration during the design phase of the street, the result will be street designs that meet the needs of all modes of traffic using that facility. If not followed retrofit designs may result, with a more awkward street design likely. The Town of Windsor has initiated development of retrofit design guidelines, in the draft *Town of Windsor Neighborhood Traffic Management and Calming Program*.

Street Hierarchy

Each jurisdiction that owns or operates a network of streets adopts a set of terms used to define the function of each street. The terms may vary by jurisdiction but there is an underlying principle, street hierarchy, which applies to all street networks.

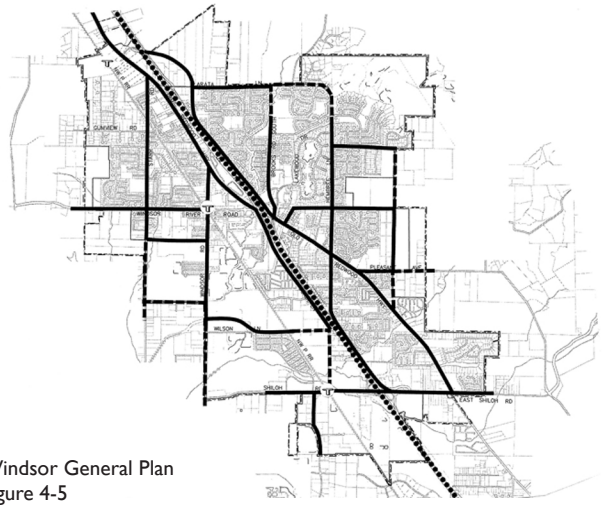
Typical Designations

In general, there are three levels in a street hierarchical system:

Local streets are usually the shortest and/or narrowest streets, providing access to/from parcels or lots within a fairly small geographic area via narrow, low-volume and low-speed streets, though they can also include connections to local destinations like schools, parks, and retail services.

Mid-range streets provide greater access, connecting neighborhoods or districts to each other and beyond; in Windsor, these streets are known as *cross-town* streets and they are meant to provide movement across the Town and connect to highways and freeways.

The highest street type, usually referred to as an *arterial street*, consists of multiple lane traffic facilities that carry larger volumes of through traffic at higher speeds, usually linking the community to other communities. In Windsor, US 101 is a freeway that meets this arterial classification.



Windsor General Plan
Figure 4-5

Town of Windsor Designations

A community's general plan often provides a rendering of a street hierarchy, and the Town of Windsor General Plan denotes the street hierarchy in terms of three classifications, including freeways, cross-town streets, and local streets. Only the two higher-level classifications, freeways and cross-town streets, are defined in the *Circulation Plan Map* (General Plan Figure 4-5). Additional detail is provided in the General Plan narrative, including the names of the state freeway and the Town's "cross-town streets," together with sub-classifications of types of cross-town streets and local streets. Specifically, "boulevards" and "rural lanes" are noted as two types of cross-town streets and "connector streets" and "alleys" are listed as two special types of local streets. This section of the General Plan also references *Implementation Program A.9* for further definition on boulevards and rural lanes, wherein these streets are described as 'streets where visual appearance is to be emphasized.'

Additional Terminology

As a point of clarification, some confusion can arise in the street classification naming convention, most notably when the public financing of road construction is provided by federal and state funding sources. For example, funding of road projects by the American Recovery and Relief Act (ARRA) could be obtained for only those streets referenced on the California Road System map as an "arterial" or "collector." Old Redwood Highway is noted as an arterial on this map. This inconsistency is not a problem as long as it is understood that street classification naming conventions often do not translate precisely between governing agencies.

Street Types

There is a broader range of street types that exist in Windsor today than the four listed in the General Plan. For example, the streets in the Town Green area are not boulevards, rural lanes, or connectors. This variety of street types has occurred over time as a result of the changing traffic characteristics and land uses as Windsor has developed. Listed below are the 12 street types that exist in Windsor including 11 developed for the Town of Windsor and one State of California street type. Figure 1 shows the correlation between the street type and the street hierarchical designation.

- Freeways (State of California street type)
- Five-Lane Boulevards
- Three-Lane Boulevards
- Two-Lane Boulevards
- Rural Lanes
- Connectors
- Commercial Streets
- Industrial Streets
- Residential Streets
- Narrow Residential Streets
- Private Driveways
- Alleys

Figure 1
Windsor Street Hierarchy and Street Types



Highest/Arterial
These streets provide regional access.

Freeway

Mid-range/Crosstown
These streets link neighborhoods and provide movement across town, as well as provide convenient connections to freeways and other arterial streets extending well beyond the community.

Five-Lane Boulevards
Three-Lane Boulevards
Two-Lane Boulevards
Rural Lanes

Local
These streets serve local trips, with some streets providing access to individual properties and other streets providing connections between adjacent neighborhoods and/or to local destinations.

Connectors
Commercial Streets
Industrial Streets
Residential Streets
Narrow Residential Streets
Private Driveways
Alleys

Transportation Context Zones

The physical design of a street should reflect consideration of its function in the community, or *context*, and its anticipated *traffic characteristics* so that it operates as designed. Street context considerations include adjacent land uses and the overall street network. Several primary traffic characteristics include traffic volume, traffic speed, and mode of travel. Street *traffic volumes* can be calculated based upon several parameters, including the location of the street in the overall community network of streets, how these connections are made and how they are controlled, and, most significantly, the designation of land uses in the area the street will serve.



Transportation Context Zones (from the Los Angeles County "Model Design Manual for Living Streets). *Credit: Duany, Plater, Zyberk and Company*

Traffic speeds are primarily a function of roadway width, topographic setting, surface condition, accessibility, lighting levels, and intersection controls. Each *mode of travel* requires nearly unique physical characteristics: vehicles need wide and compacted surfaces to travel on; bicycles and pedestrians require much less area, but need protection from fast-traveling vehicles; bicycles and pedestrians also need streets that accommodate their slower travel speeds (this concept is most obvious at street crossings/intersections); buses need stopping locations and shelters for passengers.

There are general design concepts that should be considered for all streets. Some of these apply to specific street users, such as pedestrians, bicyclists, transit riders, or motorists, while others apply to all street users. In order to apply these concepts successfully, designers must be familiar with all the operational characteristics that their designs will create and how combining several concepts can result in operations that may not be readily apparent when considering each element separately.

Land Use

Street designs should be consistent with adjacent land uses in order to achieve vehicle operating speeds that are appropriate for their respective settings. Very high vehicle speeds should occur only on arterial streets, with the mid-range vehicle speeds of through-traffic occurring on cross-town streets that provide movements across town and connections to regions beyond town limits, and given their setting and function, most local streets should be designed so that vehicle operating speeds and volumes remain low. This will encourage alternative travel modes and also meet the needs of those who live or work along such streets.



Residents along connector streets such as Foothill Drive benefit from low vehicle speeds in their neighborhood

Design Concepts for Motorists

Traditional street design has focused on the automobile and movement of goods, and it is essential that streets are well designed for all motorists. By careful consideration of the transportation context and traffic characteristics of motorized transport, this can be done without compromising the needs of non-motorized travelers. The following recommended design features should be incorporated into street designs.

Crosstown Streets

- *Street designs should accommodate vehicular traffic volume demands but should not be wider than necessary.* Five-lane boulevards are necessary only where the average daily traffic volume (ADT) is anticipated to exceed 15,000 vehicles per day (vpd), while two- and three-lane boulevards can accommodate up to 15,000 vpd.

- *The number of travel lanes usually needs to vary over the length of a crosstown street,* with more lanes needed to accommodate turning movements at intersections, and to accommodate higher traffic volumes on approaches to other crosstown streets and US 101. The same cross-town street could be designed as a five-lane boulevard near freeway interchanges and a two- or three-lane boulevard further from the freeway. These transitions from five-lane boulevards to three- or two-lane is necessary over long distances where travel speeds or travel volumes are high; transition zones can be shortened where travel speeds are low or in places where the street context changes from rural to urban.

- *Crosstown streets should be designed to operate at speeds that serve motorized travelers efficiently.* Just as pedestrians need facilities that meet their needs, motorists need to travel across town relatively quickly. Design speeds vary between 35 and 45 mph on five-land boulevards depending on the street context and between 25 and 40 mph on two- and three-lane boulevards. These speeds can be established (but not greatly exceeded) when street designs attend to the details of each travel mode. One design element that can facilitate high-volume/high speed flow is to restrict access.

- *The majority of access points should be intersecting streets or driveways that serve multiple lots or land uses.* If a high level of direct access is necessary, the context likely would be best served by a connector or other type of local street. Intersections should be spaced every eighth to a quarter of a mile (650 to 1,300 feet).

- *Median islands can be installed in the center of most cross-town streets*, serving to restrict movements, decreasing the potential for vehicular conflicts and in some instances providing refuge for pedestrians, increasing their crossing safety. When landscaped, median islands offer visual interest, which is especially important on streets that are located at entrances to Windsor.



Shiloh Road is a crosstown street that transitions from a five-lane boulevard to a two-lane boulevard



Shiloh Road is effective as a two-lane boulevard cross-town street near Windsor Road because it carries less than 10,000 vpd



Old Redwood Highway combines a landscaped median and turn lane near Alden Lane

- *Rural lanes are a special category of cross-town street that should incorporate street design concepts that enhance the unique settings* that surround Windsor and where these streets are located. In particular, these streets are likely to be asymmetric, with urban street design elements incorporated into the development on one side of the street, while the rural land uses across the street dictate a different design approach. Accommodating heritage trees is a common design goal on all streets, and particularly on rural lanes.



Reiman Lane is an example of a rural lane

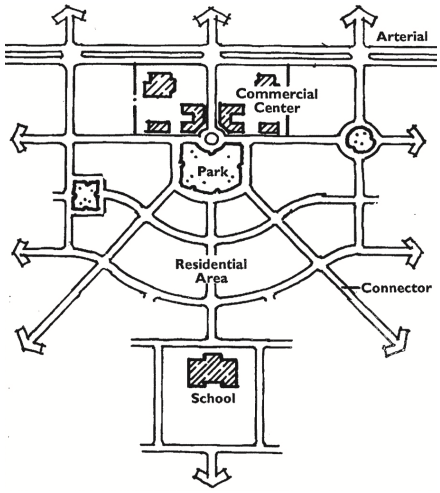
Local Streets

- *Interconnect streets to the maximum extent possible.* Interconnected street networks diffuse traffic rather than concentrate it, making it less likely that any single street will be overburdened by excessive traffic volumes. Interconnected streets also provide easy access for residents both within and between neighborhoods, creating a walkable community. Cul-de-sacs may still be necessary where streets abut creeks and railroad tracks, though if no such physical limitation exists, cul-de-sacs would be inappropriate.

- *Where vehicular connection is not possible due to natural features such as creeks, or existing street networks, provide pedestrian and bicycle connections where legally permissible.* Opportunities to improve street connections should be pursued whenever feasible. Consideration should be given to eliminating existing barriers and cul-de-sacs.

- *Street alignments and connections should provide direct routes to local destinations such as schools, parks, and neighborhood commercial enterprises.* Street alignments should result in connections every 150 feet to every eighth of a mile (650 feet). For example, where a parcel to be subdivided consists of at least one acre and the subdivision is to be at least eight units, connections through the parcel should provide adequate access to adjacent existing or potential development near 650 feet. Larger subdivisions adding a network of streets should provide intersections closer together.

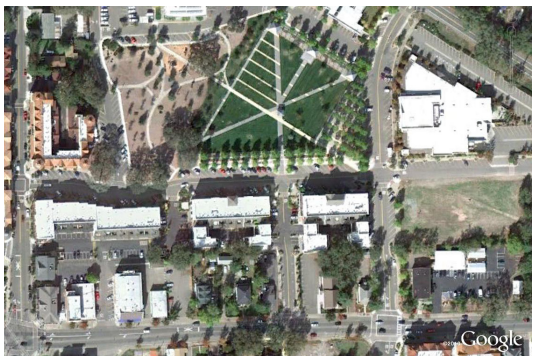
- *Street stubs should be located where they are likely to be extended.* In some instances, circulation plans that consider multiple properties may be required to ensure an adequate network of streets and efficient lotting patterns. Stubs are not required where land will remain undevelopable, such as along parks, major creeks, steep slopes, or permanent open space; however, in these instances frequent trail connections should be considered.



Sample street alignments and connections.
Credit: Town of Windsor Design Standards, Calthorpe/Solomon, 1997



Aerial photography of Vintana Subdivision street connections.
Credit: Google Earth



Aerial photography of the Windsor Town Green, an easily walkable community. *Credit: Google Earth*

- *Local street intersections can be offset, forcing turning movements*. If carefully sited, "T" intersections can also create prominent vistas to parks and civic features. Offsets should be located at least 150 feet apart on low speed local streets, and at least 400 feet apart on higher speed local streets.



The Windsor Golf Course can be seen from Luisa Way.

Lane Widths

Lane widths in Windsor for the most part vary between 10, 11, and 12 feet.

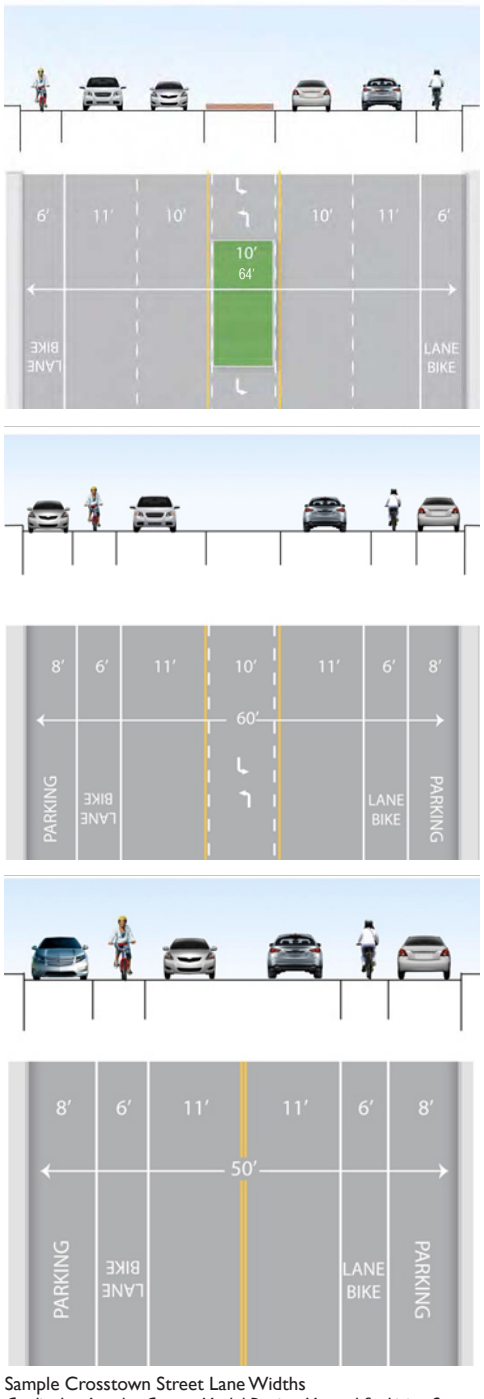
Street classification is important when considering lane widths. Proximity to other lanes, curbs, parked vehicles, and gutters also factor into how wide a lane may need to be in order to function as intended. Drivers tend to shy away from curbs, bicyclists sharing their lane, parked vehicles, and opposing traffic flow, but not from vehicles traveling in the same direction. Damage to gutters can occur when heavy vehicles drive in narrow lanes. Based on these considerations, the following design features should be incorporated into street designs.

- On five-lane boulevards, inside lanes, or those next to the median or center turn lane, should be 10 feet wide and outside lanes should be 11 feet wide where bike lanes or parking lanes exist and 12 feet wide where they are adjacent to the curb. There are no inside lanes on any other street.

- Turn-lanes and medians with limited landscaping can be 10 feet wide as traffic is usually traveling at lower speeds and/or small trees and shrubs can be planted and maintained in this width. A median width of 16 feet is necessary where large trees are to be planted or preserved.

- Through travel lanes need to be 11 feet wide on two- and three-lane boulevards, rural lanes, commercial streets and industrial streets in order to accommodate mid- to high range traffic volumes or a high percentage of truck traffic.

- Travel lanes on some commercial streets, connectors and all standard residential streets can be 10 feet wide because these streets are expected to carry low speed or low volume traffic flows, or are located in residential neighborhoods, together with proximity to parking lanes. The exception to this design concept is on commercial streets where on-street parking is angled rather than parallel; on these streets, the travel lane includes a four-foot buffer zone, increasing the effective lane width to 15 feet. This design can contain the parking maneuver on one side of the centerline.



Sample Crosstown Street Lane Widths
Credit: Los Angeles County Model Design Manual for Living Streets (modified)

- Travel lanes should be 12 feet wide on narrow neighborhood streets in order to minimize damage to the gutter pan, and because the adjacent curb represents an obstruction due to the lack of parking lanes.

- Two travel lanes, each 10 feet wide, are to be provided on private driveways and alleys where traffic volumes are so low that opposing traffic flow will seldom be experienced yet potentially can occur. Where garages front on alleys, sufficient setback is necessary for turning maneuvers and sight distance. One- and two-story buildings need less setback than three-story or taller buildings, due to emergency access considerations.



Pearl Bailey Court is a narrow residential street

Parking

Street parking is considered an important community commodity and most streets should be designed to provide on-street parking for the convenience of the motoring travelers and for the adjacent land users who desire parking in close proximity to their respective buildings. Parking needs/restrictions not only depend on land uses (parking "generators"), but also on the proximity of other area parking facilities.



McClellend Drive is a commercial street with angled parking

Parking lanes increase the overall width of a street, which can lead to unintended consequences such as higher average travel speeds or unfortunate door swings that obstruct other travelers. It is therefore important to consider streets where such lanes may not be necessary, and where they are, how wide parking lanes need to be.

Where bike lanes are adjacent to high turn-over parking spaces, including pull-in and back-in angled and parallel spaces, design features should be provided in order to heighten awareness for bicyclists and motorists of their interaction during parking maneuvers.



Windsor Road has street parking on both sides of the street in a high-density residential area, and the striped bike lanes help define where cyclists should travel



Popular street parking spaces front the Town Green and commercial enterprises along McClelland Drive *Credit: Google Earth*

Crosstown Streets

- Typically, parking is not provided on five-lane boulevards so that the available street width can be used for the vehicular traffic capacity. Where it is, parking bays are constructed.

- Parallel parking lanes should be eight feet wide on two- or three-lane boulevards because these streets are usually located within corridors where the curb-to-curb widths are sufficient to accommodate full width parking lanes.

- Angled parking spaces require 19 feet of street width when configured at a 45-degree angle to the curb. Angled parking could be oriented as either head-in or back-in. Head-in angled parking may place bicyclists at risk since bicyclists tend to be in drivers' blind spots as they pull in and back out of diagonal spaces. Back-in angled parking employs maneuvers that are similar to parallel parking and the process places bicyclists directly in drivers' line of sight when backing in and pulling out of the spaces. However, back-in angled parking can have a greater impact on approaching traffic. To address these issues with both types of angled parking, a four-foot buffer zone should be provided to create space for vehicles.

- Angled parking designs can be installed on low speed two- and three-lane boulevards, and on local commercial streets where streets are wide yet travel volumes do not necessitate additional travel lanes. Opening car doors is easier in angled parking spaces, as drivers do not need to compete with the traffic flow.



Parking bays on Windsor River Road provide parking spaces that are eight feet wide



Head-in angled parking on McClelland Drive

Local Streets

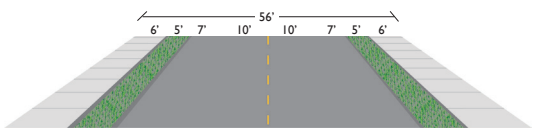
- Eight-foot parallel parking lanes are appropriate on connector streets and the commercial and industrial local streets as these streets can have a higher percentage of trucks that need curbside parking or because the daily traffic volumes are sufficiently high and the street would operate more efficiently with wider parking lanes.

- Parking lanes need to be just seven feet wide on residential neighborhood streets where travel speeds and volumes are low.

- No street parking is necessary on alleys, private driveways and narrow residential neighborhood streets. These street types should be chosen for a design if parking demand is expected to be low or if sufficient off-street parking will be provided.



A standard Residential Street design can be seen on Savannah Way



Sample Local Street Parking Design (Residential Streets)

Design Concepts for Pedestrians

Building streets that are convenient, comfortable, and safe for pedestrians will increase the likelihood that people will choose to walk. Streets are most safe for pedestrians where sidewalk facilities are ubiquitous, continuous, well-lit, and buffered from fast-moving motorists, and crossing facilities are closely spaced. Well-designed pedestrian facilities should be provided to the maximum extent possible, incorporating the following principles.

Buffer Zones

- Pedestrians are more comfortable when separated from moving vehicles, buffered from the speed and noise of motorized traffic by a planter strip, a combination tree-well/all-weather surface, and/or parking lanes. Given the very different travel speeds and intent of motorists versus pedestrians, the separation is useful for both modes. The separation can be provided in a variety of ways, depending on the design goal.

- All landscaping provides some form of visual screening and to some extent physical barriers. Trees provide shade for parked cars unlike shrubs. More information about street tree design is located in the section "Additional Design Concepts for All Streets." Planter strips or tree-well/all-weather surfaces also provide space for doors of parked vehicles to swing open without obstructing the pedestrian travel way.

- In commercial areas the buffer zones can consist of an edge zone where the bumper of vehicles parked on an angle overhang the curb, together with a zone for furnishings such as trash receptacles or benches. Such commercial areas may also include extensions of the adjacent businesses, which should be designed to ensure that items placed along building frontages, including signs, landscaping, or tables with chairs, do not encroach into the pedestrian travel way.

- Parking lanes and bike lanes provide separation between pedestrian travel ways and motor vehicle travel lanes.



Bike lanes and low landscaping on Hembree Lane buffer pedestrians from vehicular traffic



Wide planter strip and heritage oak trees on Mitchell Lane provide generous buffer for pedestrians and park users

Sidewalks

- Sidewalks should be provided on both sides of all Windsor streets with the exceptions of Rural Lanes and Narrow Residential Streets. If right of way is constrained, it is better to create smaller lots, narrower travel lanes or reduce the on-street parking supply to accommodate two sidewalks rather than eliminate one of the two sidewalks.

- Streets need continuous sidewalks. In the same way that off-site street improvements are needed so that vehicular traffic is continuous, a development may need to provide off-site pedestrian facilities to ensure continuous sidewalks and eliminate sidewalk gaps. This is especially true when the development would otherwise leave a gap of less than 250 feet on a street block.



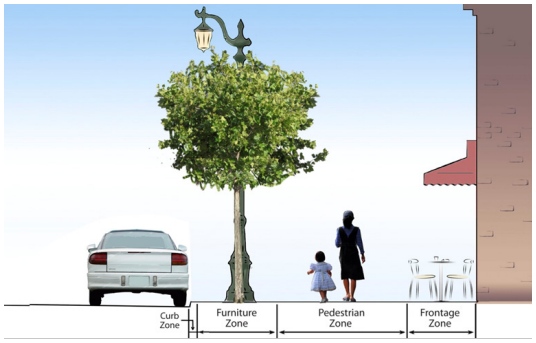
A new sidewalk was constructed on Old Redwood Highway when a market was renovated

- The width of the walks will vary by the type of street, with crosstown streets needing six-foot to eight-foot clear pedestrian travel ways, with wider sidewalks needed where pedestrian activity is expected to be high. Commercial streets need eight-foot to 16-foot clear travel ways (sidewalks not including buffer zones or edge zones) due to the higher level of pedestrian activity, where 16-foot sidewalk widths are necessary where buildings are located at the back of sidewalk. On most local streets, the minimum width of a sidewalk is six feet to accommodate the passing of pedestrians traveling in opposite directions together with providing room for the common social dynamic that occurs on sidewalks.

- The sidewalk travel way should be easy to navigate for all travelers, including children, adults, elder adults and mobility challenged persons. Predictable geometry and clear lines of sight are safer than horizontal and vertical curves. Travel ways should be clear of all obstructions, including street lights, above-ground utilities such as guy wires, poles, and back-flow preventers, mailboxes, and landscaping system components. These facilities may be sited in alleys, behind sidewalks, on-site or in adjacent areas such as planter strips in the all-weather surface areas adjoining tree wells that are not a part of the sidewalk travel way.



Sidewalks should be designed to accommodate the social dynamics of pedestrians



Sidewalk design guidance
Credit: Los Angeles County Model Design Manual for Living Streets

Crossing Facilities

Pedestrian mobility is greatly enhanced by closely spaced and comfortable crossing facilities. Motorists should be provided cues to alert them to the likeliness that a pedestrian may be in their travel area, and pedestrians should be provided facilities that increase the likeliness that they will choose to use the facilities rather than walk in unexpected or dangerous places. There are several categories of crossing facilities described below that can accomplish these goals, though this list is not exhaustive.

- *Medians* – Crossing high-speed, high-volume streets is necessary for most pedestrians, especially transit riders because transit stops are typically located on either side of the street. On three- or five-lane boulevards, the center lane area is sufficiently wide to accommodate a median. This median can function as a pedestrian refuge island, allowing the pedestrian to focus on vehicles approaching from a single direction at a time, simplifying their crossing task and providing a place to safely wait if there is not a gap in traffic coming in both directions at the same time.

- *Curb Extensions* – Crossing facilities include curb extensions at intersections,which is an extension of the sidewalk into the parking lane area. This decreases the parking supply but has the great advantages of increased visibility of pedestrians to drivers and decreased crossing



The task of crossing four travel lanes on Lakewood Drive is simplified by the median



Curb extensions and a red brick-like stamped crosswalk on Windsor Road provide visual cues of a pedestrian crossing location

distance and time for the pedestrians. The less time spent crossing a street the safer the pedestrian activity. Curb extension designs need careful consideration, in recognition that bicyclists' travel can be hindered by poorly designed facilities. Street context and intersection geometrics should be evaluated during the design phase.

- *Enhanced Crosswalks* – Crosswalks are usually ten feet wide and are marked curb to curb. By using a material other than asphalt, such as a coloring agent, or high visibility signs or markings there will be better visual cues to the drivers and pedestrians that this is the best place to cross. These design features must conform to engineering standards to ensure that the feature is understood to all drivers, even those who are new to the area or unfamiliar with a specific street.



An enhanced crossing on Windsor River Road near Keiser Park is frequently used

- *Frequent Crossings; Connections* – Pedestrians have to exert considerable energy and time to travel and they commonly strive to minimize the distance and/or time necessary to complete a trip, resulting in crossings mid-block or against traffic signals. Designers can provide features like frequent or closely spaced intersection crossings to anticipate these travel patterns and enhance pedestrian safety. Without closely spaced intersections, midblock crossings could be provided particularly where destinations would likely create consistent crossings, though such crossings should include pedestrian-activated lighting systems to the maximum extent practicable. If new development abuts existing cul-de-sacs, connections that permit pedestrian travel create a shorter travel distance.



Pedestrian and bicycle connections between new and old developments are possible, as seen betwen Savannah Way and Lockwood Drive. *Credit: Google Earth*

Travelers with Disabilities

Travelers with disabilities use all of the various modes of travel discussed in this guide. Attention to specific design solutions and site conditions can enable mobility for disabled users, ensuring that the transportation system truly is accessible to all.

The Americans with Disabilities Act (ADA) of 1990 and the California Government Code (CGC) prescribe that facilities shall be made accessible to persons with disabilities. The CGC requires that buildings, structures, sidewalks, curbs, and related facilities that are constructed using any State funds or the funds of cities, counties, or other governing bodies be accessible to, and usable by people with disabilities.

Caltrans Design Information Bulletin (DIB) 82-04 provides current design guidance on how to comply with the various Federal and State laws and regulations that relate to pedestrian accessibility. The Caltrans *Highway Design Manual* discusses ADA design requirements in detail.



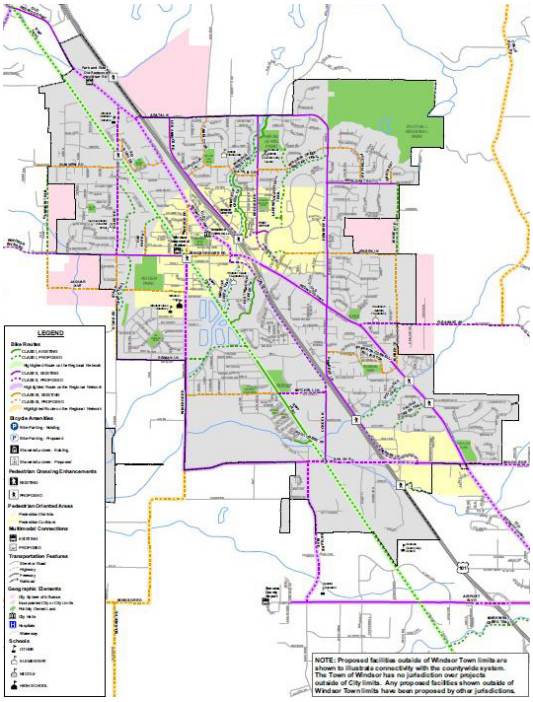
The Americans with Disabilities Act (ADA) of 1990 requires that facilities be accessible to persons with disabilities *Credit: CalTrans*

Design Concepts for Bicyclists

Bicyclists should have safe, convenient, and comfortable access to all destinations. Every street is a bicycle street, regardless of bikeway designation. Street designs should accommodate all types, levels, and ages of bicyclists. Like motorists, bicyclists need places to park and secure their "vehicle".

Bicyclist skill levels vary considerably and designers should understand the characteristics and infrastructure preferences of different bicyclists. Bicycle improvements range from shared roadways to separate facilities to accommodate as many user types as possible. Some bicyclists are very confident and will ride under most roadway conditions, while others perceive traffic and safety as significant barriers towards increased use of cycling. These bicyclists may become confident with encouragement and experience.

There are a variety of bicycle facilities and the current general types include Class I, Class II and Class III bikeways as described below.



2008 Windsor Bicycle and Pedestrian Master Plan Map, SCTA

Classifications

Class I Bikeways

Class I Bikeways, shared use paths and trails, are facilities separated from motor vehicle traffic by a barrier or open space, either within the street right-of-way or within a separate right-of-way. These shared use paths and trails are used by pedestrians and bicyclists and are appropriate in areas not well-served by the street system. Designers should consider providing crossing facilities on streets where these paths intersect.



Bicyclists on this shared use path must cross Mitchell Lane mid-block, assisted by the crosswalk markings and associated signage

The Town of Windsor has developed a system of existing and planned paths and trails as provided in the most current *Town of Windsor Bicycle and Pedestrian Master Plan*. There are numerous bicycle design references, including the Caltrans *Highway Design Manual*, and *National Association of City Transportation Officials Bikeway Design Guide* to name two.

A separated bicycle lane was recommendedon Old Redwood Highway south of Pleasant Avenue as part of the 2008 *Windsor, CA SDAT: Old Red Going Green – A Sustainable Design Assessment Team Final Report.*



This bridge near Los Amigos Road provides a shortened travel route for non-motorized travelers

Class II Bikeways

Class II Bikeways (bike lanes) provide an area for bicyclists within the travel way for their preferential or exclusive use, which is very helpful on high volume or high speed roadways like cross-town streets. On low volume and low speed

streets, particularly local streets, bicyclists can more readily share the travel lanes, independent of these streets being equipped with bicycle signs or markings.

- Where bike lanes are provided, the preferred width of a bike lane is to be six feet in order to provide sufficient space to travel without using the gutter pan, together with providing room for the bicyclist to maintain maximum distance from the higher speed motoring travelers. Where right of way is constrained, the bicycle lane may be reduced to a minimum width of five feet.

- Pavement coloring is useful for a variety of applications in conjunction with bicycle facilities, such as colored bike lanes and bike boxes. A bike box is a designated area at the head of a traffic lane at a signalized intersection that provides bicyclists with a safe and visible way to get ahead of queuing traffic during the red signal phase and are especially useful in left turn lanes. A full description of "bike boxes" can be found in the Los Angeles County *Model Design Manual for Living Streets*.

- Green colored bike lanes are used to highlight conflict areas between cyclists and motorists, such as at intersection right turn lanes, high traffic areas in Town, and near schools. The Town Engineer should be consulted to determine the feasibility of such green colored pavement as part of a street design.



A separated bicycle lane on a busy street in Copenhagen
Credit: N. Dakin



Cyclist on Windsor River Road



Bike box in Portland, Oregon *Credit: Source Unknown*



Green bike lane on Old Redwood Highway

Class III Bikeways

Class III Bikeways (Bike Routes) are part of the bicycle network where bicyclists share the travelway with motorists. Connector streets are the highest volume local streets, and are the most common Class III facilities. In some areas in Windsor it may be feasible to mark some of these streets with Shared Lane Markings ('sharrows'). The advantage of such markings is to increase the awareness of drivers to the potential presence of bicyclists, together with guiding bicyclists on riding within the travel way in an alignment that eliminates weaving in and out of adjacent parking lanes. A full description of 'sharrows' can be found in the *California Manual on Uniform Traffic Control Devices* (CAMUTCD). The Town Engineer should be consulted to determine the feasibility of such markings as part of a street design on a connector street.

Bicyclists can comfortably share the travel lane on low-volume and/or low-speed streets. This minimizes the road width which is helpful for pedestrians who cross these streets and also in consideration of maintenance associated with larger streets.



Bicyclist guided by sharrows *Credit: Source Unknown*

Parking

Secure bicycle parking at likely destinations through the development review process or through Town-funded projects is an integral part of a bikeway network, just as motorists are provided convenient and secure parking. The Town shall develop and utilize bicyle parking standards or requirements.

Bicycle thefts are common and lack of secure parking is often cited as a reason people hesitate to ride a bicycle. At employment centers where a bicycle may need to be parked all day, bike lockers provide security and protection from inclimate weather conditions.

The most common bicycle parking design is the inverted U-shaped rack. It is easy to lock a bicycle to these rack types, and this matter of convenience is one way designs can encourage bicycle travel. Such racks can be accommodated in small areas near destinations. Bicycle parking should not interfere with pedestrian movement.



U-shaped bike rack in Windsor



Bike lockers are provided for employees at Windsor Town Hall



Bike racks are provided for visitors to Huerta Gym, the Windsor recreational facility

Design Concepts for Transit Accommodations

Public transit serves a vital transportation function for many people by providing access to jobs, schools, shopping, recreation, visitation, worship, and other daily functions. For transit to provide optimal service, streets should be designed to accommodate transit vehicles as well as access to stops.

Most riders walk to and from these stops and need sidewalks for basic access. Bicycle-friendly streets do the same for those who access transit by bicycle. Upon arriving at a stop, shelters keep transit riders out of the rain and sun and provide increased comfort, and benches greatly improve the comfort of waiting passengers. Other amenities offered for passengers waiting to board include street lighting, trash receptacles and secure bicycle parking.

Many transit trips also require a rider to cross a street either on an inbound trip or an outbound trip. These stop crossing locations should be designed for transit riders' safety and convenience, employing the same design concepts as those applied for other pedestrians.

Transit Access

- In Windsor transit service is provided by Sonoma County Transit (SCT), including local and intercity service routes. The transit stops for intercity routes are located almost exclusively on crosstown streets, while stops for the local service are located along local commercial and connector streets. All stops should be attractive and visible from a distance.

- Criteria for the design and location of transit amenities in Windsor should reflect a context sensitive approach. Transit shelters, bus bays and bus stop amenities should be designed and situated based on a set of prioritizing criteria that considers, for example, the special needs (age and ability) of residents who live adjacent to bus stops, boarding counts at each location, street crossing widths, and traffic volumes. If such criteria are not available during the planning stage of design, designers should contact SCT representatives. For additional transit-friendly design ideas, consult the *Pedestrian Safety Guide for Transit Agencies*, published by Federal Highway Administration (FHWA).

Transit Operations

- Sonoma County Transit deploys buses with lengths of 25, 30 and 40 feet, with all buses less than nine feet wide. Similar to other large vehicles, buses are adequately accommodated by a travel lane width of 11 feet. The design of bus pullouts or bus bays should reflect current SCT and ADA design requirements. For example, a minimum six-foot clear pedestrian travel way is necessary for ADA compliance.

- Where transit has a high priority on town streets technology should be applied to increase average speeds of transit vehicles where appropriate, such as use of pre-emption devices and programming at important signalized intersections.



Sonoma County Transit Shelter



Sonoma County Transit local service bus stopped at the Windsor Depot on Emily Rose Circle

Design Concepts for Intersections

The highest level of traffic activity occurs at street intersections where drivers have the greatest number of traffic options: controls such as traffic signals, modern roundabouts, stop signs, and yield signs are present to control right-of-way; controls create delay as travelers take turns; turning movements commonly occur; and destinations are commonly located at street intersections, further complicating intersection operations. The potential for conflict is increased when there is a combination of modes, and pedestrians, motorists, bicyclists, and buses enter and leave intersections at many different speeds and on varying travel paths. The complexity of intersection operations requires a high level of street design attention. Based on these considerations, the following design features should be incorporated into street designs.



Windsor Road/Windsor River Road is an example of a complex intersection

For Pedestrians

- Curb extensions, textured crosswalks and raised intersections can be used singly or in combination on local streets. Curb extensions slow traffic, increase pedestrian visibility, and reduce pedestrian crossing distances by narrowing the pavement width, though careful consideration is necessary to avoid hindering bicyclists' travel. Crosswalks can be textured by means of stamped asphalt or colored concrete with the appearance of a paver, alerting drivers that the area being traversed has a special identity. Raised intersections raise the entire intersection a few inches to reduce travel speeds.



A circular island in an intersection is used to control traffic speeds, though effective designs are difficult to achieve

- Small circular islands can be placed at the center of the intersection of two local streets. These islands, or traffic circles, are typically landscaped and can be made more effective in controlling speed when used in a series spaced 600-800 feet apart. However, poor or awkward designs can create unintended consequences, such as wrong-way driving or driving in parking lanes, making traffic circles a less-than-desirable traffic calming measure.

- In-Roadway Warning Lights are a special type of traffic signal installed in the road surface as warning devices. These have been deployed in Windsor to enhance safety for pedestrians crossing crosstown streets. The CA-MUTCD provides guidance on locations suited for these devices.



Example of enhanced pedestrian crossing on Los Amigos Road

For Motorists

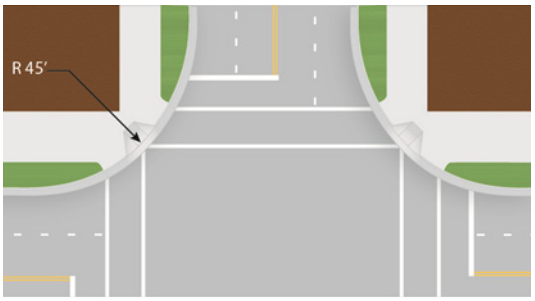
- Since most vehicular congestion occurs at intersections, turning lanes are often added on one or more approaches to the intersection. Streets should have turn lanes only if it has been determined that the extra vehicular capacity is necessary in order to meet Town of Windsor traffic capacity standards, as identified in the General Plan.

Where turn lanes are necessary, the lane should extend only as far as necessary to provide storage for the queue of vehicles anticipated.

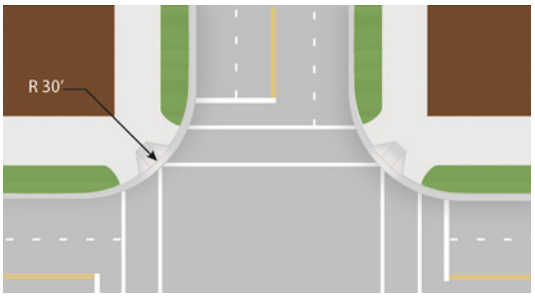
- Intersection curb radii are a design element that affects the ability of large vehicles to turn within one-half of the street, comfortable turning speeds, and pedestrian safety. Specifically, large vehicles require greater curb radii than passenger cars, though the greater the curb radius is the greater the crossing distance for pedestrians.

- Local streets are expected to have lower speeds and less truck traffic than cross-town streets. A high number of truck turning movements, including large semi-tractor-trailer combination vehicles and transit vehicles, would be expected to occur at locations where two cross-town streets intersect, and these intersections need to be sufficiently large to accommodate the needs of the large-vehicle turning maneuvers. Where local streets meet cross-town streets truck turning maneuvers would still occur, though not at the same frequency, and as such, these intersections could be smaller. Finally, where two local streets intersect, intersection turning radii and curb radii should be even smaller than the other types of intersections. These intersection radii values should be based on a specific design vehicle, one that would be representative of the typical intersection operation.

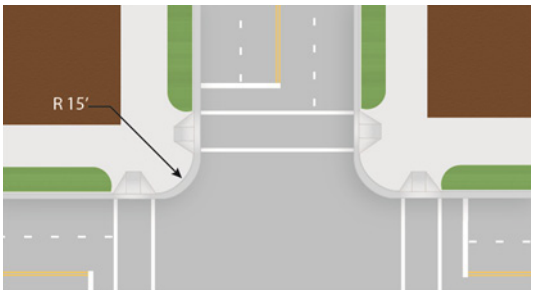
- The location of driveways near intersections must consider establishing a balance between sight access and intersection operations. The nearest residential driveway is generally located 35 feet from the intersecting street face of curb on local streets, a minimum 50 feet for commercial or industrial driveways, and at least 75 feet near crosstown street intersections.



A curb radius of 45 feet is appropriate at crosstown street intersections where truck turning volumes are high
Credit: Los Angeles County Model Design Manual for Living Streets



A curb radius of 30 feet is appropriate at local streets/ crosstown street intersections
Credit: Los Angeles County Model Design Manual for Living Streets



A curb radius of 15 feet is effective at local street intersections where pedestrian crossing volumes are high and truck turning volumes are low
Credit: Los Angeles County Model Design Manual for Living Streets

Design Vehicles

- The Passenger vehicle[1] should be the design vehicle at the intersection of two local streets, and the occasional encroachment into opposing lanes by a turning vehicle larger than this design vehicle (fire trucks or moving vans, for example) is acceptable. This is to provide a balance between large vehicle turning movements and area land users or residents who do not want turns by other vehicles made at high speeds in these locations.

- The Single-Unit truck[2], such as delivery trucks and 25-foot buses, should be the design vehicle for intersections involving a cross-town street-local street intersection. This is to provide a balance between large vehicle turning



Sonoma County Transit local Windsor service is provided by buses 25 feet in length, which are representative of Single Unit Trucks

[1]AASHTO Passenger design vehicle, P vehicle. *See AASHTO Exhibit 9-21*
[2]AASHTO Single Unit design vehicle, SU vehicle. *See AASHTO Exhibit 9-22*

movements and area land users or residents who do not want turns by other vehicles made at high speeds in these locations. The design shall allow the design vehicle to begin and end the turning maneuver without encroaching into the opposing lane of travel at these intersections.

- A design vehicle of the WB-50 truck[3] should be used for the design of intersections where cross-town streets meet, as well as for any intersection where 40-foot buses make turns. The design shall allow the turning maneuver to begin and end without encroaching into the opposing lane of travel at these important intersections.

- It is necessary on occasion for very large trucks, including extra-legal loads that necessitate travel via a transportation permit, to pass through town using Windsor streets rather than US 101. While transportation permitted routes are determined by Public Works Engineering staff on a case-by-case basis, those large vehicles that do not require such permits are encouraged to use the network of streets shown on the Town of Windsor *Truck Routes Map*, available on the Town of Windsor website.

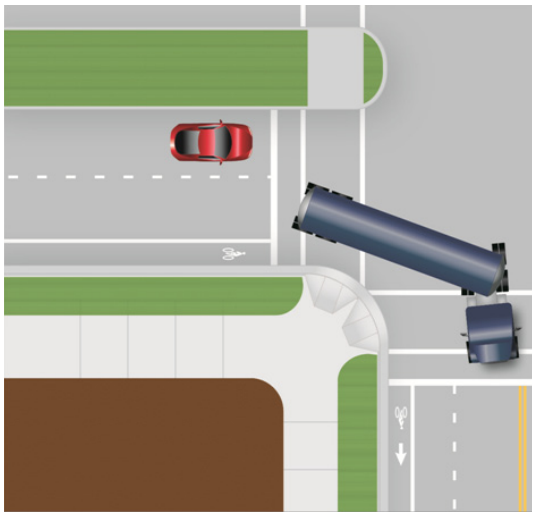


Image of a WB-50 truck turning movement
Credit: Los Angeles County Model Design Manual for Living Streets (Michele Weisbart)

Intersection Controls

The *California Manual on Uniform Traffic Control Devices* (CA-MUTCD) provides guidance for the use of various intersection controls. Where crosstown streets intersect, special consideration is given to traffic control devices, with warrants included in the CA-MUTCD for guidance on particular types. General Information on the most common intersection controls is provided below.



Stop sign on McClelland Drive

<u>All-Way Stop Controls</u>

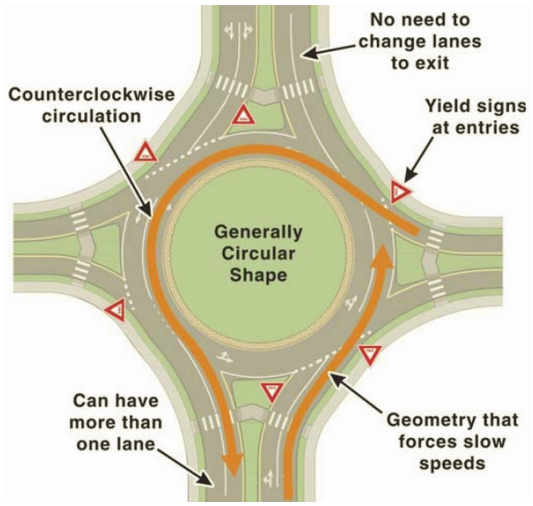
Crosstown streets are often free flowing, with intersection controls such as stop signs installed on minor street approaches only. All-way stop controls can be considered at intersecting crosstown streets with low to moderate vehicle and pedestrian traffic. All-way stop controls may also be necessary as an interim measure when a signal or roundabout is warranted but cannot be constructed promptly. Because all traffic is required to stop at all-way stop controlled intersections, such controls can result in unnecessary delay, fuel consumption and greenhouse gas emissions.

Local street intersections are often controlled by stop signs on one of the crossing streets. Typically two-way stop controls are alternated reducing the potential for one local street to become an unplanned thoroughfare. Also, stop signs can result in increased traffic noise and should not be installed where they are not justified.

[3] AASHTO Semitrailer combination design vehicle, WB-50. *See AASHTO Exhibit 9-24*

Roundabouts

Modern roundabouts are potentially the safest and most aesthetic form of traffic control for many intersections. A roundabout is an intersection design that requires drivers to approach the intersection, slow down, stop and/or yield to pedestrians in a crosswalk, and then enter a circulating roadway, yielding to drivers already in the roundabout. Each leg of a roundabout has a triangular splitter island that provides a refuge for pedestrians and helps to regulate traffic speeds. Most roundabouts in the United States have single lanes and diameters of 100 to 140 feet. Such roundabouts are designed to easily accommodate large vehicle turning movements.



Roundabout Design Elements
Credit: Roundabouts: An Informational Guide, 2nd Edition

Roundabouts, unlike residential traffic circles, require specialized engineering evaluation and design to work safely and effectively. The most recent version of the Federal Highway Administration (FHWA) publication, *Roundabouts: An Informational Guide*, is considered the primary source of information on design of roundabouts. Good roundabout designs are a collaborative effort between roundabout designers, urban streetscape designers, lighting design and roadway design and construction professionals. Special consideration must be given to street grades, types of vehicular traffic, entry and exit points, as well as pedestrian and bicyclist elements. Pedestrian crossings should be well lit at night. Features such as In-Roadway Warning Light (IRWL) systems may be appropriate on roundabout approaches with higher volumes and/or entering roadway speeds. Pedestrian Hybrid Beacons should be installed at roundabout pedestrian crossings with multiple vehicle lanes.



Roundabout in Petaluma, California at Petaluma Boulevard South/Crystal Lane *Credit:W-Trans*

Traffic Signals

Traffic signals control vehicle, bicycle and pedestrian right-of-way by allocating time to the various demands, with most modern traffic signals equipped with sensors or push buttons that detect vehicles, bicycles, and push buttons, respectively. Traffic signals can have separate controlled movements, or phases, for left turning, right turning and through traveling vehicles and bicycles, and for pedestrian crossings. The more phases at an intersection the more time required to serve all movements, with the total time to serve all phases known as the cycle length. Larger and more complex intersections have longer cycle lengths, and ideally signal timing should provide adequate time for safe passage while minimizing the cycle length. Where signals are closely spaced, they can be interconnected and signal timing coordinated in order to maximize flow and reduce vehicular delay along a street corridor.



Traffic Signal at Old Redwood Highway and Hembree Lane

Additional Streetscape Design Concepts

Landscape Design

Landscaping and street trees are essential parts of Windsor's streets; they contribute to the beauty and function of a street, together with providing comfort and safety for people who live and travel along the street. A street lined with trees and other plantings looks and feels narrower and more enclosed, which encourages drivers to slow down and to pay more attention to their surroundings. Trees provide a physical and psychological barrier between pedestrians and motorized traffic, increasing safety as well as making walking more enjoyable.

Street Trees

Street trees should be selected appropriately and pruned to maintain six- or seven-foot vertical clearance for public safety and convenience purposes. Generally, these trees are spaced 30 feet on-center. Street trees should correspond with the function and hierarchy of streets. Boulevards, for example, should be planted with grand, tall trees. The same species of tree should be continuously applied to a given street as a means of continuity and street identity, unless changing tree species is warranted due to separation by major visual barriers, such as freeways or interchanges, or localized street design plans for certain corridor segments of larger roadways, including *Old Redwood Highway Streetscape Design Guidelines – Downtown Segment*. The Planning Director maintains a list of approved street tree types as well as a listing of trees assigned to designated roadways.



Poplar trees planted on Victory Lane

Depending on the tree type, available planting area, or presence of other utilities, the Town Engineer may require root barriers and structural soil to ensure compatibility and long term tree health.

Tree Wells and Planting Strips

Trees can be placed between the sidewalk and street within planting strips or in tree wells. Tree wells are generally to be used on commercial streets along commercial and multi-family land uses where there is a need for a variety of street furniture, such as newspaper racks and mailboxes. The hardscape between tree wells provides a space for this furniture. In locations without street furniture, the area between tree wells facilitates direct access to the curb, making it easier for people to move between their parked vehicles and adjacent retails shops or apartment buildings.



Evergreen Pear trees located in tree wells on McClelland Drive

Planting strips that contain trees are generally appropriate in residential and industrial neighborhoods, where landscaping provides benefit and trees provide shade but there is less demand for curb access. Tree wells could be considered for industrial streets. Native and drought-tolerant plant materials consistent with the Town of Windsor's Water Efficient Landscape Ordinance are encouraged in planter strips.

Lighting Design

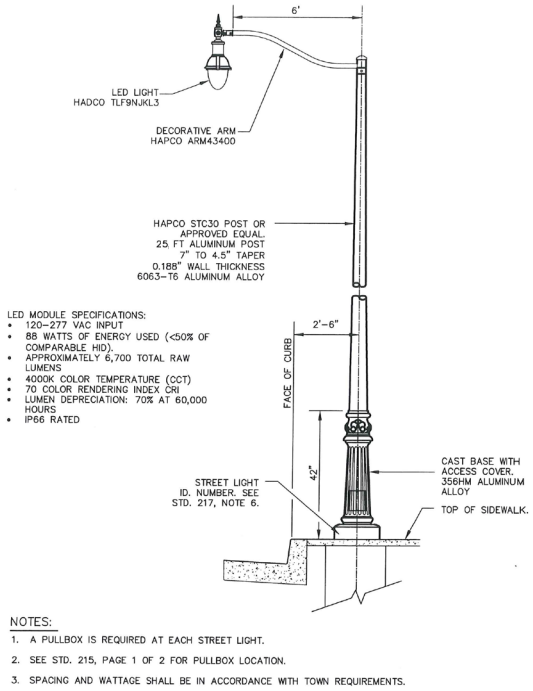
Street lighting standards need to be consistent with Windsor's small town character and should be designed with as much concern for the pedestrian environment as for vehicular travel. Street lighting designs should enhance vehicular movement safety and also provide a lighted travel way for pedestrians. It is essential to provide illumination at intersections and mid-block crossings in order for motorists to see pedestrians. In addition, pedestrian scale lighting along sidewalks provides greater security for people walking alone at night. Ambient lighting, such as lighting provided by adjacent land uses, can contribute to the lighting of public spaces.

- Street lighting at intersections is crucial to safe vehicular movements and pedestrian crossings because intersections are where vehicular turning movements are concentrated, where most pedestrian crossings occur, and where potential conflicts are numerous. The lower the vehicular traffic volume and the smaller the intersection the less potential conflicts. This is why local street intersections require lower levels of street lighting than crosstown streets; crosstown street intersections can consists of multiple approach lanes and high vehicular traffic volumes, and when combined with higher speeds, a well-lit space increases traffic safety.

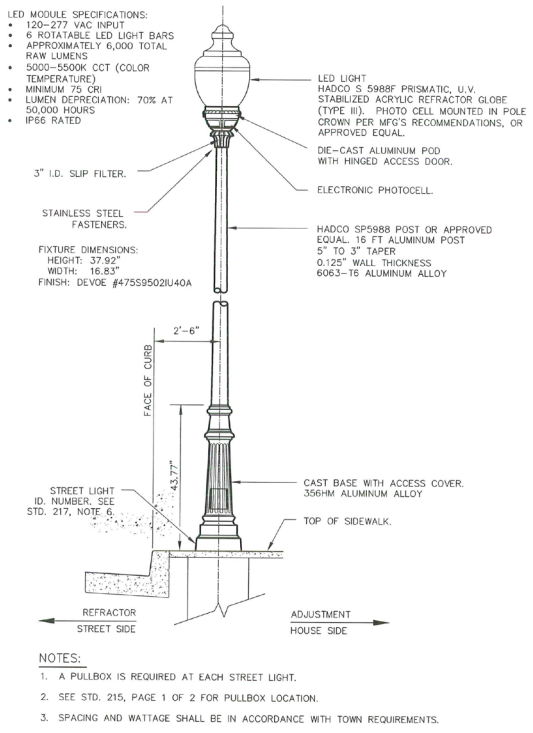
- Cobra overhead lighting is incorporated into intersections controlled by traffic signals. Victorian overhead teardrop streetlight fixtures should be used at crosstown street intersections and at local street intersections where determined by the design engineer and approved by the Town Engineer. Cobra and teardrop mast-arm mounted lights are installed at heights of 30 and 25 feet, respectively, above finished grade. Lamps should be designed to direct light to appropriate surfaces and minimize glare into residences.

- Acorn-style street lights are installed at the top of a street light pole, not suspended over the street on a mastarm. Installed at 20 feet above finished grade, this lighting is pedestrian-oriented and decorative in style. These lights are to be installed along most local streets and at local street intersections.

- A mix of street lights, including acorn-style and teardrop style, is appropriate on commercial streets and some crosstown streets, providing effective lighting for the high volumes of vehicular and pedestrian travelers expected.



Victorian overhead teardrop streetlight design details



Acorn-style street lights are pedestrian-oriented and decorative

- Street lights should be spaced according to Town Standards and based upon appropriate levels of light coverage, as recommended by the *California Manual on Uniform Traffic Control Devices* (CA-MUTCD). Specifically, the requirements of the lighting standards referenced in the CA-MUTCD, Practice for Roadway Lighting, RP-8, 2001, published by Illuminating Engineering Society (IES) should be met.

- In addition to the technical lighting level requirements of RP-8, street lighting design needs to conform to the standards adopted by the Town of Windsor in accordance with their Engineering Design and Construction Standards.



Pedestrian scale lighting on Windsor Road at Windsor High School

Continuous Public Street Frontages

Continuous public street frontage should be provided to the maximum extent possible for all creeks, public trails, parks, rail corridors, and other public open space to ensure access to public resources. Continuous public street frontages for these facilities also improve quality of life through higher visibility of these open spaces which promotes public safety through "eyes on" surveillance by roadway users, pedestrians, and neighbors.



Trione Circle Trail is a pleasant continuous corridor

Retrofit Designs

Streets designs that incorporate these guidelines should function as intended. One measure of the success of a street's design is a lack of complaints about vehicular traffic issues such as speeding or cut-through traffic. In the past, the Town has received requests for traffic calming measures in response to this kind of behavior, in effect asking for street redesign. In response, the Town of Windsor Department of Public Works has created a program to address these design issues, the *Neighborhood Traffic Management and Calming Program*. The program includes a wide variety of measures that are intended to create lower speeds and/or reduce traffic volumes on residential streets. However, retrofit designs are awkward compared to original designs, so one of the goals of these guidelines is to avoid such traffic problems and awkward solutions by incorporating good design policies initially.



Speed bump on Wright Way

Summary

It is important to develop well-defined associations between the physical design and the desire traffic operations of the street. These associations are more readily understood by looking at the context that the street fits in: the General Plan intentions for a street, the land uses adjacent to the street, the traffic characteristics intended for the street, and how all the physical attributes work to create the operational character of the street. If all these things are taken into consideration during the design phase of the street, the result will be street designs that meet the needs of all modes of traffic using that facility.

The street design concepts have been applied to Windsor and 11 street types developed. A summary of the design concepts are shown in Table 1. In addition, a one-page description of each of the 11 street types is provided, including the expected traffic operational characteristics and the design elements that work to achieve the expected operations, together with a graphical representation and photograph of a Windsor street that is a typical example.



The intersection of McClelland Drive and Honsa Drive is thoughtfully-designed

Table 1
Summary of Street Design Elements

Lane Function Component	Crosstown Street Type				Local Street Type						
	Boulevard			Rural Lane	Connector	Commercial Street	Industrial Street	Residential Street	Narrow Residential Street	Private Driveway	Alley
	5 Lane	3 Lane	2 Lane								
	ADT 10,000-35,000	ADT 7,000-15,000		ADT 5,000-15,000	ADT 4,000-8,000	ADT 2,000-7,000	ADT < 2,000	ADT < 2,000	ADT < 200	≤ 4 lots	Secondary Access
Pedestrian Areas [A] *(2 of each where used)* [B]											
Landscape Zone (includes curb) [C]	6	6	6		5	5 (tree well)	5	5			
Sidewalk (excludes landscape)	6-8	6-8	6-8	6 (path)	6	8 or 11 [D]	6	6	6 [B,E]		
Sub-total pedestrian area width	*12-14*	*12-14*	*12-14*		*11*	*13-16* [D]	*11*	*11*	*6*	*0*	*0*
Medians and Center Lane *(only 1 applies)*											
Turn Lane or Median with Limited Landscaping	10	10		10							
Median with Trees	16	16		16							
Vehicle Travel Lanes *(2 of each where used)*											
Inside Lane	10										
Outside Lane [F]	11	11	11	11	10	11	11	10	12	10 [G]	10
Bike Lane/Area	6	6	6	6 [H]	Shared	Shared	Shared	Shared	Shared		
Parking Lanes											
No Parking	0 [I]			0					0	0	0
Parallel One Side		8				8					
Parallel Both Sides		16	16		16	16	16	14			
Buffer Zone		4 [J]	4 [J]			4 [J]				5 [K]	5 [L]
Angled Parking One Side [M]			19			19					
Angled Parking Both Sides [M]		38	38			38					
Total Width (to back of walk)	**88** **92** **94** **98**	**Varies**	**Varies**	**Varies**	**58**	**64** **70** **79** **100**	**60**	**56**	**30**	**25**	**20**

Notes: Blank table cells indicate that the configuration is not under consideration for this street type. Values are in feet unless otherwise noted

[A] Adjacent to pedestrian areas, additional building setbacks may be required based upon zoning and adjacent land use

[B] Only one is used on Narrow Residential Street types and possibly Rural Lanes depending on location

[C] Landscape zones may be planter strips or tree wells. Tree wells are essential adjacent to commercial and multi-family land uses, and a combination of the two, and optional elswehere

[D] Where building is located at back of sidewalk

[E] Excludes curb width

[F] Outside lane widths must be increased by one foot where bike lanes or parking lanes are not provided, for gutter pans (maximum 12 feet)

[G] If drainage design requires curb and gutter, increase lane width to 12 feet

[H] Bike lane provided on urban side and possibly on rural side if wide shoulder is present

[I] Unless provided in parking bays

[J] For angled parking

[K] For landscaping

[L] Minimum width to structures

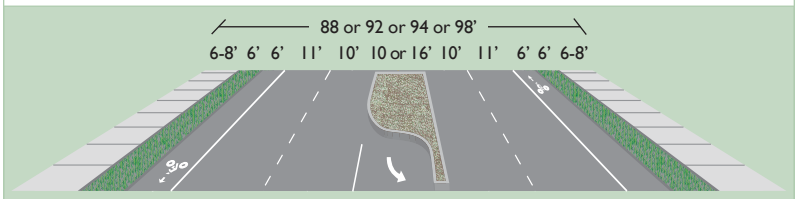
[M] Provided only on low speed streets

Crosstown Street — Five-Lane Boulevard

- Five-Lane Boulevards serve as major routes across town, providing access to and from US 101 and linking neighborhoods to major destinations. They are designed to carry significant traffic volumes and facilitate transit and bicycle travel. Street parking is not provided.
- Median landscaping may be low-profile, but if trees are to be accommodated, median widths increase. With no street parking, curb extensions are not provided, though raised medians provide pedestrians with a refuge as they cross the street.
- Pedestrian crossings are important for their convenience and safety, and should be provided approximately every quarter-mile. Wide sidewalks and landscape zones provide areas designed to buffer pedestrians from high volumes and speeds of vehicular traffic.
- Bike lanes are essential as these streets link to major destinations.
- Large trucks and buses are common and bus turnouts with shelters are provided for transit users' comfort.



Existing Configuration



Proposed Configuration

Concepts for Pedestrians

Landscape Zone	Primarily 6 feet wide planter strips (includes curb width)
Sidewalk	6 to 8 feet wide sidewalk, or 11 feet where buildings are located at back of sidewalk
Crossing Treatments	Enhanced crossings needed at regular intervals

Concepts for Bicyclists

Bike Lanes	6 feet wide
Enhancements	Possible green-colored bike lanes and bike boxes

Concepts for Transit Accomodations

Transit Facilities	Bus bays, bus shelters, and enhanced pedestrian crossings at intersections in close proximity

Concepts for Motorists

Traffic Volume Range	15,000 – 35,000 ADT
Design Speed	45 mph
Travel Lanes	10 feet wide inside lanes and 11 feet wide outside lanes
Median Strip/Turn Lane	10 feet wide with limited landscaping, 16 feet with large trees
Accessibility	Limit driveways for access control
Parking Lanes	No street parking unless bays added
Curb and Gutter	Yes

Concepts for Intersections

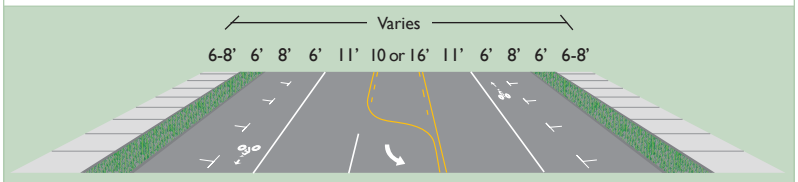
Controls	Traffic signals, roundabouts or side street controls
Design Vehicle	WB-50 at other crosstown street intersections Single Unit Trucks (SU) at local street intersections

Crosstown Street — Three-Lane Boulevard

- Three-Lane Boulevards serve as major routes across town, in some places linking neighborhoods to major destinations. These streets carry mid-range traffic volumes and they are important links for all travel modes.
- Crossings are important for pedestrian safety and comfort, and should be provided approximately every quarter-mile. Curb extensions should be provided at many intersections to increase the visibility of pedestrians prior to crossing.
- Bike lanes are essential as these streets link to major destinations.
- Large trucks and buses are common and bus turnouts with shelters are provided for transit users' comfort.
- Angled parking is provided only on streets where design speeds are low, such as 25 mph.



Existing Configuration



Proposed Configuration

Concepts for Pedestrians

Landscape Zone	Primarily 6 feet wide planter strips (includes curb width)
Sidewalk	6 to 8 feet wide sidewalk, or 11 feet where buildings are located at back of sidewalk
Crossing Treatments	Curb extenstions provided at many intersections and some mid-block locations Enhanced crossings needed at regular intervals

Concepts for Bicyclists

Bike Lanes	6 feet wide
Enhancements	Possible green-colored bike lanes and bike boxes

Concepts for Transit Accommodations

Transit Facilities	Bus bays, bus shelters, and enhanced pedestrian crossings at intersections in close proximity

Concepts for Motorists

Traffic Volume Range	7,000 – 15,000 ADT
Design Speed	25 – 40 mph
Travel Lanes	11 feet wide
Median Strip/Turn Lane	10 feet wide with limited landscaping, 16 feet with large trees
Accessibility	Limit driveways for access controls
Parking Lanes	8 feet wide where parallel, 19 feet plus buffer zones where angeld
Curb and Gutters	Yes

Concepts for Intersections

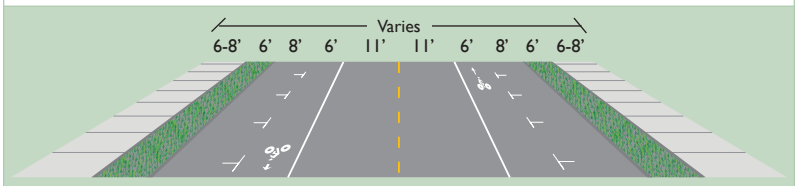
Controls	Traffic signals, roundabouts, all-way stops or side street controls
Design Vehicle	WB-50 at other crosstown street intersections Single Unit Trucks (SU) at local street intersections

Crosstown Street — Two-Lane Boulevard

- Two-Lane Boulevards serve as major routes across town, in some places linking neighborhoods to major destinations. These streets carry mid-range traffic volumes and they are important links for all travel modes.
- Crossings are important for pedestrian safety and comfort, and should be provided approximately every quarter-mile. Curb extensions should be provided at many intersections to increase the visibility of pedestrians prior to crossing.
- Bike lanes are essential as these streets link to major destinations.
- Large trucks and buses are common and bus turnouts with shelters are provided for transit users' comfort.
- Angled parking is provided only on streets where design speeds are low, such as 25 mph.



Existing Configuration



Proposed Configuration

Concepts for Pedestrians

Landscape Zone	Primarily 6 feet wide planter strips (includes curb width)
Sidewalk	6 to 8 feet wide or 11 feet wide where buildings are located at back of sidewalk
Crossing Treatments	Curb extenstions provided at many intersections and some mid-block locations Enhanced crossings needed at regular intervals

Concepts for Bicyclists

Bike Lanes	6 feet wide
Enhancements	Possible green-colored bike lanes and bike boxes

Concepts for Transit Accommodations

Transit Facilities	Bus bays, bus shelters, and enhanced pedestrian crossings at intersections in close proximity

Concepts for Motorists

Traffic Volume Range	7,000 – 15,000 ADT
Design Speed	25 – 40 mph
Travel Lanes	11 feet wide
Median Strip/Turn Lane	none
Accessibility	Limit driveways for access control
Parking lanes	8 feet wide where parallel, 19 feet plus buffer zone where angled
Curb and Gutter	Yes

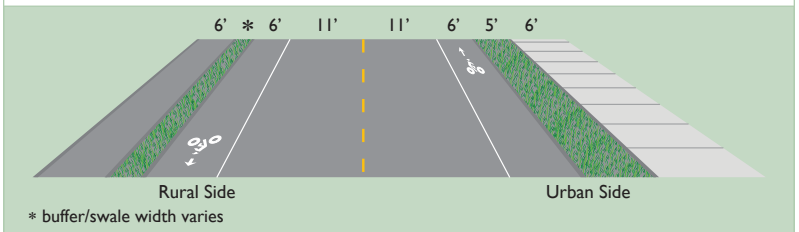
Concepts for Intersections

Controls	Traffic signals, roundabouts, all-way stops or side street controls
Design Vehicle	WB-50 at other crosstown street intersections Single Unit Trucks (SU) at local street intersections

- Rural Lanes are a special category of crosstown street that should incorporate design concepts that enhance the unique settings that surround Windsor where these streets are located.
- Streets are asymmetric, with urban conditions on one side and rural on the other. If present, heritage trees should be incorporated into the street design. Existing trees should be preserved and reinforced through planting of similar species at a similar spacing, and where existing, views and vistas should be maintained. Building set backs should be significant in order to maintain the open space setting.
- Pedestrian facilities are needed though the look of concrete is out of place and all-weather surface of some other materials are preferred. The rural side of these streets may limit installation of any facilities, though careful consideration is essential.
- Bike lanes are provided on the urban side and possibly can be provided on the rural side if a wide shoulder is present.



Existing Configuration



Proposed Configuration

Concepts for Pedestrians

Landscape Zone	5 feet wide planter strips (urban side) and possible buffer or drainage swale (rural side)
Sidewalk	6 feet wide sidewalk (urban side) and if possible 6 feet wide all-weather surface (rural side)
Crossing Treatments	Enhanced crossings needed at intersections

Concepts for Bicyclists

Bike Lanes	6 feet wide (urban side) and possibly narrower by converting shoulder to bike lane (rural side)
Enhancements	Possible green-colored bike lanes and bike boxes

Concepts for Transit Accommodations

Transit Facilities	Bus bays, bus shelters, and enhanced pedestrian crossings at intersections in close proximity

Concepts for Motorists

Traffic Volume Range	5,000 – 15,000 ADT
Design Speed	30 mph
Travel Lanes	11 feet wide
Median Strip/Turn Lane	10 feet wide with limited landscaping, 16 feet with large trees
Accessibility	Very accessible with driveways at each lot
Parking Lanes	No street parking
Curb and Gutter	Yes on Urban Side, No on Rural Side

Concepts for Intersections

Controls	All-way stops or side street controls
Design Vehicle	WB-50 at other crosstown street intersections Single Unit Trucks (SU) at local street intersections

Local Street — Connector

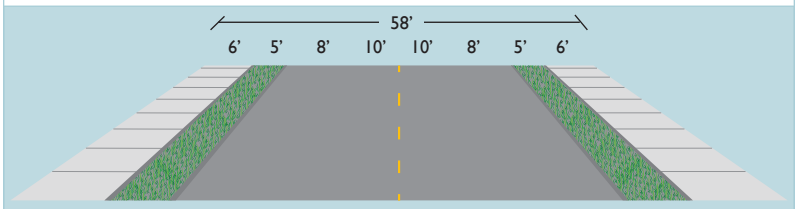
- Connectors are the widest of the streets classified as local streets. They are to provide connections between neighborhoods and/or local destinations. Streets like Foothill Drive, Cameron Drive, and Gumview Road are examples.

- Pedestrian facilities usually consists of six-foot sidewalks and five-foot planter strips. Enhanced crosswalk markings and curb extensions should be provided at some intersections to help calm traffic and ease pedestrian street crossings.

- Bicyclists share the travel lanes with motorists, as traffic volumes and speeds are less than those on cross-town streets. Shared Lane Markings may be appropriate, especially where the street provides connectivity to cross-town streets, schools or parks, though the Town Engineer should be consulted regarding feasibility.



Existing Configuration



Proposed Configuration

Concepts for Pedestrians

Landscape Zone	5 feet wide planter strips (includes curb width)
Sidewalk	6 feet wide
Crossing Treatments	Crosswalks frequently marked and curb extensions at some locations

Concepts for Bicyclists

Bike Lanes	Shared travel lanes
Enhancements	Possible "Sharrow" markings

Concepts for Transit Accommodations

Transit Facilities	none

Concept for Motorists

Traffic Volume Range	4,000 – 8,000 ADT
Design Speed	30 mph
Travel Lanes	10 feet wide
Median Strip/Turn Lane	none
Accessibility	Very accessible with driveways at each lot
Parking Lanes	8 feet wide on both sides of the street
Curb and Gutter	Yes

Intersection Concepts

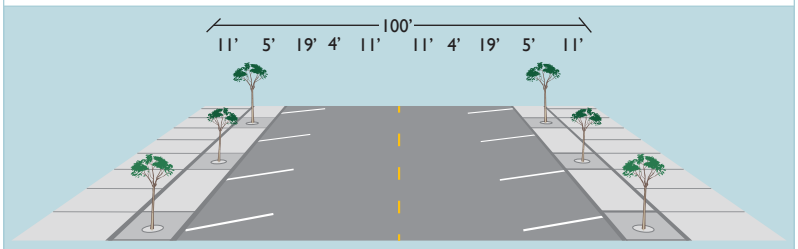
Controls	Usually two-way or all-way stop controls
Design Vehicle	Single Unit Truck (SU) at all street intersections

Local Street — Commercial Street

- Commercial Streets are local streets used where there is a high degree of retail business. Buildings and storefronts are positioned at the front of each lot. On-street parking is encouraged, either angled or parallel, and traffic speeds are low.
- Street trees are located in landscape zones that separate wide sidewalks from the street. The landscape zone between tree wells is hardscape to provide a place for street furniture, such as mailboxes and trash recepticles.
- Sidewalks are a minimum of eight feet wide, though 11-foot sidewalks are necessary where buildings are adjacent to the back of sidewalk. Sidewalks are wider in the central business district to accomodate high-density pedestrian use.
- Bicyclists share the travel lanes, though four-foot buffer zones are provided adjacent to angled parking spaces for their safety.



Existing Configuration



Proposed Configuration

Concepts for Pedestrians

Landscape Zone	5 feet wide, primarily tree wells plus hardscape between trees (includes curb width)
Sidewalk	Standard 8 feet wide; 11 feet wide where buildings are located at back of walk; widest downtown
Crossing Treatments	Curb extensions provided at many intersections and some mid-block locations

Concepts for Bicyclists

Bike Lanes	Shared travel lanes
Enhancements	Possible "Sharrow" markings

Concepts for Transit Accommodations

Transit Facilities	Bus bays and bus shelters

Concepts for Motorists

Traffic Volume Range	2,000 – 7,000 ADT
Design Speed	25 mph
Travel Lanes	11 feet wide
Median Strip/Turn Lane	none
Accessibility	Some access control; alleys can provide secondary access to businesses and multi-family land uses
Parking Lanes	8 feet wide where parallel, 19 feet plus buffer zone when angled on low speed
Curb and Gutter	Yes

Intersection Concepts

Controls	Usually all-way stop controls
Design Vehicle	WB-50 at crosstown street and Single Unit Trucks (SU) at local street intersections

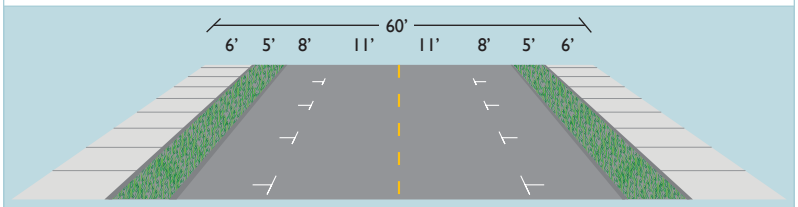
- Industrial Streets are two-lane local streets that provide direct access to various industrial uses with no other land uses on the streets. Very low traffic volumes and low to mid-range speeds are common, with a high percentage of large trucks and truck-trailer combinations. Travel lanes of 11 feet can accommodate these large vehicles, though parking lanes provide additional pavement area for awkward turning maneuvers

- Pedestrians are expected and, like all streets, will be best served where sidewalks are separated from the vehicles by landscape zones. Crosswalks are marked at select intersections.

- Bicyclists are expected to share the travel lanes due to low traffic volumes and low travel speeds.



Existing Configuration



Proposed Configuration

Concepts for Pedestrians

Landscape Zone	5 feet wide planter strips (includes curb width) or tree wells
Sidewalk	6 feet wide
Crossing Treatments	Marked crosswalks at some intersections

Concepts for Bicyclists

Bike Lanes	Shared travel lanes with no markings
Enhancements	none

Concepts for Transit Accommodations

Transit Facilities	none

Concepts for Motorists

Traffic Volume Range	Less than 2,000 ADT
Design Speed	30 mph
Travel Lanes	11 feet wide
Median Strip/Turn Lane	none
Accessibility	Very accessible with driveways at each lot
Parking Lanes	8 feet wide
Curb and Gutter	Yes

Intersection Concepts

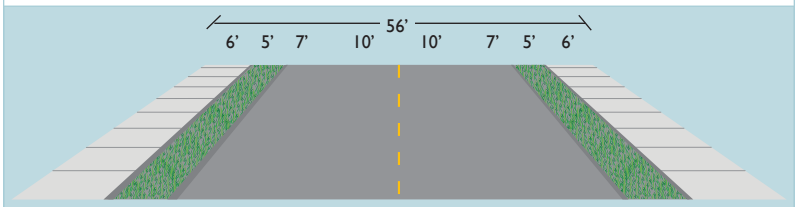
Controls	Usually stop-controlled
Design Vehicle	WB-50 at intersections

Local Street — Residential Street

- Residential Streets primarily serve single family residences and are intended to operate at low volumes and speeds. To facilitate low traffic speeds travel lane widths, parking lane widths and curb radii at intersections are kept to a minimum.
- Cul-de-sacs would be inappropriate except where physical limitations exist, such as creeks or railroad tracks, because interconnected streets provide easy access to pedestrians.
- Where sidewalks are sufficiently wide, social walking can easily occur. Planter strips provide a pleasant buffer between sidewalks and paved areas.
- Local street intersections can be equipped with traffic circles, be aligned at 150-foot offsets from other streets, or be provided with prominent vistas to parks and civic features. These intersection designs greatly enhance the streetscape for pedestrians and residents.



Existing Configuration



Proposed Configuration

Concepts for Pedestrians

Landscape Zone	5 feet wide planter strips (includes curb width)
Sidewalk	6 feet wide
Crossing Treatments	Some marked crosswalks and curb extensions

Concepts for Bicyclists

Bike Lanes	Shared travel lanes with no markings
Enhancements	none

Concepts for Transit Accommodations

Transit Facilities	none

Concepts for Motorists

Traffic Volume Range	Less than 2,000 ADT
Design Speed	25 mph
Travel Lanes	10 feet wide
Median Strip/Turn Lane	none
Accessibility	High level of access and street connectivity
Parking Lanes	7 feet wide
Curb and Gutter	Yes

Intersection Concepts

Controls	Neighborhood pattern of alternating uncontrolled intersections with stop-controlled intersections or traffic circles
Design Vehicle	Passenger vehicle at intersections

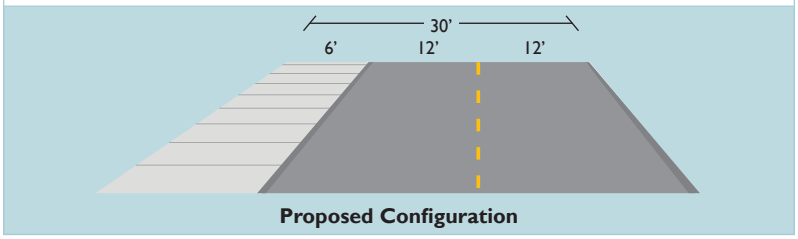
- Narrow Residential Streets serve up to 20 residences. The distinguishing characteristic of this street type as compared to the wider Residential Street is that street parking is not provided. This parking arrangement requires that sufficient off-street parking or a common parking lot be provided unless parking demand is low. Building setbacks are increased to provide extra space for parking.

- The travel lanes are 12 feet wide on this street to provide a 24-foot curb-to-curb width, which is narrow enough to keep maintenance costs low and travel speeds low without inhibiting large vehicle access when needed on occasion. In addition to providing adequate street width for emergency vehicle access, the 12-foot lanes reduce the potential of vehicles driving in the gutter pan and damaging the street infrastructure.

- Sidewalk on one side will maintain a more rural setting, and is appropriate with very low traffic volumes that develop on these streets to accommodate pedestrian travel.



Existing Configuration



Proposed Configuration

Concepts for Pedestrians

Landscape Zone	Optional, including planter strips or tree wells or a combination
Sidewalk	6 feet wide (includes curb width), on one side only
Crossing Treatments	Some marked crosswalks

Concepts for Bicyclists

Bike Lanes	Shared travel lanes
Enhancements	none

Concepts for Transit Accommodations

Transit Facilities	none

Concepts for Motorists

Traffic Volume Range	Up to 200 ADT
Design Speed	20 – 25 mph
Travel Lanes	12 feet wide
Median Strip/Turn Lane	none
Accessibility	High level of access and street connectivity
Parking Lanes	No street parking unless bays added
Curb and Gutter	Yes, both sides

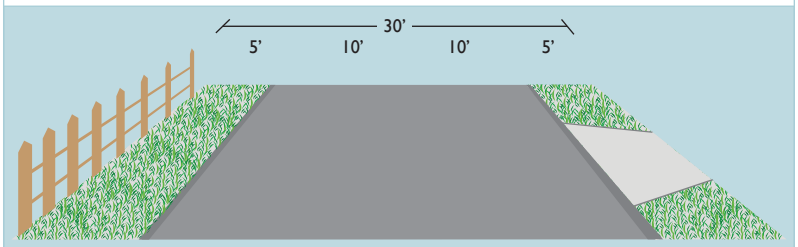
Intersection Concepts

Controls	Some stop-controlled intersections
Design Vehicle	Passenger vehicle at intersections

- Private driveways are appropriate where the street serves only the lots to be created and if circulation and parking are not an advantage to the larger community. With only four lots or fewer served, speeds and traffic volumes are very low.
- Streets are 20 feet wide unless drainage design requires curb and gutter on both sides, which increases the width to 24 feet (face of curb to face of curb).
- Five-foot setbacks are needed to ensure emergency access.
- Private streets are to be designed and constructed to public street *structural* standards.
- Pedestrians can walk comfortably in the street in such a setting, so sidewalks are not required.



Existing Configuration



Proposed Configuration

Concepts for Pedestrians

Landscape Zone	5 feet wide on one side (includes curb width)
Sidewalk	none
Crossing Treatments	none

Concepts for Bicyclists

Bike Lanes	Shared travel lanes
Enhancements	none

Concepts for Transit Accommodations

Transit Facilities	none

Concepts for Motorists

Traffic Volume Range	Less than 500 ADT
Design Speed	20 mph
Travel Lanes	10 feet wide
Median Strip/Turn Lane	none
Accessibility	High level of access
Parking Lanes	No street parking
Curb and Gutter	Yes, or Vertical Curb

Intersection Concepts

Controls	none
Design Vehicle	Passenger vehicle at intersections

- Alleys are a unique private local street because they function as a secondary access, not a primary access. As such, there are no average daily traffic volumes to speak of. Alleys may be a design choice where limited access to public streets are desired, or in a planned unit development (PUD) because private street maintenance can be funded.

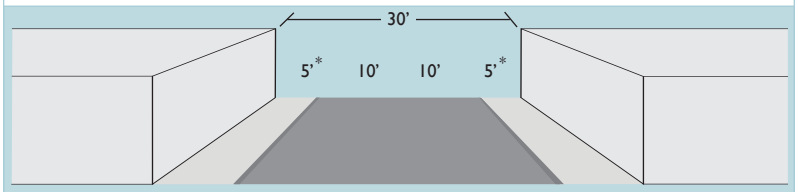
- Historically, alleys in Windsor have been designed as 24-foot wide streets with parking bays, considerably wider than 20 feet, prompting complaints from area residents regarding cut-through or speeding motorists. If narrow and well-lit, as well as connected for easy travel by pedestrians, alleys can provide adjacent land users with a place to meet neighbors from properties that adjoin from the back and provide space for public utilities.

- Where garages front on alleys sufficient setback is necessary for turning maneuvers and sight distance. For emergency access maneuvers, setbacks may be greater than five feet for structures exceeding two stories.



Alley between Emily Rose Circle and David Clayton Lane

Existing Configuration



* may increase for structures exceeding two stories

Proposed Configuration

Concepts for Pedestrians

Landscape Zone	none
Sidewalk	Shared travel lanes
Crossing Treatments	none

Concepts for Bicyclists

Bike Lanes	Shared travel lanes
Enhancements	none

Concepts for Transit Accommodations

Transit Facilities	none

Concepts for Motorists

Traffic Volume Range	Secondary access (no ADT)
Design Speeds	15 mph
Travel Lanes	10 feet wide
Median Strip/Turn Lane	none
Accessibility	High level of access
Parking Lanes	none
Curb and Gutter	none

Intersection Concepts

Controls	none
Design Vehicle	Passenger vehicle at intersections

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