

A8 | TRANSPORTATION/MOBILITY

Urban Design

Creating a connection between the street and the adjacent land uses is an element of street design that is often overlooked, (see also Appendix A2, *Placemaking & Resiliency*). Neighborhood workshops conducted during the early phase of this comprehensive planning process confirmed that the look and feel of streets is important to the citizens of Frisco. This attention to the environment created by the roadway is one of the most effective ways to reinforce the desired image of the City and attract new residents, businesses and investment.

Frisco is doing an excellent job of streetscaping in the newer areas of the community; however, the enhancements and urban design elements used in a streetscape must be carefully selected. The principle is that the characteristics of the street must complement the adjacent development.

The Concept of Realms

It is critical to understand how urban design elements can work together to accommodate the needs of automobiles, pedestrians and land uses alike. The anatomy of a street can be divided into four major realms:

- Travelway Realm;
- Pedestrian Realm;
- Land Use Realm; and
- Intersection Realm.

The Intersection Realm is not illustrated in the graphic above, but it is a portion of the roadway that deserves special attention because it can function as a community, neighborhood or special district gateway and it typically accommodates the greatest volume of pedestrian activity.

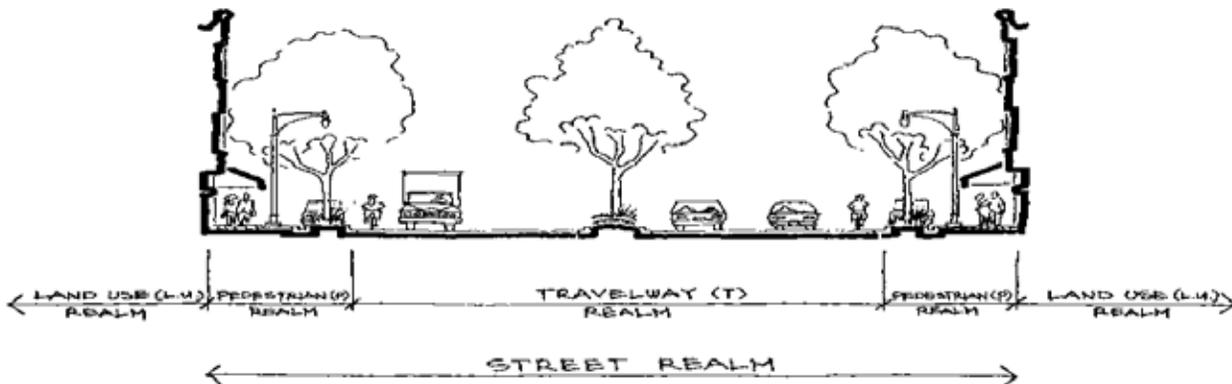


Figure A8-1: The Street Realm

Travelway Realm



The Travelway Realm

The Travelway Realm is the area between the curb lines reserved for automobile traffic.

Depending on the functional classification of the street, it may be shared with bicyclists.

The dimensions required for the Travelway Realm are spelled out clearly in Section 2 of the City's *Engineering Standards*. One of the most important principles of placemaking is that there should be a strong relationship between the street edge and the adjacent land use, (see also Chapter 3, *Place Making & Resiliency*). For instance, in mixed-use areas adjacent to collector streets or minor thoroughfares, on-street parking or alternative travel lane widths may be appropriate, whereas in other contexts, such as along a major thoroughfare, they generally would not be.

Pedestrian Realm

The Pedestrian Realm is the area on either side of the street between the curb line and the right-of-way line. Most of the time, this area provides the best opportunity for incorporating urban design



The Pedestrian Realm

elements. These elements should vary based on the adjacent land use and roadway types. For instance, the Pedestrian Realm for mixed-use or transit-oriented developments will be quite different than the Pedestrian Realm for single-use areas or along a collector or major or minor thoroughfare, where the uses tend not to be mixed.

In mixed-use or transit-oriented areas, *Figure A8-1*, a number of amenities may be provided to draw people out and encourage strolling and relaxation. These could include:

- Wider sidewalks;
- Tree wells;
- Street furnishings such as benches and trash receptacles;
- Lamp posts;
- Bollards;
- Drinking fountains;
- Planters for flowers and shrubs;
- Street trees; and
- Mounted maps and Informational kiosks.

Benches or planters are especially beneficial for senior citizens and disabled persons, who can use them as needed to stop and rest. These and other amenities also reward other pedestrians by increasing the attractiveness and comfort of the street environment and making walking a natural and pleasurable part of the day, giving residents a reason to come out of their homes and cars to engage with their neighbors and their community.



The Pedestrian Realm In A Mixed-Use Or Transit-Oriented Area

In single-use areas (retail, commercial or residential), the Pedestrian Realm should be configured differently. Sidewalks and other paved areas should be shaded to create a comfortable walking environment for pedestrians and to reduce surface and ambient temperatures. Trees can be combined with other devices—canopies, awnings, sometimes building shadows—to provide even more shade. Retail areas along collector streets or minor thoroughfares should include a sidewalk out to the curb with tree wells for landscaping. These amenities would also accommodate parking or drop-off areas where allowed.

Low-density residential and office uses should have a different Pedestrian Realm. In these locations, a landscape buffer can be integrated into the parkway area between the sidewalk and the curb. Major thoroughfares, where on-street parking and drop-off is prohibited, should feature a distinct landscape buffer with trees between the sidewalk and the curb to beautify the area and provide pedestrians with a sense of safety.

Land Use Realm

The Land Use Realm is the area adjacent to the roadway, located entirely within private property. It is important to discuss because it contributes, either negatively or positively, to the overall look and feel of the area. Dictated almost entirely by zoning, this realm can differ radically between rural, residential, retail and mixed-use areas. The Land Use Realm is the interface between the character and activities



The Land Use Realm In A Mixed-Use Or Transit-Oriented Area

associated with the adjacent land uses and those of the Travelway and Pedestrian Realms. A key concept in this environment is compatibility between the thoroughfare and its surroundings, both physically and operationally. The Land Use Realm acknowledges the contexts of community, environment and transportation needs and knits them together to improve mobility and livability.

As with the Pedestrian Realm, the characteristics of future development, whether mixed-use, transit-oriented or single-use, should be suited to the context of the surroundings. For example, the elements in a mixed-use area along a non-thoroughfare roadway should include build-to lines with well-defined pedestrian signage, buildings with transparent windows, parking behind the buildings (or on the street) and a pedestrian-friendly environment. Conversely, in areas that are conventionally developed with single uses (such as commercial, retail or residential development along a thoroughfare), required minimum setback lines will typically locate the buildings away from the street so that they don't relate as well to the roadway.

Intersection Realm

The Intersection Realm, located within the public right-of-way and involving the abutting private property, creates a frame for the roadway with the intersection at its center. The Intersection Realm is characterized by a high level of activity and shared use, the potential for multi-modal conflicts (mainly between vehicles and pedestrians or cyclists) and complex travel



The Intersection Realm

movements. An area such as this will often serve as an entrance into a special district or development and, as such, the use of special urban design treatment may help establish a landmark or an identity node. Within Frisco, there are tremendous opportunities to incorporate specific amenities to create this sense of identity.

Intersection areas should include clearly marked pedestrian crosswalks and curb ramps, decorative lighting, landscaping and even special art or monuments. Other intersection treatments, such as the use of modern roundabouts, may be appropriate in special cases, such as along local or collector streets, but should be used only with the approval of the City's Engineering Department.

Mixed-Use and Multi-Modal Streets

With an increased emphasis on a multi-modal system, it is important to create a roadway environment that will accommodate the necessary features of mixed-use and transit-oriented developments. Roadways serving these development types need to include more pedestrian-friendly amenities and on-street parking, but must still provide for efficient automobile movement and adequate emergency access.

Sidewalks

The sidewalk along a mixed-use street is the primary physical environment in the Pedestrian Realm. It is where most of the activity occurs. In fact, sidewalks in mixed-use areas may be wider than the travel lanes. For mixed-use streets to be successful, the design of the adjacent building facades, especially at the ground floor level, must relate well to the street. Transit amenities, when located on sidewalks, are part of a range of street furniture that is essential to designing a successful transit street, and shade trees, wide sidewalks, benches and other amenities make streets more active and appealing.

On-Street Parking



On-Street Parking Provides A Buffer In A Mixed-Use Area

Beyond urban design features and sidewalks, on-street parking is the most important element in the design of a mixed-use street. The presence of parked cars reduces travel speeds, separates pedestrians from moving vehicles

and adds to the vitality of retail establishments. The image below uses on-street parking as a buffer for pedestrian activity.

New Roadway Sections for Mixed-Use and Transit-Oriented Development

The roadway cross-sections already adopted in the City's *Engineering Standards* will be carried forward with the addition of three new roadway types, (see also *Chapter 9, Transportation/Mobility*). These new cross-sections include narrower lanes to encourage slower vehicle speeds and more space for pedestrians and on-street parking, a concept approved in the 2006 Comprehensive Plan update. These roadway types should be used primarily in mixed-use and transit-oriented areas where they will blend easily with the adjacent development. The exact dimensions and geometrics will be resolved by the City's Engineering Department once the general parameters are approved.

Figures A8-2 through A8-4 are cross-sections of the recommended roadway types. Two of the new cross-sections accommodate on-street parking. Two will be classified as alternative minor thoroughfares, the third as a collector street. The Minor Thoroughfare 2 (Figure A8-2) shows a section with a reduced median width and narrower travelway and an increased parkway width for pedestrians. The 90-foot right-of-way dimension is the same as the existing Minor Thoroughfare roadway type.



Figure A8-2: Minor Thoroughfare 2 (Mixed-Use or Transit-Oriented Development)

The Minor Thoroughfare 3 cross-section below proposes a right-of-way width of 110 feet, 20 feet wider than for a Minor Thoroughfare 2. This roadway type provides the same travelway and median width as Thoroughfare 2, but includes additional area for on-street parking and a slightly wider parkway. The third new roadway type is a Collector 2 (Figure A8-4). The typical 60-foot section includes two travel lanes plus a lane of parallel parking and a parkway on each side of the roadway.



Figure A8-3: Minor Thoroughfare 3

The purpose of these new standards is to help integrate the type of street with the character of the development adjacent to it. The decision to apply these new standards to future roadways within the Mixed-Use and Transit-Oriented Development areas on the Land Use Plan will be left to the discretion of the City. Figure A8-5, highlights the Mixed-Use and Transit-Oriented Development areas where these street types might be successfully applied.



Figure A8-4: Collector 2 (Mixed-Use or Transit-Oriented Development)

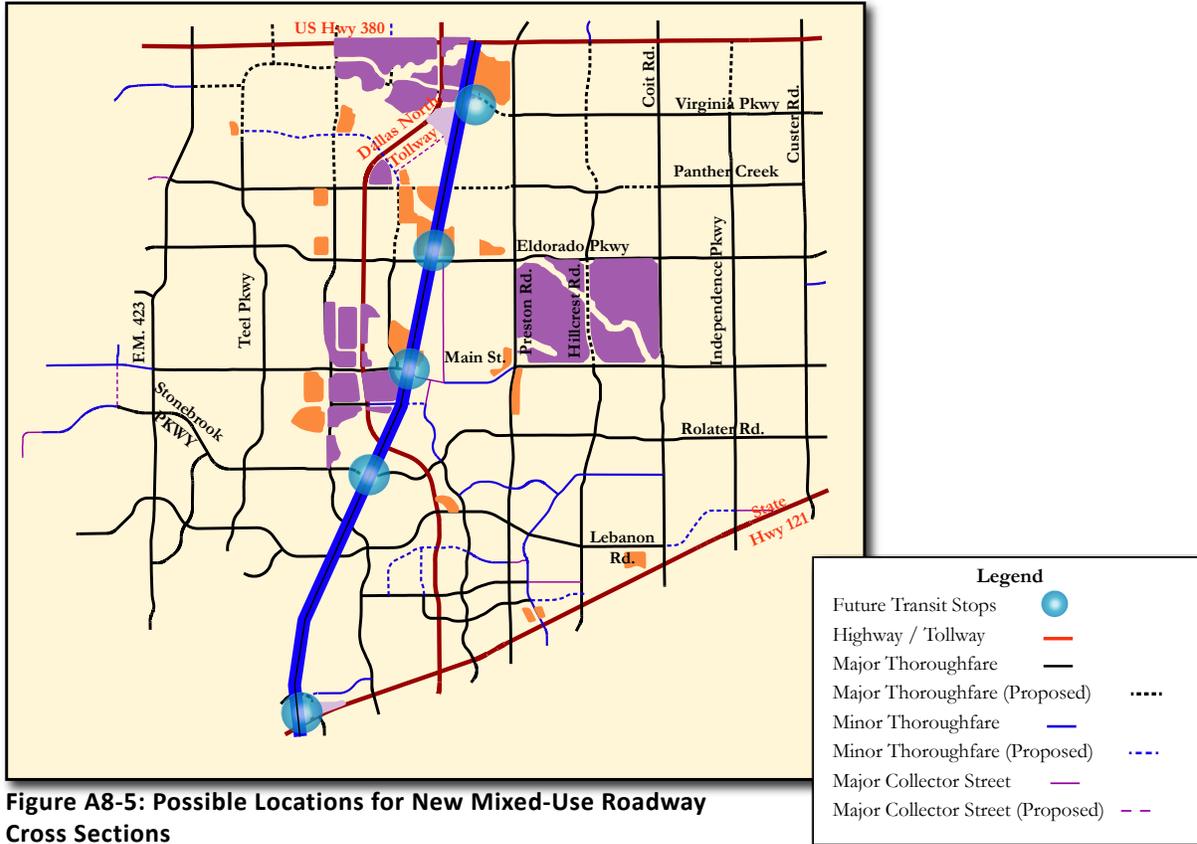


Figure A8-5: Possible Locations for New Mixed-Use Roadway Cross Sections

Street System Continuity

The location of median openings on Frisco streets must comply with the Access Management standards outlined in the City’s *Engineering Standards*. The following subsections outline options that can be applied to achieve better connectivity throughout Frisco as development occurs. Better connectivity will help improve both mobility and access within the City.



Where residential streets are long and have limited access to adjacent developments, every trip is a long one, especially to simple services.

Interconnected Street System

A city’s roadway system should be designed to provide improved connections between neighborhoods and other land uses and to complement the goals in the areas of urban design, livability and sustainability. To improve the livability in residential areas, it is important to enhance the flexibility of not only modes of transportation, but also routes. An interconnected street pattern that provides flexible routes and a number of access points for private and emergency vehicles lessens automobile congestion and reduces dependence on major thoroughfares.

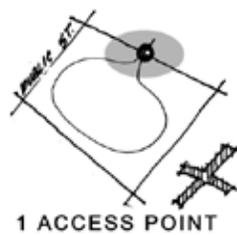
This type of system accommodates continuous sidewalks, short blocks which slow traffic to the desired speed and provides other benefits such as improved pedestrian safety, better local circulation, shorter walking distances and a logical structure to the physical development pattern of the community. Shorter blocks that encourage lower vehicle speeds are especially appropriate

in high-density and mixed-use developments. It is also important to try to incorporate well-lit, grade-separated, ADA-compliant pedestrian and bike trails into bridge structures that cross creeks and floodplains.

MULTIPLE ACCESS POINTS



ONE ACCESS POINT



As the image above shows, encouraging multiple access points between developments can provide relief to the major thoroughfare intersections throughout the city. Essentially, this concept:

- spreads traffic out,
- allows greater flexibility of travel routes,
- reduces miles traveled,
- lessens the burden on the intersections, and
- allows multiple routes for emergency responders.

Frisco’s previous thoroughfare planning efforts have resulted in a robust network of thoroughfares, essentially on a one-mile grid system, (see also Chapter 9, *Transportation/Mobility*). This facilitates the efficient movement of large volumes of traffic, but the use of interconnected collectors and local streets is important to serve the land uses between the major thoroughfares.

Street Intersections

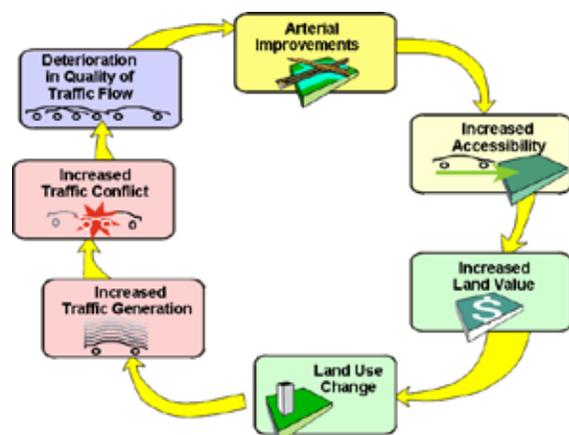
The City should ensure that street intersections are properly aligned to promote better street continuity. When collectors and local streets are planned to connect to major thoroughfares, careful thought must be given to the location where the connection occurs. Median openings are needed for left-turn, in-and-out access along

divided roadways, and these openings need to comply with the City’s access management policies and spacing standard requirements described in the City’s *Engineering Standards*. Adequate distance needs to be provided between median openings to allow for proper deceleration and sufficient vehicle storage area (where vehicles stack up behind each other, usually waiting to make a turn). Also, along divided roadways, streets and driveways should be aligned with one another to minimize the number of openings and facilitate the installation and coordination of traffic signals, if they are necessary.

Access Management

Access management is another important aspect of street continuity. The purpose of access management is to improve safety, reduce congestion and protect the City’s transportation investment. Many of the concerns related to access management are the same as those discussed above in relation to street intersections—median openings, access and space for deceleration and vehicle storage.

The graphic above depicts the typical life cycle of a roadway without access management. As thoroughfare improvements are made, access to development increases. Over time, land uses change, traffic and the potential for crashes increases; eventually, the road may cease to operate effectively. Access management is designed to break this cycle. This Transportation



Typical Life-Cycle of a Roadway with No Access Management

Strategy endorses the City's access management standards and proposes policies on access management elsewhere in this chapter, (*see also Chapter 9, Transportation/Mobility*).

Traffic Systems Management

Efficient operation of the roadway network is of the utmost importance to the traveling public. The City is already employing many of the available technologies and techniques to help maintain an acceptable level of service on the local transportation system. Plans that coordinate signal timing and programs that update these plans in response to changes in traffic volumes and traffic patterns are vitally important to the everyday operation of the City's roadway network.

Reliable, up-to-date traffic signal control equipment is extremely important to the overall mobility in Frisco and to coordinated signal timing plans. This equipment includes not only the hardware and controller in the signal cabinet, but also the following components, which are necessary for efficient control of the overall system:

- Reliable vehicle detection on the street (video or radar);
- Communications equipment that provides a link to equipment in the field; and
- Central control equipment (computers, radios, video monitors, software).

The ability to communicate reliably from a centralized location to devices in the field is critical to maintaining operations on a network the size of Frisco's because it is more efficient and economical to manage field equipment from one location than to visit each intersection individually. Even if an incident requires someone to be dispatched to the field, a reliable system often makes it possible to know beforehand what the situation entails, who should respond and what equipment the responder will need when they get to the

incident. Some of the devices commonly used to improve and maintain efficient roadway operations include variable message signs, dynamic lane assignment signs and video surveillance cameras placed at strategic locations along thoroughfare roadways.

The City should prepare incident and special event management plans in anticipation of a variety of incidents and events. The management of these events could involve the use of the following technologies for the purposes described below:

- Video surveillance cameras to verify the location or details of an incident or event;
- Variable message signs to help divert traffic;
- Modified signal timing plans to better handle the diverted traffic; and
- Dynamic lane assignment signs to more efficiently manage available lane capacity.

These plans could be implemented to address:

- Incidents blocking lanes on certain stretches of major roadways;
- Planned roadway construction;
- Pre-game traffic heading to a ballpark, arena or stadium;
- Post-game traffic leaving the venue; or
- Increased traffic volumes associated with tax-free shopping days or the day after Thanksgiving.

The use of video surveillance cameras has also been shown not only to improve traffic safety, but also to reduce the number of incidents at intersections caused by red light running. These crashes tend to cause more severe injuries and more property damage due to the higher speeds typically associated with this particular offense. It has been shown that the use of this technology can reduce the number of red light running offenses, thereby reducing the potential for accidents leading to injuries and significant intersection delays.

The modeling information presented in the Transportation Chapter demonstrates that

congestion on the thoroughfare street system will increase as Frisco and the region grows, (see also Chapter 9, Transportation/Mobility). This will likely have a negative impact on the neighborhood collector and local street system as drivers attempt to find ways to avoid delays on the major roadways by speeding and cutting through residential areas. Traffic management is a means of addressing these impacts and improving neighborhood livability.

Traffic management is a City-wide issue. Many problems and solutions need to be looked at from a broad perspective to ensure that the solution for one street or neighborhood does not create problems for another. A traffic management program is an effective, systematic and fair approach to ensuring an acceptable level of service as Frisco's population, and therefore its roadway traffic, continues to increase.

Traffic Calming

Frisco's traffic calming guidelines provide a consistent, City-wide approach to addressing neighborhood traffic and transportation issues related to safety, speed and traffic volume on local streets. The methods, devices and purposes of traffic calming are not new to Frisco. The City's approach to traffic calming recognizes that a street is a highly complex environment hosting multiple competing interests. These interests include:

- Controlled versus unlimited land access;
- Livability versus mobility;
- Vehicular accommodations versus pedestrian and bicycle accommodations; and
- Consistency of function versus flexibility of form.

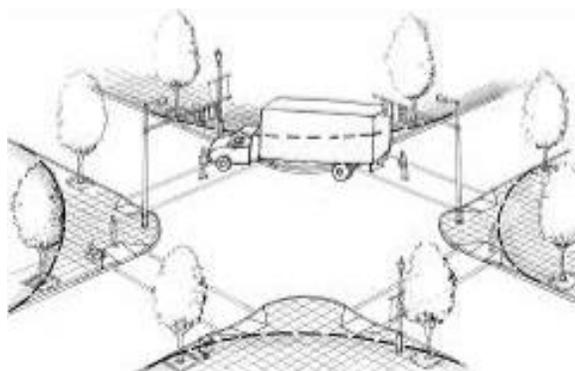
The following descriptions of potential traffic calming devices are directly linked to the City-wide street designations and are intended to enhance both the form and function of current and planned roadways.

Traffic Calming Devices

Curb Return Radii

Curb return radii are the curved sections of curb at the intersection of two streets. Their purpose is to guide vehicles as they make turning movements and to separate vehicular traffic from pedestrian areas at street corners. The current City of Frisco *Engineering Standards* document defines specific curb radii by street type. This subsection outlines a general strategy for selecting the curb return radii design criteria and discusses situations requiring larger radii. Factors that should be considered to determine the appropriate curb return radii include:

- The width of the receiving lane;
- The degree of tolerance at locations where vehicles may encroach into opposing lanes in the course of the turning movement;
- The number and frequency of large vehicles on the street;
- Vehicle speeds;
- The angle of the turn;
- Vehicle and pedestrian volumes; and
- The presence of bike and/or parking lanes.



Smaller curb return radii shorten the distance that pedestrians must cross at intersections. The occasional turn made by large trucks can be accommodated with slower speeds and some encroachment into the opposing traffic lanes.

Curb Return Radii Strategy

Curb return radii should be designed to accommodate the largest vehicle (especially emergency response vehicles) that will regularly and frequently turn the corner. This principle assumes that occasionally a large vehicle can safely encroach into the opposing travel lane during the turning movement.

In urban centers, transit-oriented developments and mixed-use areas, where pedestrian activity is intensive, curb return radii should be as small as possible.

- The design vehicle should be selected by determining the frequency of large truck and bus turns at the intersection in question. Bus routes should be identified to determine whether buses are required turn at the intersection and in which direction. Existing and potential land uses along both streets should be reviewed to evaluate the potential for truck turning movements at the intersection.
- Curb return radii of different lengths can be used on different corners of the same intersection to match the requirements of the design vehicle turning at each corner. Variable curves can be used to better match the wheel track of the design vehicle.

If the occasional encroachment of a large vehicle into oncoming lanes during a turning movement is not acceptable, a larger curb return radius should be used as the standard. In addition, pavers, colored stamped concrete, stone or other contrasting material can be incorporated into the street surface to help direct the driver. This could create an area within the intersection where pedestrians could wait to cross the street. It would also make the street appear narrower while still accommodating vehicles of all types.

Modern Roundabouts

Modern roundabouts are an alternative form of intersection control that is becoming more common in the United States. In the appropriate circumstances, significant benefits can occur with the conversion of an intersection controlled by a

four-way stop sign or a traffic signal into a modern roundabout. It should be noted, however, that additional right-of-way may be needed to accommodate an intersection of this type, and any such conversion would be subject to the approval of the City’s Engineering Department. The benefits of a roundabout could include improved safety, speed reduction, enhanced aesthetics or better functionality. Until recently, many state and local agencies throughout the United States have been hesitant to install roundabouts due to the lack of objective, nation-wide planning, performance and design guidelines. With the creation of the Federal Highway Administration’s guidebook entitled *Roundabouts: An Informational Guide*, state and local agencies now have a firm set of design guidelines, and roundabouts must conform to these standard practices to ensure safe, optimal operation. Modern roundabouts should be considered along local streets, collectors and on minor thoroughfares, but in general, they should not be installed along six-lane major thoroughfares.



General Roundabout Diagram



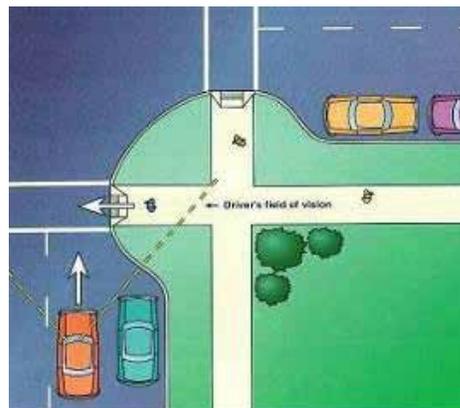
A Roundabout Creates a Special Element within the Intersection Realm

Curb Extensions

Curb extensions (also called bulb-outs or neck-downs) extend the raised curb into the roadway, effectively reducing the width of the street and providing an additional measure of traffic control. Curb extensions, which typically occur at intersections, can provide several benefits, among them:

- Reduce pedestrian crossing distance and exposure to traffic;
- Improve driver and pedestrian sight distance and visibility;
- Narrow the traveled portion of the roadway, both visually and physically, creating a traffic calming effect;
- Direct pedestrian crossings to preferred locations;
- Keep vehicles from parking too close to corners and blocking crosswalks;
- Provide wider pedestrian waiting areas at crosswalks and intersection bus stops;
- Reduce the curb return radius and slow turning traffic; and
- Facilitate compliance with the ADA requirements by providing space for level landings.

Curb extensions serve to better define and delineate the travel portion of the roadway, separating it from the parking lane and the roadside. This technique can be used where vehicles regularly exceed the speed limit, where on-street parking would typically be delineated only by pavement markings and where the distance between the outside curb lines is greater than what is required for the travel portion of the street. In the design of a curb extension, the turning radii for large vehicles must be accommodated.



Curb Extensions can Shorten the Distance a Pedestrian Needs to Travel

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