5. INTERSECTIONS

Designing Intersections

This chapter includes the guideline recommendations with the most potential for conflicts and tradeoffs – the ones for designing intersections. In addition to Tables 5.1-5.5, which provide information about most design elements related to the various possible intersection types, this chapter also describes Charlotte's new approach to evaluating the level-of-service (LOS) at intersections for motorists, pedestrians, and bicyclists.



Designing street segments often involves tradeoffs (particularly when retrofitting



streets without ample right-of-way), but designing intersections is even more complicated, for the following reasons:

- There are a large number of possible intersection types, due to the many combinations of street types. Furthermore, each intersection will potentially vary from the "ideal" or "preferred" design, particularly when the requirements of specific land use contexts are also considered.
- Intersections are where the transitions between different street types are most

likely to occur. These transitions can be problematic, as they present potential conflicts between those elements that might support one street type over another.

• Vehicular traffic delays occur most often at intersections, so engineers typically attempt to reduce travel delays by increasing capacity at intersections. However, intersections are also where pedestrians are expected to cross the street. Conflicts are therefore created, because capacity increases for motorists often lead to lower LOS for other travelers (pedestrians and cyclists). Simply put, each additional turn lane or through lane makes crossing that intersection by foot or bicycle more difficult and is also more likely to directly affect the adjacent land uses through loss of right-of-way. This means that working through design tradeoffs is both more difficult and potentially more important for intersections than for street segments.

• Given the importance of intersections for congestion relief, pedestrian crossings, and commercial interests, these locations are also often where mismatches between transportation and land uses occur.

All of the above issues combine to make intersection design the most likely point of contention between traffic engineers, land use planners, urban designers, the traveling public, and those people who live and work near an intersection. The information contained in this chapter and in Appendixes A-C is intended to provide guidance through the myriad tradeoffs associated with intersection design and to support the Street Design Guidelines' objective of providing safer and more convenient travel for all modes.

Level of Service at Signalized Intersections

A consistent definition of the *verb* "intersect" is to "cut or divide by passing through or across". A consistent definition of the *noun* "intersection" is "a place where two or more roads (or streets) meet" or "a junction of roads (or streets)." Common synonyms for the noun "intersection" include crossroads, crossing, or corner. However defined, an intersection is where motorists, pedestrians, and bicyclists come together in their travel, and they compete for the use of the same space or signal time.

A motorist's interest in maintaining a smooth flow through intersections – to not have to wait 1 to 3 minutes for the next green signal phase at a signalized intersection, or to find a safe gap between vehicles traveling on the street perpendicular to his or her approach – collides with the interests of pedestrians and bicyclists to travel across or through



At this intersection, the competition between motorists and pedestrians for the same space is particularly pronounced. Vehicles making this right turn and pedestrians wanting to cross in the crosswalk are in obvious conflict... especially since right-turns-on-red are allowed.

the intersection safely. Motor vehicles traveling through, or making right or left turns will be competing for the same roadway space or signal green time. Pedestrians will be looking for shorter crossing distances and, especially, to not find themselves in conflicts with turning vehicles. Bicyclists will be looking for

separation from motor vehicles.

As discussed earlier, intersections are also much more likely than segments to be the places where there are capacity deficiencies. This is why more through or turn lanes are added at intersections. A segment with only two travel lanes in one travel direction may widen to four lanes at an intersection, for example.

There is an ongoing, intense pressure for traffic engineers to add lanes at intersections, so as to reduce delays for motor vehicles traveling during peak travel periods. However, the decisions made about enhancing traffic LOS conditions during peak traffic periods will affect the cross-section of the intersection for all hours of every day and night. This is why, as part of these Guidelines, CDOT is changing the analytic process and the City will be changing the stakeholders' expectations about the physical and operational design of intersections.

To that end, CDOT has devised methodologies for determining LOS for bicycles and pedestrians at signalized intersections. The technical details of these methodologies can be found in Appendixes B and C, and a more detailed description of their application is found in Appendix A.



The intersection of Sharon and Fairview Roads; capacity increases for motor vehicles have made pedestrian crossings in this multi-use area much more difficult.



The intersection of Randolph and Wendover Roads, another example where capacity increases for motor vehicles have affected pedestrian level-of-service, though the land uses and their orientation to the intersection make the issue less obvious.

The bicycle and pedestrian LOS methodologies are used, in conjunction with existing traffic analysis methods, to evaluate how a signalized intersection performs for all travelers. Traditionally, the concept of LOS has only been applied to motor vehicles and then mostly related to traffic congestion

or reduction of motorists' delay. The types of improvements that result from such a single mode approach, however, are not necessarily benign for other travelers or for the City. For that reason, these Guidelines introduce the approach wherein all users' interests are evaluated when making decisions about intersection design.

The Guidelines' multi-modal approach to intersection planning and design includes a "trigger" or threshold for considering an intersection for potential capacity increases. As outlined in the technical table in Appendix A and applied through these Guidelines, that threshold value varies according to the street type. Since Main Streets and some Avenues are intended to be much more pedestrian-oriented than are Boulevards and Parkways, it stands to reason that the threshold required to investigate potential vehicular capacity increases at these intersections should be set higher, to avoid unintended negative impacts on pedestrians, cyclists, and adjacent land uses. Therefore, the threshold volume/capacity (V/C) ratio for motor vehicles is not only higher, but it will also be measured for two hours, rather than for only the peak 60 minute period.

Using a higher threshold doesn't mean that congestion is ignored, only that its influence is tempered to meet other street design objectives. This approach allows careful consideration of the likely impacts of potential improvements on pedestrians, cyclists, and the adjacent land uses, prior to making design decisions based solely on traffic congestion.

Once the threshold for a *given inter-section type is met* and an intersection is listed as "saturated", then the intersection will be evaluated as to the types of options that might be implemented and the potential impacts of those options. The pedestrian and bicycle LOS methodologies will be applied to meet the target pedestrian and bicycle LOS for

that specific intersection type.

In some cases, meeting the pedestrian and bicycle LOS targets may prove very difficult if vehicular capacity increases are provided. The LOS measures for these modes are primarily determined by the number of lanes that must be crossed on foot or by bike and the physical and operational (signalization) elements included to aid in crossing. Depending on the land use context and other functional aspects of the surrounding street network, it may not be possible to both expand capacity and maintain or enhance other travelers' LOS. Where that occurs, the planning and design team should thoroughly evaluate the overall objectives for the intersection in relation to the rest of the network and the City's goals for provision of multimodal streets. In many parts of the City, the decision may well be that the capacity improvement cannot or should not occur.

Sight Distance at Corners

Once the decision to make changes at an intersection occurs, the tables found in this chapter are used to decide how, and in which combinations, various design elements should be provided in the design of that intersection. An important design consideration that is not, however, included in Tables 5.1-5.5, is corner sight distance, which impacts the relationship between the street and the buildings adjacent to it.

Sight distance refers to the ability of motorists to see other vehicles or objects in the street without obstructions.

Corner sight distance is applicable where motorists need to decide whether to stop or whether to enter an intersection.

These Urban Street Design Guidelines have some objectives that will change the way that CDOT's current sight distance recommendations are applied. In general, CDOT's Sight Distance

Policy will be applied to all intersections, although there are some instances that will call for using the policy with the greatest possible flexibility. For example, in a very urban or pedestrian-oriented context, there may be a conflict between sight triangles (the space available for drivers to see each other as they approach an intersection) and the desire to have buildings situated close to the street or even directly behind the sidewalk (Figure 5.1). Even with the wider sidewalks and amenity zones found in these areas, meeting the requirement of a strictly applied sight triangle for an adjacent intersection may not be possible or desirable. Likewise, the requirements for departure sight triangles along streets (when pulling out of side streets or driveways), if applied strictly, may conflict with the desire to provide bus shelters, street furnishings, or enough street trees of sufficient size to create a canopy.

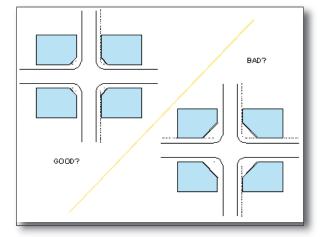


Figure 5.1. Sight Distance Triangles in Urban Locations: Potentially Conflicting Objectives?

On the other hand, on streets designed for other contexts, where higher speeds and land uses with deeper setbacks are found, a stricter application of the sight distance recommendations is required. In those cases, the traditional viewpoint of maintaining adequate "room for error" by motorists is necessary for maintaining safety - a worthwhile objective and intended outcome for all

streets and intersections defined within these Guidelines.

In summary, corner sight distance must be applied carefully, to avoid unintended and potentially negative consequences. As with many of the recommendations contained within these Guidelines, those designing a street should make an effort to best match the design outcome to the surrounding context.

Intersection Design Elements

Tables 5.1 - 5.4 describe the features of non-local intersection types (Main Streets, Avenues, Boulevards, and Parkways). The information in these sections is detailed, but not necessarily prescriptive. The detailed information on dimensions should be used by the design team in conjunction with the design method and tradeoff analyses outlined in Chapter 3 and the LOS guidelines discussed above and described in Appendix A. Note that the plan view diagrams do not show dimensions for these street types, as the focus is on understanding and evaluating the tradeoffs among the various uses and users of the right-ofway.

Table 5.5 describes the design elements for local intersections (Residential, Office/Commercial, and Industrial). The elements and dimensions described are more prescriptive than those for the non-local streets, since these streets are typically provided through the development process.

5.1 Main Street Intersections

This section describes the features of all (non-local street) intersections that include at least one Main Street approach to the intersection. Main Streets can intersect with all of the other street types, except for Parkways. With the proper application of these Guidelines, Main Street intersections will be located in a pedestrian-oriented context. This is why Main Streets and Parkways should not intersect - because they should exist in mutually exclusive contexts. The design of a Main Street intersection will typically favor the pedestrian orientation of the Main Street leg, whether the intersecting street is a Local Street, an Avenue, or a Boulevard. For example, although Avenues and Boulevards will have higher volumes, more lanes, and higher speeds than do Main Streets, their intersections with Main Streets should be carefully designed to maintain a relatively high pedestrian level-of-service, even with the potential for more through lanes.

General Intent:

- (1) Pedestrian-oriented design and very good pedestrian level of service (LOS) should guide the design decision for <u>all</u> Main Street intersections (see Appendix A for a description of how to balance pedestrian and bicycle LOS with vehicular LOS).
- (2) At Main Street intersections with Avenues and Boulevards, the physical and operational design should particularly provide very good pedestrian LOS if the Main Street extends across the intersecting street (see Appendix B for a description of the pedestrian LOS methodology).
- (3) Some elements will remain constant for all Main Street intersections, such as the use of enhanced pavement markings, countdown signals, not allowing right-turns-on-red, and limiting the use of turn lanes onto and off of Main Streets.

The following table provides guidance in applying design elements to different types of Main Street intersections. The column headings refer to the various possible types of approach legs. The "Main Street Approach" column should be used to assess Main-to-Main intersections, as well as the Main Street approach to any of the other intersection types (Main-to-Avenue and Main-to-Boulevard). Note that the recommendations for Avenues and Boulevards are intended to maintain a relatively high pedestrian LOS at intersections with Main Streets. For a discussion of Main streets intersecting Local Streets, see "Local Street Intersections", Section 5.5.

Main Street Intersections 5.1



Main Street Intersections

Diagram reflects possible scenarios and intersection may vary slightly in design. For specific information refer to the guidelines shown on Table 5.1

Table 5.1 Main Street Intersection Elements

Element:	Main/Main Intersections or Main Approach to	Avenue Approach to Main/Avenue Intersection:	Boulevard Approach to Main/Boulevard	Parkway Approach to Main Street Intersection:
	Other Intersection Types:	MungAvenue Intersection.	Intersection:	Street Intersection.
Level of Service (Level of Service)			Intersection.	
• Pedestrian LOS Objective	LOS A for the entire Main/Main intersection.	LOS B for the entire Main/ Ave intersection.	LOS B for the entire Main/Blvd intersection	Not a valid intersection type.
Bicycle LOS Objective	Not applicable (see Appendix A for details).	LOS B for the entire Main/ Ave intersection, using the average LOS value of only the Avenue approaches (see Appendix A for de- tails).	LOS B for the entire Main/Blvd intersection, using the average LOS value of only the Blvd approaches (see Appen- dix A for details).	Not a valid intersection type.
• Motor Vehicle V/C Threshold	1.0, for two consecutive AM or PM hours, for the entire Main/Main intersection.	1.0, for two consecutive AM or PM hours, for the entire Main/Avenue intersection.	.95, for two consecutive AM or PM hours, for the entire Main/Blvd intersection.	Not a valid intersection type.
Median	Atypical, but allowable under special circumstances (see Section 4.1).	Atypical. When provided, should be a minimum width of 6' at intersections, 8' preferred.	Should be provided, with a minimum width of 8' at intersections.	Not a valid intersection type.

Main Street Intersection Elements (continued) Table 5.1

Element:	Main/Main Intersections or Main Approach to Other Intersection Types:	Avenue Approach to Main/Avenue Intersection:	Boulevard Approach to Main/Boulevard Intersection:	Parkway Approach to Main Street Intersection:
Pedestrian Refuge Island	Atypical, but allowable at signalized intersections, if necessary for traffic calming. Where provided, refuges should be a minimum of 6' wide, measured face-of-curb to face-of-curb.	crosswalk or by providing	Yes, typically created by extending the median through the crosswalk (8' minimum width at intersections with Main Streets, due to high speeds on Blvds).	Not a valid intersection type.
Number of Through Lanes	No more than 1 in each direction.	Typically, 1 to 2 lanes in each direction.	Typically, 2 lanes in each direction.	Not a valid intersection type.
Left-Turn Lane	Allowable only with the 3-lane Main Street cross-section. Typically, the turn lane will be 10' wide.	Will be provided with the 3-lane cross-section. Allowable on the 4-lane cross-section, if accept- able pedestrian LOS can be maintained. 10' turn lanes suitable. 9' turn lanes allowable in constrained situations.	Should be provided, ideally 11' wide. In constrained situations, may be 10' wide.	Not a valid intersection type.

Table 5.1 Main Street Intersection Elements (continued)

Element:	Main/Main Intersections or Main Approach to Other Intersection Types:	Avenue Approach to Main/Avenue Intersection:	Boulevard Approach to Main/Boulevard Intersection:	Parkway Approach to Main Street Intersection:
Dual Left-Turn Lanes	Inapplicable.	Inappropriate.	Inappropriate.	Not a valid intersection type.
Right-Turn Lanes	Inappropriate.	Inappropriate.	Inappropriate.	Not a valid intersection type.
Right-Turn Corner Islands	Inapplicable.	Inapplicable.	Inapplicable.	Not a valid intersection type.
Tapers	Inappropriate.	Inappropriate.	Inappropriate.	Not a valid intersection type.
Bicycle Lanes	Inapplicable. Bikes are expected to travel in mixed traffic.	Should be provided. 4' minimum. When onstreet parking exists along the segment, bike lanes should be 5' minimum, with 6' preferred. There should be a "receiving" lane on the opposite side of the intersection. Otherwise, the bike lane should be dropped just prior to the actual intersection, to allow the cyclist to safely merge. The bike lane should never be located to	Should be provided. 5' minimum. 6' preferred. There should be a "receiving" lane on the opposite side of the intersection. Otherwise, the bike lane should be dropped just prior to the actual intersection, to allow the cyclist to safely merge. The bike lane should never be located to the right of an exclusive vehicle turning lane.	Not a valid intersection type.

Main Street Intersection Elements (continued) Table 5.1

Element:	Main/Main Intersections	Avenue Approach to	Boulevard Approach to	Parkway Approach to Main
	or Main Approach to	Main/Avenue Intersection:	Main/Boulevard	Street Intersection:
	Other Intersection Types:		Intersection:	
		the right of an exclusive		
		vehicle turning lane.		
Curb Extensions	Should be provided at all	7' extensions should be	Inappropriate.	Not a valid intersection type.
	corners, at same width	provided where full-time,		
	as on-street parking (7'),	on-street parking exists		
	except at far-side bus stops	along the segment, except		
	with high service frequen-	at far-side bus stops on 2-3		
	cies.	lane cross-sections.		
Bus Stops:	Typically located at far	Typically located at far side	Typically located at far	Not a valid intersection type.
	side of intersection.	of intersection.	side of intersection.	
• Pullout	No.	No.	Consider for high fre-	Not a valid intersection type.
			quency bus stop loca-	
			tions.	
• Curb	Not allowable at far-side	Yes, where full-time, on-	No.	Not a valid intersection type.
Extension	stops with high service	street parking exists. Do		
2110011011	frequencies. May be	not use at far-side on the		
	considered at other stop	2-3 lane cross-sections.		
	locations.			
Curb Radii	The intent in these pedes-	The intent in these pedes-	The intent in these pe-	Not a valid intersection type.
	trian-oriented areas is to	trian-oriented areas is to	destrian-oriented areas	
	keep the curb radii small.	keep the curb radii small.	is to keep the curb radii	

Table 5.1 Main Street Intersection Elements (continued)

Element:	Main/Main Intersections	Avenue Approach to	Boulevard Approach to	Parkway Approach to Main
	or Main Approach to	Main/Avenue Intersection:	Main/Boulevard	Street Intersection:
	Other Intersection Types:		Intersection:	
	(See Appendix D, "Curb	(See Appendix D, "Curb	small. (See Appendix D,	
	Radii" for details)	Radii" for details)	"Curb Radii" for details)	
ADA Ramps:				
• Type 1	No.	No.	No.	Not a valid intersection type.
• Type 2	Yes. The ramp should be aimed toward the crosswalk.	Yes. The ramp should be aimed toward the crosswalk.	Yes. The ramp should be aimed toward the crosswalk.	Not a valid intersection type.
Crosswalks:	Should be provided on all legs, unless there is a physical restriction or safety-related reason that requires otherwise.	Should be provided on all legs, unless there is a physical restriction or safety-related reason that requires otherwise.	Should be provided on all legs, unless there is a physical restriction or safety-related reason that requires otherwise.	Not a valid intersection type.
• Marked	Yes, always using enhanced marking or enhanced paving.	Yes, always using enhanced marking or enhanced paving.	Yes, always using enhanced marking, but not enhanced paving.	Not a valid intersection type.
• Location	Should not be located on the radius.	Should not be located on the radius.	Should not be located on the radius.	Not a valid intersection type.
Traffic Control:				
• Two-Way Stop	No.	No.	No.	Not a valid intersection type.

Main Street Intersection Elements (continued) Table 5.1

Element:	Main/Main Intersections	Avenue Approach to	Boulevard Approach to	Parkway Approach to Main
	or Main Approach to	Main/Avenue Intersection:	Main/Boulevard	Street Intersection:
	Other Intersection Types:		Intersection:	
• Four-Way	Allowable if both streets	Allowable if both streets	No.	Not a valid intersection type.
Stop	are two-lane and estab-	are two-lane and signal		
· · · · ·	lished warrants are met.	warrants not met.		
• Roundabout	Allowable, except at inter-	Allowable, as a gateway	No.	Not a valid intersection type.
100110000000	sections with Boulevards.	transition.		
• Signals	Yes, depending on war-	Yes, depending on war-	Yes. Bus priority should	Not a valid intersection type.
0.9	rants. Bus priority should	rants. Bus priority should	be used where appropri-	
	be used where appropri-	be used where appropriate.	ate.	
	ate.			
• Signal	90 second maximum cycle	90 second cycle length pre-	120 second maximum	Not a valid intersection type.
Timing	length (applies to entire	ferred, 120 second maxi-	cycle length (applies to	
8	Main/Main intersection).	mum (applies to entire	entire Main/Blvd inter-	
	The intent is to keep	Main/Ave intersection).	section). The intent is	
	overall delay low, while	The intent is to keep	to keep overall delay as	
	offering enough time for	overall delay low, while	low as possible, while	
	pedestrians to cross.	offering enough time for	offering enough time	
		pedestrians to cross.	for pedestrians to cross.	
• Right-	No.	No.	No.	Not a valid intersection type.
Turn on Red				
	Yes, with countdown. The	Yes, with countdown. The	Yes, with countdown.	Not a valid intersection type.
Pedestrian Signals	countdown should show	countdown should show	The countdown should	The a valid intersection type.

Table 5.1 Main Street Intersection Elements (continued)

Element:	Main/Main Intersections	Avenue Approach to	Boulevard Approach to	Parkway Approach to Main
	or Main Approach to	Main/Avenue Intersection:	Main/Boulevard	Street Intersection:
	Other Intersection Types:		Intersection:	
	the total number of sec-	the total number of sec-	show the total number	
	onds available for cross-	onds available for cross-	of seconds available for	
	ing. Also consider audible	ing. Also consider audible	crossing. Also consider	
	signals (where deemed	signals (where deemed	audible signals (where	
	appropriate) and leading	appropriate) and leading	deemed appropriate)	
	pedestrian interval.	pedestrian interval.	and leading pedestrian	
			interval.	
 Bicycle 	Provide for all Main Street	Provide for through lanes	Provide for left turns.	Not a valid intersection type.
Detectors	approaches to signalized	and left turns.		
	intersections.			
 Advance 	Yes, at signalized intersec-	Yes, at signalized intersec-	Yes, typically, placed 6-8'	Not a valid intersection type.
Stop Bars	tions. Typically, placed	tions. Typically, placed	from crosswalk.	
1	6-8' from crosswalk. May	6-8' from crosswalk. May		
	be further back, if neces-	be further back, if neces-		
	sary to allow additional	sary to allow additional		
	maneuvering space for	maneuvering space for		
	vehicles turning off of the	vehicles turning off of the		
	other street.	other street.		
• Bike Box	Inapplicable, since bikes	Should be considered, but	Should be considered,	Not a valid intersection type.
	are expected to travel in	only if a bike lane ap-	but only if a bike lane	
	mixed traffic.	proaches the intersection.	approaches the intersec-	
		This bike lane approach	tion. This bike lane	

Main Street Intersection Elements (continued) Table 5.1

Element:	Main/Main Intersections or Main Approach to Other Intersection Types:	Avenue Approach to Main/ Avenue Intersection:	Boulevard Approach to Main/Boulevard Intersection:	Parkway Approach to Main Street Intersection:
		need not run the entire length of the segment.	approach need not run the entire length of the segment.	
Bicycle Stop Bars	Inapplicable, since bikes are expected to travel in mixed traffic.	Should be provided if there is a bike lane, but no bike box.	Should be provided if there is a bike lane, but no bike box.	Not a valid intersection type.
GradeSeparation	No.	No.	No.	Not a valid intersection type.
Lighting:				
• Street	Yes.	Yes.	Yes.	Not a valid intersection type.
• Pedestrian	Yes.	Yes.	Yes.	Not a valid intersection type.
Traffic Calming	Typically not necessary, but may be used to maintain desired speeds.	Consider a combination of elements on intersection approach to slow traffic approaching intersection. At the intersection, curb extensions may be used, for example (see "curb extensions", above, and CDOT's Traffic Calming Report for more information).	May be appropriate, if necessary to maintain desired speeds. Lateral shifts and some forms of narrowing may be considered. See CDOT's Traffic Calming Report for more information.	Not a valid intersection type.

5.2 Avenue Intersections

This section describes the features of all (non-local street) intersections that include at least one Avenue approach to the intersection. Avenues serve a wide variety of land uses and transportation functions. They are expected to provide a safety and comfort balance among the various modes in all contexts. The majority of non-local street intersections will be with Avenues. There are also several potential cross-sections for Avenues. The mix of possible land uses, cross-sections, and intersection types, along with the desire to provide a balance among the modes, makes Avenue intersections the most complicated in many respects. At intersections with Parkways, in particular, providing the necessary modal balance may prove difficult and plan/design teams might consider transitioning the Parkway to a Boulevard prior to the approach. A pedestrian-oriented Avenue should typically not intersect with a Parkway, if at all possible.

General Intent:

- (1) Design decisions will assess and compare the tradeoffs of safe and efficient travel for motorists, pedestrians, and cyclists.
- (2) Capacity increases or delay reductions at Avenue intersections will be carefully evaluated against the impacts to all travelers and their level-of-service, as well as the impacts on adjacent land uses.

The following table provides guidance in applying design elements to different types of Avenue intersections. The column headings refer to the various possible types of approach legs. The "Avenue Approach" column should be used to assess Avenue-to-Avenue intersections, as well as the Avenue approach to any of the other intersection types (Avenue-to-Main and Avenue-to-Boulevard). For a discussion of Avenues intersecting Local Streets, see "Local Street Intersections", Section 5.5.

Avenue Intersections 5.2



Avenue Intersections

Diagram reflects possible scenarios and intersection may vary slightly in design. For specific information refer to the guidelines on Table 5.2

Table 5.2 Avenue Intersection Elements

Element:	Main Street Approach to Avenue/Main Intersections:	Avenue/Avenue Intersections or Avenue Approach to Other Intersection Types:	Boulevard Approach Avenue/Boulevard Intersection:	Parkway Approach to Avenue/Parkway Intersections:
Level of Service (L	OS):	7.		
Pedestrian LOS Objective	LOS B for the entire Avenue/Main intersection.	LOS B for the entire Avenue/ Avenue intersection.	LOS B for the entire Avenue/Blvd intersection.	LOS D for the entire Avenue/Parkway inter- section.
Bicycle LOS Objective	LOS B for the entire Avenue/Main intersection, using the average LOS value of only the Avenue approaches (see Appendix A for details).	LOS B for the entire Avenue/ Avenue intersection.	LOS B for the entire Avenue/Blvd intersection.	LOS C/D for the entire Avenue/Parkway inter- section.
• Motor Vehicle V/C Threshold	1.0, for two consecutive AM or PM hours, for the entire Avenue/Main intersection.	.95, for two consecutive AM or PM hours, for the entire Avenue/Avenue intersection.	.95, for two consecutive AM or PM hours, for the entire Avenue/Blvd intersection.	.95, for two consecutive AM or PM hours, for the entire Avenue/Park- way intersection.
Median	Atypical, but allowable under special circumstances (see Chapter 4, Section 4.1).	Atypical. When provided, should be a minimum width of 6' at intersections (8' preferred if the Avenue has land uses likely to generate heavy pedestrian traffic).	Should be provided, with a minimum width of 6' at the intersection (8' minimum if the Avenue approaches have land uses likely to generate pedestrian traffic across the Boulevard approaches).	Yes, preferably 9' wide at the intersection, 6' minimum (8' minimum if Avenue approaches have land uses likely to generate pedestrian traffic across the Parkway approaches).

Avenue Intersection Elements (continued) Table 5.2

Element:	Main Street Approach to	Avenue/Avenue Intersections	Boulevard Approach	Parkway Approach to
	Avenue/Main	or Avenue Approach to Other	Avenue/Boulevard	Avenue/Parkway
	Intersections:	Intersection Types:	Intersection:	Intersections:
Pedestrian Refuge Island	Atypical, but allowable at signalized intersections,	Desirable, particularly on 4 lane sections. To be pro-	Yes, created by extending the median through the	Yes, created by extending the median to the
	if necessary for traffic calming. Where provided, refuges should be a minimum of 6' wide, measured face-of-curb to face-of-curb.	vided either by extending the median to the crosswalk or by providing a separate, 6' minimum, pedestrian refuge (measured face-of-curb to face-of-curb).	crosswalk (6' minimum, face-of curb to face-of-curb; 8' if Avenue approaches have land uses likely to generate pedestrian traffic across the Boulevard approaches).	crosswalk (6' minimum, face-of-curb to face-of-curb to face-of-curb; 9' preferred; 8' minimum if Avenue approaches have land uses likely to generate pedestrian traffic across the Parkway approaches).
Number of Through Lanes	No more than 1 in each direction.	Typically, 1 to 2 lanes in each direction.	Typically, 2 lanes in each direction.	2 or 3 lanes in each direction.
Left-Turn Lane	Allowable only with the 3-lane Main Street cross-section. Typically, the turn lane will be 10' wide.	Will be provided with the 3-lane cross-section. Allowable on 4 lane cross-sections. 10' turn lanes suitable. 9' turn lanes allowable in constrained situations.	Should be provided, ideally 11' wide. In constrained situations, may be 10' wide.	Should be provided, ideally 11' wide. In constrained conditions, may be a minimum of 10' wide. Should preferably include a 4' offset and an edge line, if there is no curb on the median.

Table 5.2 Avenue Intersection Elements (continued)

Element:	Main Street Approach to	Avenue/Avenue Intersections	Boulevard Approach	Parkway Approach to
	Avenue/Main	or Avenue Approach to Other	Avenue/Boulevard	Avenue/Parkway
	Intersections:	Intersection Types:	Intersection:	Intersections:
Dual Left-Turn	Inapplicable.	Inappropriate onto Main	Should be avoided. The	Even with the greater
Lanes		Streets. Should be avoided at	preferred option is to try	emphasis on vehicle
		other Avenue intersections.	the longest possible storage	capacity for Parkways,
		The preferred option is to	lane and green time for a	dual-lefts should be
		try the longest possible stor-	single left-turn first and/or	avoided onto Avenues,
		age lane and green time for a	to provide additional con-	as the overall dimen-
		single left-turn first and/or to	nections in the surround-	sions of the intersection
		provide additional connec-	ing street network. May be	can become detrimental
		tions in the surrounding street	considered:	to the Avenue environ-
		network. May be considered :	1) when turning move-	ment. The preferred
		1) when turning movements	ments are greater than	option is to try the
		are greater than through	through movements,	longest possible storage
		movements, thereby affording	thereby affording the possi-	lane and green time for
		the possibility to eliminate a	bility to eliminate a through	a single left-turn first
		through lane in exchange for	lane in exchange for the	and/or to provide ad-
		the dual left;	dual left;	ditional connections in
		2) when turning movements	2) when turning move-	the surrounding street
		are greater than 400 vehicles	ments are greater than 400	network.
		per hour;	vehicles per hour;	
			3) when it can be shown	
			that dual lefts will still per-	
			mit an acceptable	

Avenue Intersection Elements (continued) Table 5.2

Element:	Main Street Approach to		Boulevard Approach	Parkway Approach to
	Avenue/Main	or Avenue Approach to Other	Avenue/Boulevard	Avenue/Parkway
	Intersections:	Intersection Types:	Intersection:	Intersections:
		3.) when it can be shown that	pedestrian LOS to be main-	
		dual lefts will still permit an	tained.	
		acceptable pedestrian LOS to		
		be maintained.		
Right-Turn Lanes	Inappropriate.	Inappropriate at Main Street	Allowable. Where used,	Although right-turn
		intersections. Discouraged	Florida slip-lane design,	lanes are the ideal on
		at Avenue/Avenue intersec-	with corner islands, is the	Parkways, they should
		tions. The preferred option is	preferred treatment . The	be very carefully consid-
		to provide additional connec-	preferred option is to pro-	ered and designed when
		tions in the surrounding street	vide additional connections	they are allowing turns
		network. May be considered:	in the surrounding street	onto Avenues. Where
		1) when turning movements	network.	used, Florida slip-lane
		are greater than through		design, with corner
		movements, thereby affording		islands, is the preferred
		the possibility to eliminate a		treatment.
		through lane in exchange for		
		right-turn lane;		
		2) when dropping a lane as the		
		street cross-section changes;		
		,		
ı				

Table 5.2 Avenue Intersection Elements (continued)

Element:	Main Street Approach to	Avenue/Avenue Intersections	Boulevard Approach	Parkway Approach to
	Avenue/Main	or Avenue Approach to Other	Avenue/Boulevard	Avenue/Parkway
	Intersections:	Intersection Types:	Intersection:	Intersections:
		3) when turning movements		
		are greater than 300 vehicles		
		per hour;		
		4) when acceptable pedestrian		
		LOS can be maintained.		
Right-Turn Corner Islands	Inapplicable.	Inapplicable at Main Street intersections. Allowable at Avenue/Avenue and Avenue/Blvd, but only if necessary to maintain pedestrian LOS or as refuge on wide cross-sections. Where provided, should be a minimum of 50 sf., preferably landscaped.	Allowable, if necessary to maintain pedestrian LOS with the addition of a right-turn lane. Minimum of 50 sf.	Yes, in conjunction with Florida slip-lane design.
Tapers	Inappropriate.	Inappropriate.	Inappropriate.	Inappropriate.
Bicycle Lanes	Inapplicable. Bikes are	Should be provided. 4' mini-	Should be provided. 5'	Typically inappropriate,
	expected to travel in	mum. When on-street parking	minimum. 6' preferred.	but may be allowable to
	mixed traffic.	exists along the segment, bike	May also be provided on	maintain bicycle net-
		lanes should be 5' minimum,	a parallel frontage road, if	work connectivity (6'
		with 6' preferred. There	that increases bicycle LOS.	minimum for adequate

Avenue Intersection Elements (continued) Table 5.2

Element:	Main Street Approach to	Avenue/Avenue Intersections	Boulevard Approach	Parkway Approach to
	Avenue/Main	or Avenue Approach to Other	Avenue/Boulevard	Avenue/Parkway
	Intersections:	Intersection Types:	Intersection:	Intersections:
		should be a "receiving" lane	There should be a "receiv-	separation from high-
		on the opposite side of the	ing" lane on the opposite	speed traffic). Pre-
		intersection. Otherwise, the	side of the intersection.	ferred option is to have
		bike lane should be dropped	Otherwise, the bike lane	separate facility outside
		just prior to the actual inter-	should be dropped just	of right-of-way or on
		section, to allow the cyclist to	prior to the actual intersec-	parallel local streets.
		safely merge. The bike lane	tion, to allow the cyclist to	
		should never be located to the	safely merge. The bike lane	
		right of an exclusive vehicle	should never be located to	
		turning lane.	the right of an exclusive	
			vehicle turning lane.	
Curb Extensions	Should be provided, at	7' extensions should be pro-	Inappropriate.	Prohibited.
	same width as on-street	vided where full-time, on-		
	parking (7'), except at	street parking exists along the		
	far-side bus stops with	segment, except at far-side bus		
	high service frequencies.	stops on 2-3 lane cross-sec-		
		tions.		
Bus Stops:	Typically located at far-	Typically located at far side of	Typically located at far side	Typically located at off-
	side of intersections.	intersection.	of intersection.	street lots or stops. Far
				side stops preferred at
				intersections.

Table 5.2 Avenue Intersection Elements (continued)

Element:	Main Street Approach to Avenue/Main Intersections:	Avenue/Avenue Intersections or Avenue Approach to Other Intersection Types:	Boulevard Approach Avenue/Boulevard Intersection:	Parkway Approach to Avenue/Parkway Intersections:
• Pullout	No.	No.	Consider for high frequency bus stop locations.	Yes.
• Curb Extension	Not allowable at far-side stops with high service frequencies. May be considered at other stop locations.	Yes, where full-time, on-street parking exists. Do not use at far-side on the 2-3 lane cross-sections.	No.	No.
Curb Radii	The intent in these pedestrian-oriented areas is to keep the curb radii small. See Appendix D, "Curb Radii" for details.	The intent is to keep the curb radii as small as possible. See Appendix D, "Curb Radii" for details.	The intent is to keep the curb radii as small as possible. See Appendix D, "Curb Radii" for details.	The intent is to keep the curb radii as small as possible. See Appen- dix D, "Curb Radii" for details.
ADA Ramps: • Type 1	No.	No.	No.	No.
• Type 2	Yes. The ramp should be aimed toward the crosswalk.	Yes. The ramp should be aimed toward the crosswalk.	Yes. The ramp should be aimed toward the crosswalk.	Yes. The ramp should be aimed toward the crosswalk, if one exists.
Crosswalks:	Should be provided on all legs, unless there is a physical restriction or safety-related reason that	Should be provided on all legs, unless there is a physical restriction or safety-related reason that requires otherwise.	Should be provided on all legs, unless there is a physical restriction or safety-related reason that requires	Should be provided on all legs, unless there is a physical restriction or safety-related reason

Avenue Intersection Elements (continued) Table 5.2

Element:	Main Street Approach to	Avenue/Avenue Intersections	Boulevard Approach	Parkway Approach to
	Avenue/Main	or Avenue Approach to Other	Avenue/Boulevard	Avenue/Parkway
	Intersections:	Intersection Types:	Intersection:	Intersections:
	requires otherwise.		otherwise.	that requires otherwise.
 Marked 	Yes, always using en-	Yes, always using enhanced	Yes, always using enhanced	Yes, always using en-
	hanced marking or	marking or enhanced paving.	marking, but not enhanced	hanced marking, but not
	enhanced paving.		paving.	enhanced paving.
• Location	Should not be located on	Should not be located on the	Should not be located on	Should not be located
200411011	the radius.	radius.	the radius.	on the radius.
Traffic Control:				
• Two-Way Stop	No.	No.	No.	No.
• Four-Way Stop	Allowable if both streets are two-lane and established warrants are met.	Allowable if both streets are two-lane and signal warrants not met.	No.	No.
• Round- about	Allowable as a gateway transition.	Allowable as a gateway transition at Main Streets. Allowable elsewhere, when: 1) volumes are less than 35,000; 2) analysis shows that roundabouts provide higher vehicle LOS than signals; and	Allowable, when: 1) volumes are less than 35,000; 2) analysis shows that roundabouts provide higher vehicle LOS than signals; and 3) provision of roundabout does not degrade pedestrian	No.

Table 5.2 Avenue Intersection Elements (continued)

Element:	Main Street Approach to	Avenue/Avenue Intersections	Boulevard Approach	Parkway Approach to
	Avenue/Main	or Avenue Approach to Other	Avenue/Boulevard	Avenue/Parkway
	Intersections:	Intersection Types:	Intersection:	Intersections:
		3) provision of roundabout	and bicycle LOS.	
		does not degrade pedestrian		
		and bicycle LOS.		
 Signals 	Yes, depending on	Yes. Bus priority should be	Yes. Bus priority should be	Yes. Bus priority should
5-8	warrants. Bus priority	used where appropriate.	used where appropriate.	be used where appropri-
	should be used where			ate.
	appropriate.			
• Signal	90 second cycle length	90 second cycle length pre-	120 second maximum cycle	120 second maximum
Timing	preferred, 120 second	ferred, 120 second maximum	length (applies to entire	cycle length (applies to
	maximum (applies to	(applies to entire Avenue/Av-	Avenue/Blvd intersection).	entire Avenue/Parkway
	entire Avenue/Main in-	enue intersection). The intent	The intent is to keep over-	intersection). The intent
	tersection). The intent is	is to keep overall delay low,	all delay as low as possible,	is to keep overall delay
	to keep overall delay low,	while offering enough time for	while offering enough time	as low as possible, while
	while offering enough	pedestrians to cross.	for pedestrians to cross.	offering enough time for
	time for pedestrians to			pedestrians to cross.
	cross.			
• Right-Turn	No.	Not at Main Street intersec-	Allowable, but should be	Desirable, depending
on Red		tions. Allowable at other	avoided in locations with a	on sight distance and
		intersections, but should be	high potential for pedestri-	potential for higher vol-
		avoided in locations with a	an traffic (in areas that are	ume pedestrian traffic at
		high potential for pedestrian	currently or are planned to	the intersection.
		traffic (in areas that are	be pedestrian-oriented	

Avenue Intersection Elements (continued) **Table 5.2**

Element:	Main Street Approach to Avenue/Main Intersections:	Avenue/Avenue Intersections or Avenue Approach to Other Intersection Types: currently or are planned to be pedestrian-oriented retail or mixed-use).	Boulevard Approach Avenue/Boulevard Intersection: or mixed-use).	Parkway Approach to Avenue/Parkway Intersections:
• Pedestrian Signals	Yes, with countdown. The countdown should show the total number of seconds available for crossing. Also consider audible signals (where deemed appropriate) and leading pedestrian interval.	Yes, with countdown. The countdown should show the total number of seconds available for crossing. Also consider audible signals (where deemed appropriate) and leading pedestrian interval.	Yes, with countdown. The countdown should show the total number of seconds available for crossing. Also consider audible signals (where deemed appropriate) and leading pedestrian interval.	Yes, with countdown. The countdown should show the total number of seconds available for crossing. Also consider audible signals (where deemed appropriate).
Bicycle Detectors	Provide for all Main Street approaches to sig- nalized intersections.	Provide for through lanes and left-turns at Avenue/Main intersections. At Avenue/Avenue and Avenue/Blvd, provide for left-turns and on through lanes of the weaker approach legs.	Provide for left-turns.	No.

Table 5.2 Avenue Intersection Elements (continued)

Element:	Main Street Approach to Avenue/Main	Avenue/Avenue Intersections	Boulevard Approach Avenue/Boulevard	Parkway Approach to
	Avenue/Main Intersections:	or Avenue Approach to Other Intersection Types:	Intersection:	Avenue/Parkway Intersections:
• Advance Stop Bars	Yes, at signalized intersections. Typically, placed 6-8' from crosswalk. May be further back, if necessary to allow additional maneuvering space for vehicles turning off of the Avenue.	Yes. Typically, placed 6-8' from crosswalk. May be further back, if necessary to allow maneuvering space for vehicles turning off of the other street. When right-turn-on-red is allowed with the four-lane cross-section, stagger the stop bars, so that the outside, turning lane's stop bar is 4' closer to the crosswalk than is the inside lane's stop bar. This allows the turning	Yes. Typically, placed 6-8' from crosswalk. When right-turn-on-red is allowed, stagger the stop bars, so that the outside, turning lane's stop bar is 4' closer to the crosswalk than are any adjacent lanes' stop bars. This allows the turning driver to see approaching traffic without encroaching into the crosswalk.	Allowable. Typically, placed 6-8' from cross-walk. When right-turn-on-red is allowed, stagger the stop bars, so that the outside, turning lane's stop bar is 4' closer to the crosswalk than are any adjacent lanes' stop bars. This allows the turning drive to see approaching traffic without encroaching
• Bike Box	Inapplicable, since bikes are expected to travel in mixed traffic.	driver to see approaching traf- fic without encroaching into the crosswalk. Should be considered, but only if a bike lane approaches the intersection. This bike lane approach need not run the entire length of the seg-	Should be considered, but only if a bike lane approaches the intersection. This bike lane approach need not run the entire	No. If a bike lane exists use bicycle stop bars, rather than a bike box.

Avenue Intersection Elements (continued) Table 5.2

Element:	Main Street Approach to Avenue/Main Intersections:	Avenue/Avenue Intersections or Avenue Approach to Other Intersection Types:	Boulevard Approach Avenue/Boulevard Intersection:	Parkway Approach to Avenue/Parkway Intersections:
Bicycle Stop Bars	Inapplicable, since bikes are expected to travel in mixed traffic.	Should be provided if there is a bike lane, but no bike box.	Should be provided if there is a bike lane, but no bike box.	Provide in the rare circumstance that a bike lane exists.
• Grade Separation	No.	No.	No.	No.
Lighting				
• Street	Yes.	Yes.	Yes.	Yes.
• Pedestrian	Yes.	Should be provided where adjacent land uses or facilities are likely to cause concentrations of pedestrians (at bus stops or in areas that are currently or are planned to be pedestrian-oriented retail or mixed-use, e.g.).	Should be provided where adjacent land uses or facilities are likely to cause concentrations of pedestrians (at bus stops or in areas that are currently or are planned to be pedestrian-oriented retail or mixed-use, e.g.).	Atypical, but should be provided in any circumstance where adjacent land uses or facilities are likely to cause concentrations of pedestrians.
Traffic Calming	Typically not necessary, but may be used to maintain desired speeds.	Consider a combination of elements on intersection approach to slow traffic approaching intersection. At the intersection, curb extensions may be used, for example	May be appropriate, if necessary to maintain desired speeds. Lateral shifts and some forms of narrowing may be considered. See CDOT's Traffic Calming	No.

Table 5.2 Avenue Intersection Elements (continued)

Element:	Main Street Approach to	Avenue/Avenue Intersections	Boulevard Approach	Parkway Approach to
	Avenue/Main	or Avenue Approach to Other	Avenue/Boulevard	Avenue/Parkway
	Intersections:	Intersection Types:	Intersection:	Intersections:
		(see "curb extensions", above,	Report for more informa-	
		and CDOT's Traffic Calming	tion.	
		Report for more informa-		
		tion).		

5.3 Boulevard Intersections

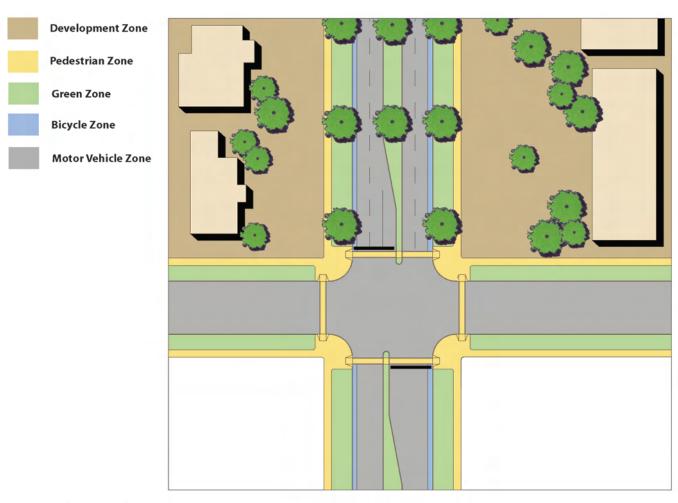
This section describes the features of all (non-local street) intersections that include at least one Boulevard approach to the intersection. Boulevards serve a wide variety of land uses, while providing important intra-city travel functions. Special care must be taken at Boulevard intersections with Main Streets and Avenues, because the higher speeds and volumes of the Boulevard must not overwhelm the pedestrian orientation of the Main Street and the desire for modal balance of the Avenue. This is an important point because the design solutions for the Boulevard approaches may be in conflict with the design requirements for the other approaches for these types of intersections.

General Intent:

- (1) Pedestrians and cyclists will be provided with a safe LOS at Boulevard intersections.
- (2) Designing for pedestrians will be particularly important where Boulevards intersect Main Streets and Avenues.
- (3) Boulevard intersections are likely to be fairly large, increasing the importance of aesthetics in their design.

The following table provides guidance in applying design elements to different types of Boulevard intersections. The column headings refer to the various possible types of approach legs. The "Boulevard Approach" column should be used to assess Boulevard-to-Boulevard intersections, as well as the Boulevard approach to any of the other intersection types (Boulevard-to-Main, Boulevard-to-Avenue, and Boulevard-to-Parkway). For a discussion of Boulevards intersecting Local Streets, see "Local Street Intersections", Section 5.5.

Boulevard Intersections 5.3



Boulevard Intersections

Diagram reflects possible scenarios and intersection may vary slightly in design. For specific information refer to the guidelines on Table 5.3

Table 5.3 Boulevard Intersection Elements

Element:	Main Street Approach to Blvd/Main Intersections:	Avenue Approach to Blvd/Avenue Intersections:	Blvd/Blvd Intersections or Blvd. Approach to Other Intersection Types:	Parkway Approach to Blvd/ Parkway Intersections:
Level of Service	(LOS):		Intersection Types.	
Pedestrian	LOS B for the entire Blvd/ Main intersection.	LOS B for the entire Blvd/ Avenue intersection.	LOS C for the entire Blvd/ Blvd intersection. LOS C for the entire Blvd/	LOS D for the entire Blvd/ Parkway intersection. LOS C/D for the entire
Bicycle	Main intersection, using the average LOS value of only the Blvd approaches (see Appendix A for de- tails).	Ave intersection.	Blvd intersection.	Blvd/Parkway intersection.
Motor Vehicle V/C Threshold	.95, for two consecutive AM or PM hours, for the entire Blvd/Main intersec- tion.	.95, for two consecutive AM or PM hours, for the entire Blvd/Ave intersection.	.95, for BOTH one AM and one PM hour, for the entire Blvd/Blvd intersection.	.95, for BOTH one AM and one PM hour, for the entire Blvd/Parkway intersection.
Median	Atypical, but allowable under special circumstances. (Chapter 4, Section 4.1)	Atypical. When provided, should be a minimum width of 6' at intersections (8' preferred if the Avenue approaches have land uses likely to generate heavy pedestrian traffic).	Should be provided, with a minimum width of 6' at the intersection. 8' minimum at Main Streets and at Avenues if the Avenue approaches have land uses likely to generate pedestrian traffic across the Boulevard.	Yes, preferably 9' wide at the intersection, 6' minimum.

Boulevard Intersection Elements (continued) **Table 5.3**

Element:	Main Street Approach to	Avenue Approach to	Blvd/Blvd Intersections or	Parkway Approach to Blvd/
	Blvd/Main Intersections:	Blvd/Avenue Intersections:	Blvd Approach to Other	Parkway Intersections:
			Intersection Types:	
Pedestrian Refuge Island	Atypical, but allowable at signalized intersections, if necessary for traffic calming. Where provided, refuges should be a minimum of 6' wide, measured face-of-curb to face-of-curb.	Desirable, particularly on 4 lane sections. To be provided either by extending the median to the crosswalk or by providing a separate, 6' minimum, pedestrian refuge (measured face-of-curb to face-of-curb).	Yes, created by extending the median through the crosswalk (6' min. width, face-of-curb to face-of-curb; 8' under conditions described above for "medians").	Yes, created by extending the median to the crosswalk (6' minimum, face-of-curb to face-of-curb; 9' preferred).
Number of	No more than 1 in each	Typically, 1 to 2 lanes in	Typically, 2 lanes in each	2 or 3 lanes in each direc-
Through Lanes	direction.	each direction.	direction.	tion.
Left-Turn Lane	Allowable only with the 3-lane Main Street cross-section. Typically, the turn lane will be 10' wide.	Will be provided with the 3-lane cross-section. Allowable on 4 lane cross-sections. 10' turn lanes suitable. 9' turn lanes allowable in constrained situations.	Should be provided, ideally 11' wide. In constrained situations, may be 10' wide.	Should be provided, ideally 11' wide. In constrained conditions, may be a minimum of 10' wide. Should preferably include a 4' offset and an edge line, if there is no curb on the median.

Table 5.3 Boulevard Intersection Elements (continued)

Element:	Main Street Approach to	Avenue Approach to	Blvd/Blvd Intersections or	Parkway Approach to Blvd/
	Blvd/Main Intersections:	Blvd/Avenue Intersections:	Blvd Approach to Other	Parkway Intersections:
			Intersection Types:	
Dual Left-Turn	Inapplicable.	Should be avoided. The	Inappropriate onto Main	Allowable, though the
Lanes		preferred option is to try	Streets. Allowable onto	overall dimensions of the
		the longest possible storage	Parkways. Should be avoid-	intersection can become
		lane and green time for a	ed onto Avenues and other	detrimental to the Bou-
		single left-turn first and/or	Boulevards. The preferred	levard environment. The
		to provide additional con-	option is to try the longest	preferred option is to try
		nections in the surround-	possible storage lane and	the longest possible storage
		ing street network. May be	green time for a single left-	lane and green time for a
		considered:	turn first and/or to provide	single left-turn first and/or
		1) when turning move-	additional connections in	to provide additional con-
		ments are greater than	the surrounding street net-	nections in the surrounding
		through movements, there-	work. May be considered:	street network.
		by affording the possibility	1) when turning move-	
		to eliminate a through lane	ments are greater than	
		in exchange for the dual	through movements,	
		left;	thereby affording the possi-	
		2) when turning move-	bility to eliminate a through	
		ments are greater than 400	lane in exchange for the	
		vehicles per hour;	dual left;	
			2) when turning move-	
			ments are greater than 400	
			vehicles per hour;	

Boulevard Intersection Elements (continued) **Table 5.3**

Element:	Main Street Approach to	Avenue Approach to	Blvd/Blvd Intersections or	Parkway Approach to Blvd/
	Blvd/Main Intersections:	Blvd/Avenue Intersections:	Blvd Approach to Other	Parkway Intersections:
			Intersection Types:	
		3) when it can be shown	3) when it can be shown	
		that dual lefts will still per-	that dual lefts will still per-	
		mit an acceptable pedestri-	mit an acceptable pedestri-	
		an LOS to be maintained.	an LOS to be maintained.	
Right-Turn	Inappropriate.	To be avoided. The pre-	Inappropriate onto Main	Yes. Where used, Florida
Lanes		ferred option is to provide	Streets. Allowable onto	slip-lane design, with corner
		additional connections in	Avenues, other Boulevards,	islands, is the preferred
		the surrounding street net-	and Parkways, when neces-	treatment. In constrained
		work. May be considered:	sary to meet vehicle LOS.	conditions, provide right
		1) when turning move-	The preferred option is to	turn deceleration lanes at a
		ments are greater than	provide additional con-	minimum.
		through movements, there-	nections in the surround-	
		by affording the possibility	ing street network. Where	
		to eliminate a through lane	used, Florida slip-lane	
		in exchange for right-turn	design, with corner islands,	
		lane;	is the preferred treatment.	
		2) when dropping a lane	Not to be used for entranc-	
		as the street cross-section	es to commercial proper-	
		changes;	ties.	
1				
1				

Table 5.3 Boulevard Intersection Elements (continued)

Element:	Main Street Approach to	Avenue Approach to	Blvd/Blvd Intersections or	Parkway Approach to Blvd/
	Blvd/Main Intersections:	Blvd/Avenue Intersections:	Blvd Approach to Other	Parkway Intersections:
			Intersection Types:	
		3) when turning move-		
		ments are greater than 300		
		vehicles per hour;		
		4) when acceptable pedes-		
		trian LOS can be main-		
		tained.		
Right-Turn	Inapplicable.	Allowable, if necessary to	Allowable, if necessary to	Yes, in conjunction with
Corner Islands		maintain pedestrian LOS	maintain pedestrian LOS,	Florida slip-lane design.
		with a turn lane or as refuge	particularly in conjunc-	
		on wide cross-sections.	tion with Florida slip-lane	
		Where provided, should be	design. Minimum of 50 sf.	
		a minimum of 50 sf., pref-		
		erably landscaped.		
Tapers	Inappropriate.	Inappropriate.	Inappropriate onto Main	Allowable.
			Streets or Avenues. Inap-	
			propriate in most circum-	
			stances at other Boulevards.	
			Allowable at Parkways.	
Bicycle Lanes	Inapplicable. Bikes are ex-	Should be provided. 4'	Should be provided. 5'	Typically inappropriate, but
	pected to travel in mixed	min. When on-street park-	minimum. 6' preferred.	may be allowable to main-
	traffic.	ing exists along the seg-	May also be provided on a	tain bicycle network con-
		ment, bike lanes should be	parallel frontage road, if	nectivity (6' minimum

Boulevard Intersection Elements (continued) **Table 5.3**

Element:	Main Street Approach to	Avenue Approach to	Blvd/Blvd Intersections or	Parkway Approach to Blvd/
	Blvd/Main Intersections:	Blvd/Avenue Intersections:	Blvd Approach to Other	Parkway Intersections:
			Intersection Types:	
		5' minimum with 6' pre-	that increases bicycle LOS.	for adequate separation
		ferred. There should be a	There should be a "receiv-	from high-speed traffic).
		"receiving" lane on the op-	ing" lane on the opposite	Preferred option is to have
		posite side of the intersec-	side of the intersection.	separate facility outside of
		tion. Otherwise, the bike	Otherwise, the bike lane	right-of-way or on parallel
		lane should be dropped just	should be dropped just	local streets.
		prior to the actual intersec-	prior to the actual intersec-	
		tion, to allow the cyclist to	tion, to allow the cyclist to	
		safely merge. The bike lane	safely merge. The bike lane	
		should never be located to	should never be located to	
		the right of an exclusive	the right of an exclusive	
		vehicle turning lane.	vehicle turning lane.	
Curb	Should be provided, at	7' extensions should be	Inappropriate.	Prohibited.
Extensions	same width as on-street	provided where full-time,		
	parking (7'), except at far-	on-street parking exists		
	side bus stops with high	along the segment, except		
	service frequencies.	at far-side bus stops on 2-3		
		lane cross-sections.		
Bus Stops:	Typically located at far	Typically located at far side	Typically located at far side	Typically located at off-
	side of intersection.	of intersection.	of intersection.	street lots or stops. Far side
				stops preferred at intersec-
				tions.

Table 5.3 Boulevard Intersection Elements (continued)

Element:	Main Street Approach to	Avenue Approach to	Blvd/Blvd Intersections or	Parkway Approach to Blvd/
	Blvd/Main Intersections:	Blvd/Avenue Intersections:	Blvd Approach to Other	Parkway Intersections:
			Intersection Types:	
• Pullout	No.	No.	Consider for high frequency bus stop locations.	Yes.
• Curb	Not allowable at far-side	Yes, where full-time, on-	No.	No.
Extension	stops with high service	street parking exists. Do		
Latension	frequencies. May be	not use at far-side on the		
	considered at other stop	2-3 lane cross-sections.		
	locations.			
Curb Radii	The intent in these pe-	The intent is to keep the	The intent is to keep the	The intent is to keep the
	destrian-oriented areas	curb radii as small as pos-	curb radii as small as pos-	curb radii as small as possi-
	is to keep the curb radii	sible. See Appendix D,	sible. See Appendix D,	ble. See Appendix D, "Curb
	as small as possible. See	"Curb Radii" for details.	"Curb Radii" for details.	Radii" for details.
	Appendix D, "Curb Radii"			
	for details.			
ADA Ramps:				•
• Type 1	No.	No.	No.	No.
• Type 2	Yes. The ramp should be	Yes. The ramp should be	Yes. The ramp should be	Yes. The ramp should be
1, pc 2	aimed toward the cross-	aimed toward the cross-	aimed toward the cross-	aimed toward the crosswalk,
	walk.	walk.	walk.	if one exists.
Crosswalks:	Should be provided on	Should be provided on all	Should be provided on all	Should be provided on all
	all legs, unless there is a	legs, unless there is a physi-	legs, unless there is a physi-	legs, unless there is a physi-
	physical restriction or	cal restriction or safety-	cal restriction or safety-	cal restriction or safety-
			1	

Boulevard Intersection Elements (continued) **Table 5.3**

Main Street Approach to	Avenue Approach to	Blvd/Blvd Intersections or	Parkway Approach to Blvd/
Blvd/Main Intersections:	Blvd/Avenue Intersections:	Blvd Approach to Other	Parkway Intersections:
		Intersection Types:	
safety-related reason that	related reason that requires	related reason that requires	related reason that requires
requires otherwise.	otherwise.	otherwise.	otherwise.
Yes, always using en-	Yes, always using enhanced	Yes, always using enhanced	Yes, always using enhanced
hanced marking or en-	marking or enhanced pav-	marking, but not enhanced	marking, but not enhanced
hanced paving.	ing.	paving.	paving.
Should not be located on	Should not be located on	Should not be located on	Should not be located on
the radius.	the radius.	the radius.	the radius.
No.	No.	No.	No.
Yes, if both streets are	Allowable if both streets are	No.	No.
two-lane.	two-lane and signal war-		
	rants not met.		
No.	Allowable, when:	Inappropriate at Main	No.
	1) volumes are less than	Streets and Parkways. Al-	
	35,000;	lowable at Avenues and	
	2) analysis shows that	other Boulevards, when:	
	roundabouts provide	1) volumes are less than	
	higher vehicle LOS than	35,000;	
	signals; and	2) analysis shows that	
		roundabouts provide	
	safety-related reason that requires otherwise. Yes, always using enhanced marking or enhanced paving. Should not be located on the radius. No. Yes, if both streets are two-lane.	safety-related reason that requires otherwise. Yes, always using enhanced marking or enhanced paving. Should not be located on the radius. No. No. No. No. No. No. Should not be located on the radius. No. No. Allowable if both streets are two-lane. No. Allowable, when: 1) volumes are less than 35,000; 2) analysis shows that roundabouts provide higher vehicle LOS than	Blvd/Main Intersections: Blvd/Avenue Intersections: Blvd Approach to Other Intersection Types: related reason that requires otherwise. Yes, always using enhanced marking or enhanced paving. Should not be located on the radius. No. No. No. No. No. No. Allowable if both streets are two-lane. No. Allowable, when: 1) volumes are less than 35,000; 2) analysis shows that roundabouts provide higher vehicle LOS than signals; and Should reason that requires related reason that requires otherwise. Yes, always using enhanced marking, but not enhanced marking, but not enhanced paving. Should not be located on the radius. No. No. No. Inappropriate at Main Streets and Parkways. Allowable at Avenues and other Boulevards, when: 1) volumes are less than 35,000; 2) analysis shows that roundabouts provide higher vehicle LOS than signals; and 2) analysis shows that

Table 5.3 Boulevard Intersection Elements (continued)

Element:	Main Street Approach to	Avenue Approach to	Blvd/Blvd Intersections or	Parkway Approach to Blvd/
	Blvd/Main Intersections:	Blvd/Avenue Intersections:	Blvd Approach to Other	Parkway Intersections:
			Intersection Types:	
		3) provision of roundabout	higher vehicle LOS than	
		does not degrade pedes-	signals; and	
		trian and bicycle LOS.	3) provision of roundabout	
			does not degrade pedes-	
			trian and bicycle LOS.	
• Signals	Yes, depending on war-	Yes. Bus priority should be	Yes. Bus priority should be	Yes. Bus priority should be
	rants. Bus priority should	used where appropriate.	used where appropriate.	used where appropriate.
	be used where appropri-			
	ate.			
• Signal	120 second maximum	120 second maximum cycle	120 seconds preferred, 150	120 seconds preferred, 150
Timing	cycle length (applies to	length (applies to entire	seconds maximum (applies	seconds maximum (applies
	entire Blvd/Main inter-	Blvd/Avenue intersection).	to entire Blvd/Blvd intersec-	to entire Blvd/Parkway in-
	section). The intent is to	The intent is to keep over-	tion). Use whichever most	tersection). Use whichever
	keep overall delay as low	all delay as low as possible,	efficiently 1) minimizes de-	most efficiently 1) mini-
	as possible, while offering	while offering enough time	lay or 2) maximizes vehicle	mizes delay or 2) maximizes
	enough time for pedestri-	for pedestrians to cross.	throughput. The intent is	vehicle throughput. The
	ans to cross.		to keep overall delay as low	intent is to keep overall de-
			as possible, while offering	lay as low as possible, while
			enough time for pedestri-	offering enough time for
			ans to cross.	pedestrians to cross.

Boulevard Intersection Elements (continued) **Table 5.3**

Element:	Main Street Approach to	Avenue Approach to	Blvd/Blvd Intersections or	Parkway Approach to Blvd/
	Blvd/Main Intersections:	Blvd/Avenue Intersections:	Blvd Approach to Other	Parkway Intersections:
			Intersection Types:	
• Right-	No.	Allowable, but should be	Desirable at Blvd/Blvd and	Desirable, depending on
Turn on		avoided in locations with	Blvd/Parkway intersections,	sight distance and potential
Red		a high potential for pedes-	depending on sight distance	for higher volume pedestri-
		trian traffic (in areas that	and pedestrian volumes.	an traffic at the intersection.
		are currently or are planned	Avoid with opposite dual	
		to be pedestrian-oriented	lefts. Allowable at Blvd/	
		retail or mixed-use).	Avenue intersections, but	
			should be avoided in loca-	
			tions with a high potential	
			for pedestrian traffic (in	
			areas that are currently or	
			are planned to be pedestri-	
			an-oriented or mixed-use).	
			Inappropriate onto Main	
			Streets.	
• Pedes-	Yes, with countdown. The	Yes, with countdown. The	Yes, with countdown. The	Yes, with countdown. The
trian	countdown should show	countdown should show	countdown should show	countdown should show
Signals	the total number of sec-	the total number of seconds	the total number of seconds	the total number of seconds
2-8	onds available for cross-	available for crossing. Also	available for crossing. Also	available for crossing. Also
	ing. Also consider audible	consider audible signals	consider audible signals	consider audible signals
	signals (where deemed	(where deemed appropri-	(where deemed appropri-	(where deemed appropri-
	appropriate) and leading	ate) and leading pedestrian	ate) and leading pedestrian	ate).

Table 5.3 Boulevard Intersection Elements (continued)

Element:	Main Street Approach to	Avenue Approach to	Blvd/Blvd Intersections or	Parkway Approach to Blvd/
	Blvd/Main Intersections:	Blvd/Avenue Intersections:	Blvd Approach to Other	Parkway Intersections:
			Intersection Types:	
	pedestrian interval.	interval.	interval. Will typically be	
			actuated.	
• Bicycle	Provide for all Main Street	Provide for left-turns and	Provide for left-turns and	No.
Detectors	approaches to signalized	on through lanes of the	on through lanes of the	
	intersections.	weaker approach legs.	weaker approach legs.	
 Advance 	Yes, at signalized intersec-	Yes. Typically, placed 6-8'	Yes. Typically, placed 6-8'	Allowable. Typically, placed
Stop Bars	tions. Typically, placed	from crosswalk. May be	from crosswalk. When	6-8' from crosswalk. When
	6-8' from crosswalk. May	further back, if necessary to	right-turn-on-red is al-	right-turn-on-red is al-
	be further back, if neces-	allow additional maneuver-	lowed, stagger the stop bars,	lowed, stagger the stop bars,
	sary to allow additional	ing space for vehicles turn-	so that the outside, turning	so that the outside, turning
	maneuvering space for	ing off of the Boulevard.	lane's stop bar is 4' closer to	lane's stop bar is 4' closer to
	vehicles turning off of the	When right-turn-on-red is	the crosswalk than are any	the crosswalk than are any
	Boulevard.	allowed with the four-lane	adjacent lanes' stop bars.	adjacent lanes' stop bars.
		cross-section, stagger the	This allows the turning	This allows the turning
		stop bars, so that the out-	driver to see approaching	driver to see approaching
		side, turning lane's stop bar	traffic without encroaching	traffic without encroaching
		is 4' closer to the crosswalk	into the crosswalk.	into the crosswalk.
		than is the inside lane's stop		
		bar. This allows the turning		
		driver to see approaching		
		traffic without encroaching		
		into the crosswalk.		

Boulevard Intersection Elements (continued) **Table 5.3**

Element:	Main Street Approach to	Avenue Approach to	Blvd/Blvd Intersections or	Parkway Approach to Blvd/
	Blvd/Main Intersections:	Blvd/Avenue Intersections:	Blvd Approach to Other	Parkway Intersections:
			Intersection Types:	
• Bike Box	Inapplicable, since bikes are expected to travel in mixed traffic.	Should be considered, but only if a bike lane approaches the intersection. This bike lane approach need not run the entire length of the segment.	Should be considered, but only if a bike lane approaches the intersection. This bike lane approach need not run the entire length of the segment.	No. If a bike lane exists, use bicycle stop bars, rather than a bike box.
• Bicycle Stop Bars	Inapplicable, since bikes are expected to travel in mixed traffic.	Should be provided if there is a bike lane, but no bike box.	Should be provided if there is a bike lane, but no bike box.	Provide in the rare circumstance that a bike lane exists.
• Grade Separation	No.	No.	No.	No.
Lighting:				
• Street	Yes.	Yes.	Yes.	Yes.
• Pedestrian	Yes.	Should be provided where adjacent land uses or facilities are likely to cause concentrations of pedestrians (at bus stops or in areas that are currently or planned to be pedestrian-oriented retail or mixed-use).	Yes, at Main Streets. Optional at Blvd/Blvd, Blvd/Ave. Atypical at Parkways. Should be provided where adjacent land uses or facilities are likely to cause concentrations of pedestrians (at bus stops or in areas	Atypical, but should be provided in any circumstance where adjacent land uses or facilities are likely to cause concentrations of pedestrians.

Table 5.3 Boulevard Intersection Elements (continued)

Element:	Main Street Approach to	Avenue Approach to	Blvd/Blvd Intersections or	Parkway Approach to Blvd/
	Blvd/Main Intersections:	Blvd/Avenue Intersections:	Blvd Approach to Other	Parkway Intersections:
			Intersection Types:	
			that are planned to be pe-	
			destrian-oriented retail or	
			mixed use).	
Traffic Calming	Typically not necessary,	Consider a combination of	May be appropriate, if nec-	No.
	but may be used to main-	elements on intersection	essary to maintain desired	
	tain desired speeds.	approach to slow traffic	speeds. Lateral shifts and	
		approaching intersection.	some forms of narrowing	
		At the intersection, curb	may be considered. See	
		extensions may be used, for	CDOT's Traffic Calming	
		example (see "Curb Exten-	Report for more informa-	
		sions", above, and CDOT's	tion.	
		Traffic Calming Report for		
		more information).		
1				
1				

5.4 Parkway Intersections

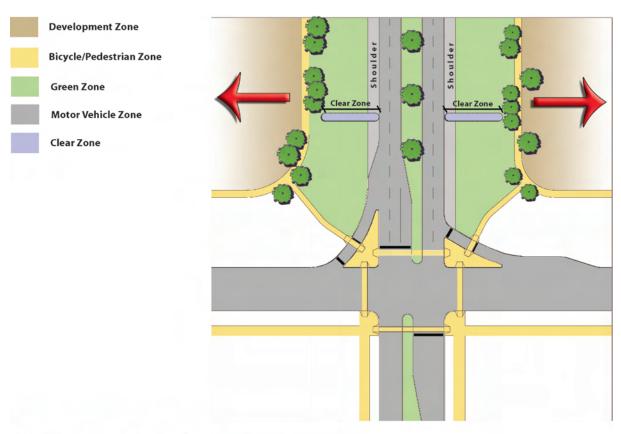
This section describes the features of all (non-local street) intersections that include at least one Parkway approach to the intersection. Parkways serve as high-volume, relatively high-speed intra-urban thoroughfares. Adjacent land uses are assumed to be auto-oriented in both type and design, with access control much more prevalent than on any other street type. Parkways may intersect with all other street types, except Main Streets. While the basic design of a Parkway intersection is intended to serve high volumes of traffic, some design elements may be adjusted to reflect the type of street the Parkway is intersecting.

General Intent:

- (1) Providing motor vehicle capacity and reducing travel delay is a major design goal for Parkway intersections.
- (2) Safety for all users is another important goal, even though motor vehicle level-of-service is emphasized.
- (3) Land uses that would generate large numbers of pedestrians wanting to cross the Parkway should be limited near Parkway intersections.

The following table provides guidance in applying design elements to different types of Parkway intersections. The column headings refer to the various possible types of approach legs. The "Parkway Approach" column should be used to assess Parkway-to-Parkway intersections, as well as the Parkway approach to any of the other intersection types (Parkway-to-Avenue, and Parkway-to-Boulevard). For a discussion of Parkways intersecting Local Streets, see "Local Street Intersections", Section 5.5.

Parkway Intersections 5.4



Parkway Intersections

Diagram reflects possible scenarios and intersection may vary slightly in design. For specific information refer to the guidelines on Table 5.4

Table 5.4 Parkway Intersection Elements

Element:	Main Street Approach:	Avenue Approach to Parkway/Avenue Intersection:	Boulevard Approach to Parkway/Boulevard Intersection:	Pkwy/Pkwy Intersection or Parkway Approach to Other Intersection Types:
Level of Service (L	OS):			
Pedestrian LOS Objective	Not a valid intersection type.	LOS D for the entire Parkway/ Avenue intersection.	LOS D for the entire Park- way/Boulevard intersec- tion.	LOS D for the entire Parkway/Parkway intersection.
Bicycle LOS Objective	Not a valid intersection type.	LOS C/D for the entire Parkway/Avenue intersection.	LOS C/D for the entire Parkway/Boulevard inter- section.	LOS D for the entire Parkway/Parkway intersection.
Motor Vehicle V/C Threshold	Not a valid intersection type.	.95, for two consecutive AM or PM hours, for the entire Parkway/Avenue intersection.	.95, for BOTH one AM and one PM hour, for the entire Parkway/Blvd intersection.	.90, for BOTH one AM and one PM hour, for the entire Parkway/Parkway intersection.
Median	Not a valid intersection type.	Atypical. When provided, should be a minimum width of 6' at intersections (8' preferred if the Avenue approaches have land uses likely to generate heavy pedestrian traffic).	Should be provided, with a minimum width of 6' at the intersection.	Yes, preferably 9' wide at the intersection, 6' minimum. 8' minimum at Avenues if Avenue approaches have land uses likely to generate pedestrian traffic across the Parkway approaches.
Pedestrian Refuge Island	Not a valid intersection type.	Desirable, particularly on 4 lane sections. To be provided either by extending the	Yes, created by extending the median through the crosswalk (6' minimum	Yes, created by extending the median to the crosswalk (6'-8 minimum as described

Parkway Intersection Elements (continued) Table 5.4

Element:	Main Street	Avenue Approach to	Boulevard Approach to	Pkwy/Pkwy Intersection or
	Approach:	Parkway/Avenue Intersection:	Parkway/Boulevard	Parkway Approach to Other
			Intersection:	Intersection Types:
		median to the crosswalk or	width, face-of-curb to face-	above for medians, 9' pre-
		by providing a separate, 6'	of-curb).	ferred).
		minimum, pedestrian refuge,		
		measured face-of-curb to face-		
		of-curb.		
Number of	Not a valid intersec-	Typically, 1 to 2 lanes in each	Typically 2 lanes in each	2 or 3 lanes in each direc-
Through Lanes	tion type.	direction.	direction.	tion.
Left-Turn Lane	Not a valid intersec-	Will be provided with the 3-	Should be provided, ideally	Should be provided, ideally
	tion type.	lane cross-section. Allowable	11' wide. In constrained	11' wide. In constrained
		on 4 lane cross-sections. 10'	situations, may be 10' wide.	conditions, may be a mini-
		turn lanes suitable. 9' turn		mum of 10' wide. Should
		lanes allowable in constrained		preferably include a 4' offset
		situations.		and an edge line, if there is
				no curb on the median.
Dual Left-Turn	Not a valid intersec-	Should be avoided. The pre-	Allowable. The preferred	Allowable, though the
Lanes	tion type.	ferred option is to try the lon-	option is to try the longest	overall dimensions of the
		gest possible storage lane and	possible storage lane and	intersection can become
		green time for a single left-	green time for a single left-	detrimental to the Avenue
		turn first and/or to provide	turn first and/or to provide	or Boulevard environments.
		additional connections in the	additional connections	The preferred option is to
		surrounding street network.	in the surrounding street	try the longest possible stor-
		May be considered:	network.	age lane and green time for

Table 5.4 Parkway Intersection Elements (continued)

Element:	Main Street	Avenue Approach to	Boulevard Approach to	Pkwy/Pkwy Intersection or
	Approach:	Parkway/Avenue Intersection:	Parkway/Boulevard	Parkway Approach to Other
			Intersection:	Intersection Types:
		1) when turning movements		a single left-turn first and/or
		are greater than through		to provide additional con-
		movements, thereby affording		nections in the surrounding
		the possibility to eliminate a		street network.
		through lane in exchange for		
		the dual left;		
		2) when turning movements		
		are greater than 400 vehicles		
		per hour;		
		3) when it can be shown that		
		dual lefts will still permit an		
		acceptable pedestrian LOS to		
		be maintained.		
Right-Turn	Not a valid intersec-	To be avoided. The preferred	Allowable, when necessary	Yes, though they should be
Lanes	tion type.	option is to provide additional	to meet vehicle LOS. The	very carefully considered
		connections in the surround-	preferred option is to pro-	and designed when they are
		ing street network. May be	vide additional connections	allowing turns onto Av-
		considered:	in the surrounding street	enues. Where used, Florida
		1) when turning movements	network. Where used,	slip-lane design, with cor-
		are greater than through	Florida slip-lane design,	ner islands, is the preferred
		movements, thereby affording	with corner islands, is the	treatment. In constrained
		the possibility to eliminate a	preferred	conditions, provide

Parkway Intersection Elements (continued) Table 5.4

Element:	Main Street	Avenue Approach to	Boulevard Approach to	Pkwy/Pkwy Intersection or
	Approach:	Parkway/Avenue Intersection:	Parkway/Boulevard	Parkway Approach to Other
			Intersection:	Intersection Types:
		through lane in exchange for	treatment. Not to be used	right turn deceleration lanes
		right-turn lane;	for entrances to commer-	at a minimum.
		2) when dropping a lane as the	cial properties.	
		street cross-section changes;		
		3) when turning movements		
		are greater than 300 vehicles		
		per hour;		
		4) when acceptable pedestrian		
		LOS can be maintained.		
Right-Turn	Not a valid intersec-	Allowable, if necessary to	Allowable, if necessary to	Yes, in conjunction with
Corner Islands	tion type.	maintain pedestrian LOS with	maintain pedestrian LOS,	Florida slip-lane design.
		a turn lane or as refuge on	particularly in conjunc-	
		wide cross-sections. Where	tion with Florida slip-lane	
		provided, should be a mini-	design. Minimum of 50 sf.	
		mum of 50 sf., preferably land-		
		scaped.		
Tapers	Not a valid intersec-	Inappropriate.	Allowable.	Inappropriate onto Avenues.
	tion type.			Allowable onto Boulevards
				or other Parkways.
Bicycle Lanes	Not a valid intersec-	Should be provided. 4' mini-	Should be provided. 5'	Typically inappropriate, but
	tion type.	mum. When on-street parking	minimum. 6' preferred.	may be allowable to main-
		exists along the segment, bike	May also be provided on	tain bicycle network

Table 5.4 Parkway Intersection Elements (continued)

Element:	Main Street	Avenue Approach to	Boulevard Approach to	Pkwy/Pkwy Intersection or
	Approach:	Parkway/Avenue Intersection:	Parkway/Boulevard	Parkway Approach to Other
			Intersection:	Intersection Types:
		lanes should be 5' minimum,	a parallel frontage road, if	connectivity (6' minimum,
		with 6' preferred. There	that increases bicycle LOS.	for adequate separation
		should be a "receiving" lane on	There should be a "receiv-	from high-speed traffic).
		the opposite side of the inter-	ing" lane on the opposite	Preferred option is to have
		section. Otherwise, the bike	side of the intersection.	separate facility outside of
		lane should be dropped just	Otherwise, the bike lane	right-of-way or on parallel
		prior to the actual intersection,	should be dropped just	local streets.
		to allow the cyclist to safely	prior to the actual intersec-	
		merge. The bike lane should	tion, to allow the cyclist to	
		never be located to the right	safely merge. The bike lane	
		of an exclusive vehicle turning	should never be located to	
		lane.	the right of an exclusive	
			vehicle turning lane.	
Curb Extensions	Not a valid intersec-	7' extensions should be pro-	Inappropriate.	Prohibited.
	tion type.	vided where full-time, on-		
		street parking exists along the		
		segment, except at far-side bus		
		stops on 2-3 lane cross-sec-		
		tions.		
Bus Stops:	Not a valid intersec-	Typically located at far side of	Typically located at far side	Typically located at off-street
	tion type.	intersection.	of intersection.	lots or stops. Far side stops
				preferred at intersections.

Parkway Intersection Elements (continued) Table 5.4

Element:	Main Street	Avenue Approach to	Boulevard Approach to	Pkwy/Pkwy Intersection or
	Approach:	Parkway/Avenue Intersection:	Parkway/Boulevard	Parkway Approach to Other
			Intersection:	Intersection Types:
Pullout	Not a valid intersec-	No.	Consider for high frequen-	Yes.
_ ,,,,,,,,,,,,,,,,,,,,,,,,,,,,,,,,,,,,,	tion type.		cy bus stop locations.	
• Curb	Not a valid intersec-	Yes, where full-time, on-street	No.	No.
Extension	tion type.	parking exists. Do not use at		
		far-side on the 2-3 lane cross-		
		sections.		
Curb Radii	Not a valid intersec-	The intent is to keep the curb	The intent is to keep the	The intent is to keep the
	tion type.	radii as small as possible. See	curb radii as small as pos-	curb radii as small as possi-
		Appendix D, "Curb Radii" for	sible. See Appendix D,	ble. See Appendix D, "Curb
		details.	"Curb Radii" for details.	Radii" for details.
ADA Ramps:				
• Type 1	Not a valid intersec-	No.	No.	No.
71	tion type.			
• Type 2	Not a valid intersec-	Yes. The ramp should be	Yes. The ramp should be	Yes. The ramp should be
71	tion type.	aimed toward the crosswalk.	aimed toward the cross-	aimed toward the crosswalk,
			walk.	if one exists (which is atypi-
				cal at these intersections).
Crosswalks:	Not a valid intersec-	Should be provided on all	Should be provided on all	Should be provided on all
	tion type.	legs, unless there is a physical	legs, unless there is a physi-	legs where there are side-
		restriction or safety-related	cal restriction or safety-re-	walks, unless there is a
		reason that requires otherwise.	lated reason that requires	physical restriction or safety-
			otherwise.	related reason that requires

Table 5.4 Parkway Intersection Elements (continued)

Element:	Main Street	Avenue Approach to	Boulevard Approach to	Pkwy/Pkwy Intersection or
	Approach:	Parkway/Avenue Intersection:	Parkway/Boulevard	Parkway Approach to Other
			Intersection:	Intersection Types:
				otherwise.
Marked	Not a valid intersec-	Yes, always using enhanced	Yes, always using enhanced	Yes, always using enhanced
	tion type.	marking or enhanced paving.	marking, but not enhanced	marking, but not enhanced
			paving.	paving.
• Location	Not a valid intersec-	Should not be located on the	Should not be located on	Should not be located on the
	tion type.	radius.	the radius.	radius.
Traffic Control:				
• Two-Way Stop	Not a valid intersection type.	No.	No.	No.
• Four-Way Stop	Not a valid intersection type.	Allowable if both streets are two-lane and signal warrants not met.	No.	No.
• Round- about	Not a valid intersection type.	No.	No.	No.
• Signals	Not a valid intersec-	Yes. Bus priority should be	Yes. Bus priority should be	Yes. Bus priority should be
	tion type.	used where appropriate.	used where appropriate.	used where appropriate.
• Signal	Not a valid intersec-	120 second maximum cycle	120 seconds preferred, 150	Parkway/Parkway intersec-
Timing	tion type.	length (applies to entire Park-	seconds maximum (applies	tions are likely to be grade
		way/Avenue intersection). The	to entire Parkway/Blvd in-	separated. If signalized, 150
		intent is to keep overall delay	tersection). Use whichever	seconds maximum (applies
		as low as possible, while	most efficiently	to entire Parkway/Parkway

Parkway Intersection Elements (continued) Table 5.4

Element:	Main Street	Avenue Approach to	Boulevard Approach to	Pkwy/Pkwy Intersection or
	Approach:	Parkway/Avenue Intersection:	Parkway/Boulevard	Parkway Approach to Other
			Intersection:	Intersection Types:
		offering enough time for pedestrians to cross.	1) minimizes delay or 2) maximizes vehicle throughput. The intent is to keep overall delay as low as possible, while offering enough time for pedestrians to cross.	intersection). Use whichever most efficiently 1) minimizes delay or 2) maximizes vehicle throughput.
• Right-Turn on Red	Not a valid intersection type.	Allowable, but should be avoided in locations with a high potential for pedestrian traffic (in areas that are currently or are planned to be pedestrian-oriented retail or mixed-use).	Desirable, depending on sight distance and pedestrian volumes. Avoid with opposite dual lefts.	Desirable, depending on sight distance and potential for higher volume pedestrian traffic at the intersection (apply carefully at Avenues).
• Pedestrian Signals	Not a valid intersection type.	Yes, with countdown. The countdown should show the total number of seconds available for crossing. Also consider audible signals (where deemed appropriate) and leading pedestrian interval.	Yes, with countdown. The countdown should show the total number of seconds available for crossing. Also consider audible signals (where deemed appropriate) and leading pedestrian interval. Will	Yes, where crosswalks exist at the intersection, with countdown. The countdown should show the total number of seconds available for crossing. Also consider audible signals (where deemed appropriate).

Table 5.4 Parkway Intersection Elements (continued)

Element:	Main Street	Avenue Approach to	Boulevard Approach to	Pkwy/Pkwy Intersection or	
	Approach:	Parkway/Avenue Intersection:	Parkway/Boulevard	Parkway Approach to Other	
			Intersection:	Intersection Types:	
			typically be actuated.		
• Bicycle	Not a valid intersec-	Provide on through lanes of	Provide for through lanes	No.	
Detectors	tion type.	the weaker approach legs.	of the weaker approach		
2 00000010			legs.		
 Advance 	Not a valid intersec-	Yes. Typically, placed 6-8'	Yes. Typically, placed 6-8'	Allowable. Typically, placed	
Stop Bars	tion type.	from crosswalk. May be fur-	from crosswalk. When	6-8' from crosswalk. When	
1		ther back, if necessary to allow	right-turn-on-red is al-	right-turn-on-red is allowed,	
		maneuvering space for vehicles	lowed, stagger the stop bars,	stagger the stop bars, so that	
		turning off of the Parkway.	so that the outside, turning	the outside, turning lane's	
		When right-turn-on-red is	lane's stop bar is 4' closer to	stop bar is 4' closer to the	
		allowed with the four-lane	the crosswalk than are any	crosswalk than are any ad-	
		cross-section, stagger the stop	adjacent lanes' stop bars.	jacent lanes' stop bars. This	
		bars, so that the outside, turn-	This allows the turning	allows the turning driver	
		ing lane's stop bar is 4' closer	driver to see approaching	to see approaching traffic	
		to the crosswalk than is the	traffic without encroaching	without encroaching into	
		inside lane's stop bar. This	into the crosswalk.	the crosswalk.	
		allows the turning driver to see			
		approaching traffic without			
		encroaching into the cross-			
		walk.			

Parkway Intersection Elements (continued) Table 5.4

Element:	Main Street	Avenue Approach to	Boulevard Approach to	Pkwy/Pkwy Intersection or
	Approach:	Parkway/Avenue Intersection:	Parkway/Boulevard	Parkway Approach to Other
			Intersection:	Intersection Types:
• Bike Box	Not a valid intersec-	Should be considered, but only	Should be considered, but	No. If a bike lane exists, use
	tion type.	if a bike lane approaches the	only if a bike lane ap-	bicycle stop bars, rather than
		intersection. This bike lane	proaches the intersection.	a bike box.
		approach need not run the	This bike lane approach	
		entire length of the segment.	need not run the entire	
			length of the segment.	
• Bicycle	Not a valid intersec-	Should be provided if there is	Should be provided if there	Provide in the rare circum-
Stop Bars	tion type.	a bike lane, but no bike box.	is a bike lane, but no bike	stance that a bike lane exists.
			box.	
• Grade	Not a valid intersec-	No.	No.	Allowable, for Parkway/
Separation	tion type.			Parkway. No for other inter-
1				sections.
Lighting:		_		
• Street	Not a valid intersection type.	Yes.	Yes.	Yes.
• Pedestrian	Not a valid intersec-	Optional. Should be provided	Atypical. Should be pro-	Atypical, but should be pro-
T CGCCCTTGTT	tion type.	where adjacent land uses or	vided where adjacent land	vided in any circumstance
		facilities are likely to cause	uses or facilities are likely	where adjacent land uses or
		concentrations of pedestrians	to cause concentrations of	facilities are likely to cause
		(at bus stops or in areas that	pedestrians (at bus stops or	concentrations of pedestri-
		are currently or are planned to	in areas that are currently	ans.

Table 5.4 Parkway Intersection Elements (continued)

Element:	Main Street	Avenue Approach to	Boulevard Approach to	Pkwy/Pkwy Intersection or
	Approach:	Parkway/Avenue Intersection:	Parkway/Boulevard	Parkway Approach to Other
			Intersection:	Intersection Types:
		be pedestrian-oriented retail	or are planned to be pe-	
		or mixed-use, e.g.).	destrian-oriented retail or	
			mixed-use, e.g.).	
Traffic Calming	Not a valid intersec-	Consider a combination of	May be appropriate, if nec-	No.
	tion type.	elements on intersection	essary to maintain desired	
		approach to slow traffic ap-	speeds. Lateral shifts and	
		proaching intersection. At the	some forms of narrowing	
		intersection, curb extensions	may be considered. See	
		may be used, for example (see	CDOT's Traffic Calming	
		"curb extensions", above, and	Report for more informa-	
		CDOT's Traffic Calming Re-	tion.	
		port for more information).		

5.5 Local Street Intersections

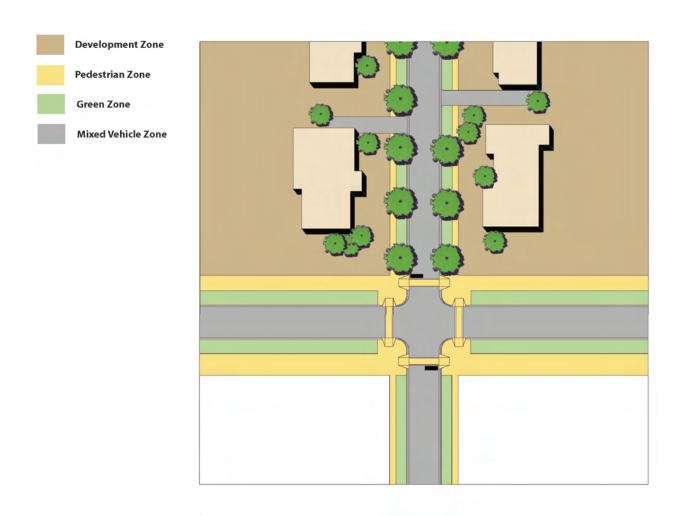
There are three different Local street types (residential, office/commercial, and industrial) and multiple cross-sections for two of those street types (residential and office/commercial). Any of these street types can intersect with any other street type. Intersections between two Local streets should be designed to reflect the primary function of Local streets - providing access to land uses. Intersections between Local streets and non-local streets should be designed to accommodate the lower volumes and modal balance of a Local street, balanced against the higher volumes and wide range of possible functions of the intersecting non-local street. The design recommendations for Local streets should be considered more prescriptive than those for non-local streets, particularly at Local/Local intersections.

Assumed Conditions:

- (1) Local streets provide access to specific (existing or planned) land uses. Traffic volumes and speeds on Local streets will be low.
- (2) Traffic volumes and speeds on Local streets will be low. Intersections of two Local streets should be designed to maintain low-speed, low-volume conditions similar to or lower than those for Main Streets.
- (3) Local streets and their intersections should be designed toward more of a pedestrian orientation than an autoorientation. This is less the case with local *industrial* streets, where higher volumes of truck traffic will require some design features that are not as pedestrian-oriented as those of other Local streets.

The following table provides guidance in applying design elements to different types of Local intersections. The column headings refer to the various possible types of approach legs. The "Local Approach" column should be used to assess all Local-to-Local intersections, as well as the Local approach to any of the other intersection types (Local-to-Main, Local-to-Avenue, Local-to-Boulevard, and Local-to-Parkway).

Local Street Intersections 5.5



Local Street Intersections

This example shows a Medium Residential Street intersection. For specific information on Local Street intersections, refer to the guidelines on Table 5.5

Table 5.5 Local Street Intersection Elements

Element: Level of Service • Pedestrian	Local/Local Intersections or Local Approach to Other Intersections: (LOS) at signalized interse LOS A for the entire Lo-	LOS A for the entire	Avenue Approach to Local/Avenue Intersections: LOS B for the entire	Boulevard Approach to Local/ Blvd Intersections: LOS B for the entire	Parkway Approach to Local/Parkway Intersections: LOS D for the en-
LOS Objective	cal/Local intersection.	Local/Main intersection.	Local/Avenue intersection.	Local/Boulevard intersection.	tire Local/Parkway intersection.
Bicycle LOS Objective	Not applicable (see Appendix A for details).	Not applicable (see Appendix A for de- tails).	LOS B for the entire Local/Avenue inter- section, using the average LOS value of only the Avenue approaches (see Ap- pendix A for details).	LOS B for the entire Local/Blvd inter- section, using the average LOS value of only the Blvd ap- proaches (see Ap- pendix A for details).	LOS C for the entire Local/Park-way intersection, using the average LOS value of only the Parkway approaches (see Appendix A for details).
Motor Vehicle V/C Threshold	1.0, for two consecutive AM or PM hours, for the entire Local/Local intersection.	1.0, for two consecutive AM or PM hours, for the entire Local/Main intersection.	.95, for two consecutive AM or PM hours, for the entire Local/Avenue intersection.	.95, for BOTH one AM and one PM hour, for the entire Local/Blvd intersection.	.90, for BOTH one AM and one PM hour, for the entire Local/Parkway intersection.
Median	Atypical, but allowable under special circumstances, as an aesthetic or	Atypical, but allowable under special circumstances (see Chapter	Atypical. When provided, should be a minimum width	Should be provided, with a minimum width of 6' at the	Yes, preferably 9' wide at the intersection, 6'

Local Street Intersection Elements (continued) Table 5.5

Element:	Local/Local Intersections	Main Street Approach	Avenue Approach to	Boulevard	Parkway Approach
	or Local Approach to	to Local/Main	Local/Avenue	Approach to Local/	to Local/Parkway
	Other Intersections:	Intersections:	Intersections:	Blvd Intersections:	Intersections:
	gateway feature. When	4, Section 4.1). When	of 6' at intersec-	intersection (face-	minimum (face-
	provided, should be a	provided, should be a	tions (face-of-curb	of-curb to face-of-	of-curb to face-of-
	minimum width of 6' at	minimum width of 6'	to face-of-curb), for	curb), for pedestrian	curb), for pedes-
	intersections (measured	at intersections (face-	pedestrian refuge.	refuge.	trian refuge.
	face-of-curb to face-of-	of-curb to face-of-			
	curb), for pedestrian	curb), for pedestrian			
	refuge. Use mountable	refuge.			
	aprons at the intersec-				
	tion to allow tighter curb				
	radii. Avoid on Local				
	Industrial streets.				
Pedestrian	Atypical, but, where a	Atypical, but allowable	Desirable, particu-	Should be provided,	Should be pro-
Refuge	median exists, a paved	at signalized intersec-	larly on 4 lane sec-	by extending the	vided, by extending
Island	portion may serve as	tions, if necessary for	tions. To be provided	median through	the median to the
	pedestrian refuge at	traffic calming. Where	either by extending	through the cross-	intersection. 9'
	the crosswalk, particu-	provided, refuges	the median to the	walk. 6' minimum	preferred width,
	larly at intersections with	should be a minimum	crosswalk or by	width (measured	with 6' mini-
	higher volume Avenues	of 6' wide (measured	providing a separate,	face-of-curb to	mum (measured
	or Boulevards. Where	face-of-curb to face-	6' minimum, pedes-	face-of-curb); 8'	face-of-curb to
	provided, refuges should	of-curb).	trian refuge (mea-	preferred if Local	face-of-curb). 8'
	be a minimum of 6' wide		sured face-of-curb to	approaches have	minimum if Local
	(measured face-of-curb		face-of-curb).	land uses likely to	approaches have

Table 5.5 Local Street Intersection Elements (continued)

Element:	Local/Local Intersections or Local Approach to	Main Street Approach to Local/Main	Avenue Approach to Local/Avenue	Boulevard Approach to Local/	Parkway Approach to Local/Parkway
	Other Intersections:	Intersections:	Intersections:	Blvd Intersections:	Intersections:
	to face-of-curb).			generate pedestrian	land uses likely to
				traffic across the	generate pedestrian
				Boulevard ap-	traffic across the
				proaches.	Parkway approach-
					es.
Number of	No more than 1 in each	No more than 1 in	Typically, 1 to 2 lanes	Typically, 2 lanes in	2 to 3 lanes in each
Through Lanes	direction.	each direction.	in each direction.	each direction.	direction.
Left-Turn	Atypical. Local street	Allowable only with	Will be provided	Should be provided	Should be pro-
Lane	entrances should not be	the 3-lane Main Street	with the 3-lane	where there are	vided where there
	wider than 3 lanes total,	cross-section. Typi-	cross-section. Al-	median openings or	are median open-
	with 2 lanes total pre-	cally, the turn lane will	lowable on 4 lane	left-overs, ideally 11'	ings or left-overs,
	ferred.	be 10' wide.	cross-sections. 10'	wide. In constrained	ideally 11' wide.
			turn lanes suitable.	situations, may be	In constrained
			9' turn lanes allow-	10' wide.	conditions, may
			able in constrained		be a minimum of
			situations.		10' wide. Should
					preferably include
					a 4' offset and an
					edge line, if there
					is no curb on the
					median.

Local Street Intersection Elements (continued) Table 5.5

Element:	Local/Local Intersections	Main Street Approach	Avenue Approach to	Boulevard	Parkway Approach
	or Local Approach to	to Local/Main	Local/Avenue	Approach to Local/	to Local/Parkway
	Other Intersections:	Intersections:	Intersections:	Blvd Intersections:	Intersections:
Dual	Inappropriate.	Inappropriate.	Typically inap-	Typically inap-	Inappropriate.
Left-Turn			propriate. May	propriate. May	
Lanes			be allowable onto	be allowable onto	
			"narrow" Local	"narrow" Local	
			Commercial streets,	Commercial streets,	
			which would be for	which would be for	
			access to campus-	access to campus-	
			style office park set-	style office park set-	
			tings. In that case, a	tings. In that case, a	
			short receiving lane	short receiving lane	
			leading into the site	leading into the site	
			would be provided	would be provided	
			if dual lefts off of a	if dual lefts off of a	
			busy thoroughfare	busy thoroughfare	
			are necessary. This	are necessary. This	
			solution should be	solution should be	
			applied only rarely.	applied only rarely.	
			Dual lefts are inap-	Dual lefts are inap-	
			propriate onto other	propriate onto other	
			Local streets.	Local streets.	

Table 5.5 Local Street Intersection Elements (continued)

Element:	Local/Local Intersections	Main Street Approach	Avenue Approach to	Boulevard	Parkway Approach
	or Local Approach to	to Local/Main	Local/Avenue	Approach to Local/	to Local/Parkway
	Other Intersections:	Intersections:	Intersections:	Blvd Intersections:	Intersections:
Right-Turn	Atypical. Local street ap-	Inappropriate.	Discouraged. The	Allowable. The pre-	Although right-
Lanes	proaches should not be		preferred option is	ferred option is to	turn lanes are the
	wider than 3 lanes total,		to provide additional	provide additional	ideal on Parkways,
	with 2 lanes preferred.		connections in the	connections in the	they should be very
			surrounding street	surrounding street	carefully consid-
			network.	network.	ered and designed
					when they are
					allowing turns
					onto Local Streets.
					The design of
					these lanes should
					discourage con-
					tinuous flow and,
					where used, Florida
					slip-lane design
					with corner islands
					is the preferred
					treatment.

Local Street Intersection Elements (continued) Table 5.5

Element:	Local/Local Intersections	Main Street Approach	Avenue Approach to	Boulevard	Parkway Approach
	or Local Approach to	to Local/Main	Local/Avenue	Approach to Local/	to Local/Parkway
	Other Intersections:	Intersections:	Intersections:	Blvd Intersections:	Intersections:
Right-Turn	Not applicable.	Not applicable.	Inappropriate.	Allowable, if neces-	Yes, if used in
Corner				sary to maintain ac-	conjunction with
Islands				ceptable pedestrian	Florida slip-lane
				LOS with the addi-	design, as dis-
				tion of a right-turn	cussed above
				lane. Minimum of	under "Right-Turn
				50 sf, Florida Slip-	Lanes".
				Lane design pre-	
				ferred.	
Tapers	Inappropriate.	Inappropriate.	Inappropriate.	Typically inappro-	Typically inappro-
				priate, but allowable	priate, but allow-
				onto Local Indus-	able onto Local
				trial streets.	Industrial streets.
Bicycle	Not applicable.	Not applicable.	Should be provided.	Should be provided.	Typically inap-
Lanes			4' minimum. 5'	5' minimum. 6'	propriate, but
			minimum and 6'	preferred. May also	may be allowed, to
			preferred when on-	be provided on a	maintain bicycle
			street parking exists	parallel frontage	network connectiv-
			along the segment.	road, if that creates	ity (6' minimum).
				the safest cycling	Preferred option
				treatment.	is to have separate
					facility outside of

Table 5.5 Local Street Intersection Elements (continued)

Element:	Local/Local Intersections or Local Approach to Other Intersections:	Main Street Approach to Local/Main Intersections:	Avenue Approach to Local/Avenue Intersections:	Boulevard Approach to Local/ Blvd Intersections:	Parkway Approach to Local/Parkway Intersections: right-of-way or on parallel local
Curb Extensions	Should be considered at Local/Local intersections (except for Industrial streets), particularly where there is the likelihood of high pedestrian volumes (such as on "wide" Commercial or Residential streets) and/or the need for traffic calming (as on "medium" or "wide" Residential streets). Should be provided at intersections with Main Streets and are allowed at Avenues.	Should be provided, at same width as onstreet parking (7'), except at far-side bus stops with high service frequencies.	7' extensions should be provided where full-time, on-street parking exists along the segment, except at far-side bus stops on 2-3 lane cross- sections.	Inappropriate.	Inappropriate.

Local Street Intersection Elements (continued) Table 5.5

Element:	Local/Local Intersections or Local Approach to Other Intersections:	Main Street Approach to Local/Main Intersections:	Avenue Approach to Local/Avenue Intersections:	Boulevard Approach to Local/ Blvd Intersections:	Parkway Approach to Local/Parkway Intersections:
Bus Stops:	Allowable far side, near side, or mid-segment.	Typically located at far side of intersection.	Typically located at far side of intersection.	Typically located at far side of intersection.	Typically located at off-street lots or stops. Far side stops preferred at intersections.
• Pullout	Inappropriate in most circumstances, though might be considered at high volume bus stops on "narrow" Local Commercial streets.	No.	No.	Consider for high frequency bus stop locations.	Yes.
• Curb Extension	Typically unnecessary at bus stops, except as described above under the general topic of "curb extensions".	Not allowed at far-side stops with high service frequencies. May be considered at other stop locations.	Should be provided, where full-time, onstreet parking exists. Do not use at farside on the 2-3 lane cross-sections.	No.	No.
Curb Radii	The intent on these low-volume and low-speed streets is to keep the curb radii small. See Appendix D, "Curb Radii" for	The intent in these pedestrian-oriented areas is to keep the curb radii small. See Appendix D, "Curb	The intent is to keep the curb radii as small as possible. See Appendix D, "Curb Radii" for	The intent is to keep the curb radii as small as possible. See Appendix D, "Curb Radii" for	The intent is to keep the curb radii as small as possible. See Appendix D, "Curb Radii" for

Table 5.5 Local Street Intersection Elements (continued)

Element:	Local/Local Intersections or Local Approach to Other Intersections:	Main Street Approach to Local/Main Intersections:	Avenue Approach to Local/Avenue Intersections:	Boulevard Approach to Local/ Blvd Intersections:	Parkway Approach to Local/Parkway Intersections:
	details.	Radii" for details.	details.	details.	details.
ADA Ramps:					
• Type 1	No.	No.	No.	No.	No.
• Type 2	Yes. The ramp should be aimed toward the crosswalk or, in the absence of crosswalks, the opposite sidewalk.	Yes. The ramp should be aimed toward the crosswalk.	Yes. The ramp should be aimed toward the crosswalk.	Yes. The ramp should be aimed toward the crosswalk.	Yes. The ramp should be aimed toward the crosswalk, if one exists.
Crosswalks:	Should be provided on all legs at signalized intersections, unless there is a physical restriction or safety-related reason that requires otherwise. Should also be provided on the Local legs of unsignalized intersections with Non-Local streets. At Local/Local intersections, crosswalks should be provided at locations	Should be provided on all legs at signalized intersections, unless there is a physical restriction or safety-related reason that requires otherwise. Typically would not provide on Main Street approach to unsignalized intersections with Local streets.	Should be provided on all legs at signalized intersections, unless there is a physical restriction or safety-related reason that requires otherwise. Typically would not provide on Avenue approach to unsignalized intersections with Local streets.	Should be provided on all legs at signalized intersections, unless there is a physical restriction or safety-related reason that requires otherwise. Typically would not provide on Blvd approach to unsignalized intersections with Local streets.	Should be provided on all legs at signalized intersections, unless there is a physical restriction or safety-related reason that requires otherwise. Typically would not provide on Parkway approach to unsignalized intersections with

Local Street Intersection Elements (continued) Table 5.5

Element:	Local/Local Intersections or Local Approach to Other Intersections:	Main Street Approach to Local/Main Intersections:	Avenue Approach to Local/Avenue Intersections:	Boulevard Approach to Local/ Blvd Intersections:	Parkway Approach to Local/Parkway Intersections:
	where there is likely to be a high level of pedestrian activity.				Local streets.
• Marked	Yes, always using enhanced marking or enhanced paving.	Yes, always using enhanced marking or enhanced paving.	Yes, always using enhanced marking or enhanced paving.	Yes, always using enhanced marking, but not enhanced paving.	Yes, always using enhanced marking, but not enhanced paving.
• Location	Should not be located on the radius.	Should not be located on the radius.	Should not be located on the radius.	Should not be located on the radius.	Should not be located on the radius.
Traffic Control:					
• Two-Way Stop	Yes.	No.	No.	No.	No.
• Four-Way Stop	Yes, at other Locals and at Main Streets.	Yes, if both streets are two-lane.	No.	No.	No.
• Round- about	Allowable at other Locals, Mains, and, in rare instances, at Avenues. Not at Boulevards or Parkways.	Allowable as a gateway transition.	Allowable for traffic calming when: 1) volumes are less than 35,000; 2) analysis shows that roundabouts provide higher	No.	No.

Table 5.5 Local Street Intersection Elements (continued)

Element:	Local/Local Intersections	Main Street Approach	Avenue Approach to	Boulevard	Parkway Approach
	or Local Approach to	to Local/Main	Local/Avenue	Approach to Local/	to Local/Parkway
	Other Intersections:	Intersections:	Intersections:	Blvd Intersections:	Intersections:
			vehicle LOS than		
			signals;		
			3) provision of		
			roundabout does not		
			degrade pedestrian		
			and bicycle LOS, and		
			4) movements are		
			balanced enough to		
			allow safe exit from		
			the Local Street leg.		
			Typically want to		
			avoid multi-lane		
			roundabouts at these		
			intersections.		
• Signals	Yes, depending on war-	Yes, depending on	Yes, depending on	Allowable, depend-	Rarely.
C	rants, though unlikely at	warrants, with bus	warrants, with bus	ing on warrants,	
	Local/Local intersections.	signal priority, where	signal priority, where	with bus signal	
		appropriate.	appropriate.	priority, where ap-	
				propriate.	

Local Street Intersection Elements (continued) Table 5.5

Element:	Local/Local Intersections	Main Street Approach	Avenue Approach to	Boulevard	Parkway Approach
	or Local Approach to	to Local/Main	Local/Avenue	Approach to Local/	to Local/Parkway
	Other Intersections:	Intersections:	Intersections:	Blvd Intersections:	Intersections:
• Signal	Typically not applicable	90 second cycle length	90 second cycle	120 second maxi-	Local/Parkway in-
Timing	at Local/Local intersec-	preferred, 120 second	length preferred, 120	mum cycle length	tersections are un-
28	tions.	maximum (applies	second maximum	(applies to entire	likely to be signal-
		to entire Local/Main	(applies to entire	Local/Blvd intersec-	ized. If signalized,
		intersection).	Local/Avenue inter-	tion).	120 second maxi-
			section).		mum cycle length
					(applies to entire
					Local/Parkway
					intersection). The
					intent is to keep
					overall delay as low
					as possible, while
					offering enough
					time for pedestri-
					ans to cross.
• Right-Turn	Allowable in rare case	Not allowed.	Allowable, but	Allowable, but	Desirable if signal-
on Red	where a Local/Local		should be avoided in	should be avoided in	ized, depending on
222 230 07	intersection is signalized,		locations with a high	locations with a high	sight distance and
	but should be avoided		potential for pedes-	potential for pedes-	potential for higher
	in locations with a high		trian traffic (in areas	trian traffic (in areas	volume pedestrian
	potential for pedestrian		that are currently or	that are currently or	traffic at the inter-
	traffic. Not allowed at		are planned to be	are planned to be	section.

Table 5.5 Local Street Intersection Elements (continued)

Element:	Local/Local Intersections	Main Street Approach	Avenue Approach to	Boulevard	Parkway Approach
	or Local Approach to	to Local/Main	Local/Avenue	Approach to Local/	to Local/Parkway
	Other Intersections:	Intersections:	Intersections:	Blvd Intersections:	Intersections:
	Main Street intersec-		pedestrian-oriented	pedestrian-oriented	
	tions. Allowable at other		retail or mixed-use).	retail or mixed-use).	
	intersections, but should				
	be avoided in locations				
	with a high potential for				
	pedestrian traffic (in ar-				
	eas that are currently or				
	are planned to be pedes-				
	trian-oriented retail or				
	mixed-use).				
• Pedestrian	Yes, where signal war-	Yes, with countdown.	Yes, with count-	Yes, with count-	Yes, with count-
Signals	rants are met, with	Also consider au-	down. Also con-	down. Also con-	down. Also
Č	countdown. Also consid-	dible signals (where	sider audible signals	sider audible signals	consider audible
	er audible signals (where	deemed appropriate)	(where deemed	(where deemed	signals (where
	deemed appropriate)	and leading pedestrian	appropriate) and	appropriate) and	deemed appropri-
	and leading pedestrian	interval.	leading pedestrian	leading pedestrian	ate).
	interval.		interval.	interval.	
• Bicycle	Provide for all Local	Provide for all Main	Provide for through	Provide for left	Typically, not ap-
Detectors	Street approaches to sig-	Street approaches to	lanes and left turns.	turns.	plicable. Bicycle
	nalized intersections.	signalized intersec-			facilities should be
		tions.			provided as far as
					possible from

Local Street Intersection Elements (continued) Table 5.5

Element:	Local/Local Intersections	Main Street Approach	Avenue Approach to	Boulevard	Parkway Approach
	or Local Approach to	to Local/Main	Local/Avenue	Approach to Local/	to Local/Parkway
	Other Intersections:	Intersections:	Intersections:	Blvd Intersections:	Intersections:
					the travel lanes on
					Parkways.
Advance	Yes, at signalized in-	Yes, at signalized	Yes. Typically, placed	Yes. Typically,	Allowable. Typical-
Stop Bars	tersections. Typically,	intersections. Typi-	6-8' from crosswalk.	placed 6-8' from	ly, placed 6-8' from
	placed 6-8' from cross-	cally, placed 6-8' from	May be further back,	crosswalk. Always	crosswalk. Stagger
	walk. May be further	crosswalk. May be	if necessary for	provide 6-8' mini-	the stop bars when
	back, if necessary for	further back, if neces-	vehicles turning off	mum advance on	right-turn on red
	vehicles turning off of	sary for vehicles turn-	of the other street.	inside lane and	is allowed. This
	the cross street.	ing off of the Local	Always provide 6-8'	stagger the stop bars	allows the turning
		Street.	minimum advance	when right-turn on	vehicle to observe
			on inside lane and,	red is allowed. This	approaching traffic
			with the four-lane	allows the turning	without encroach-
			cross-section, stagger	vehicle to observe	ing into the cross-
			the stop bars when	approaching traffic	walk.
			right-turn on red is	without encroaching	
			allowed. This allows	into the crosswalk.	
			the turning vehicle		
			to observe approach-		
			ing traffic without		
			encroaching into the		
			crosswalk.		

Table 5.5 Local Street Intersection Elements (continued)

Element:	Local/Local Intersections or Local Approach to	Main Street Approach to Local/Main	Avenue Approach to Local/Avenue	Boulevard Approach to Local/	Parkway Approach to Local/Parkway
	Other Intersections:	Intersections:	Intersections:	Blvd Intersections:	Intersections:
Bike Box	Inapplicable, since bikes are expected to travel in mixed traffic.	Inapplicable, since bikes are expected to travel in mixed traffic.	Should be considered, but only if a bike lane approaches the intersection. This bike lane approach need not run the entire length of the segment.	Should be considered, but only if a bike lane approaches the intersection. This bike lane approach need not run the entire length of the segment.	No. If a bike lane exists, use bicycle stop bars, rather than a bike box.
Bicycle Stop Bars	Inapplicable, since bikes are expected to travel in mixed traffic.	Inapplicable, since bikes are expected to travel in mixed traffic.	Should be provided if there is a bike lane, but no bike box.	Should be provided if there is a bike lane, but no bike box.	Provide in the rare circumstance that a bike lane exists.
Grade Separation	No.	No.	No.	No.	No.
Lighting					
• Street	Yes.	Yes.	Yes.	Yes.	Yes.
Pedestrian	Should be provided where adjacent land uses or facilities are likely to cause concentrations of pedestrians (at bus stops or in areas that are	Yes.	Should be provided where adjacent land uses or facilities are likely to cause concentrations of pedestrians (at bus	Should be provided where adjacent land uses or facilities are likely to cause concentrations of pedestrians (at bus	Atypical, but should be provided in any circum- stance where adja- cent land uses or facilities are likely

Local Street Intersection Elements (continued) Table 5.5

Element:	Local/Local Intersections	Main Street Approach	Avenue Approach to	Boulevard	Parkway Approach
	or Local Approach to	to Local/Main	Local/Avenue	Approach to Local/	to Local/Parkway
	Other Intersections:	Intersections:	Intersections:	Blvd Intersections:	Intersections:
	currently or are planned		stops or in areas that	stops or in areas that	to cause concentra-
	to be pedestrian-oriented		are currently or are	are currently or are	tions of pedestri-
	retail or mixed-use, e.g.).		planned to be pedes-	planned to be pedes-	ans.
			trian-oriented retail	trian-oriented retail	
			or mixed-use, e.g.).	or mixed-use, e.g.).	
Traffic	Slow points should be	Typically not neces-	Consider a combi-	May be appropri-	No.
Calming	provided on Local streets	sary, but may be used	nation of elements	ate, if necessary to	
	every 300-500 feet. Stops	to maintain desired	on intersection	maintain desired	
	at intersections can count	speeds.	approach to slow	speeds. Lateral shifts	
	as slow points. Curb		traffic approaching	and some forms	
	extensions and other		intersection. At the	of narrowing may	
	devices can also narrow		intersection, curb	be considered. See	
	the intersection and serve		extensions may be	CDOT's Traffic	
	to calm traffic (see "curb		used, for example	Calming Report for	
	extensions", above, and		(see "curb exten-	more information.	
	CDOT's Traffic Calming		sions", above, and		
	Report for more infor-		CDOT's Traffic		
	mation)		Calming Report for		
			more information).		