202 Speed Management

202.1 General

This chapter describes strategies that may be used to achieve desired operating speeds across all context classifications. The design elements described in this chapter are national best practices for low speed designs and are allowable on arterials and collectors when consistent with the context classification of the roadway.

The ***FDM*** recognizes a range of design speeds for each context classification. For very low speed conditions (35 mph or less) the context classification design speed range indicates the upper end of desirable operating speeds. For instance, the design speed range for C4 is 30-45 mph, but in conditions where on-street parking is present, a 35 mph or lower design speed should be used. Additionally, when the current design speed of a roadway exceeds the allowable range for the context classification, the design elements described in this section can be used to achieve a lower operating speed.

202.1.1 Lane Elimination Projects

Lane elimination projects (a.k.a., “road diets”) are intended to reconfigure the existing cross section to allow other uses. This type of project typically does not move existing curbs, but with the removal of a travel lane(s) may provide space to implement the speed management strategies discussed in this chapter. Lane elimination alone is not a speed management strategy.

See ***FDM 126*** for information on lane elimination projects.

202.2 Speed Management Concepts

Low speed areas will typically have characteristics where conventional controls, such as centerline horizontal curvature, have limited applicability, such as:

- C6, C5 and C2T segments, which may be only a few blocks long and may already be built out, with limited possibility for roadway realignment
- C4 and C3 segments which are only a few blocks long and where reconstruction is not planned (such as a RRR project)
- Any project where interventions are part of a RRR project rather than a reconstruction or realignment, so curb lines are assumed to be fixed.

The design elements shown in ***Table 202.3.1*** are intended to be implemented on RRR projects, but may also be incorporated into New Construction or Reconstruction projects. For new construction or reconstruction projects, it may be possible to provide a centerline curvature to support the desired low speed, in addition to the other techniques described in this chapter.

Table 202.3.1 indicates the appropriate context classification, design speed range, and potential techniques that may be applicable to achieve the indicated design speed. The design elements shown in this table are not exhaustive. Creativity, judgment, and experience in the use of low speed design strategies are encouraged. Successful strategies typically incorporate one or more of the following speed management concepts:

- **Enclosure**: Enclosure is the sense that the roadway is contained in an "outside room" rather than in a limitless expanse of space. Drivers' sense of speed is enhanced by providing a frame of reference in this space. The same sense of enclosure that provides a comfortable pedestrian experience also helps drivers remain aware of their travel speed. Street trees, buildings close to the street, parked cars, and terminated vistas help to keep drivers aware of how fast they are traveling. This feedback system is an important element of speed management.
- **Engagement**: Engagement is the visual and audial input connecting the driver with the surrounding environment. Low speed designs utilize engagement to help bring awareness to the driver resulting in lower operating speeds. As the cognitive load on a driver's decision-making increases, drivers need more time for processing and will manage their speed accordingly. Uncertainty is one element of engagement – the potential of an opening car door, for instance, alerts drivers to drive more cautiously. On-street parking and proximity of other moving vehicles in a narrow-lane are important elements of engagement, as are architectural detail, shop windows, and even the presence of pedestrians.
- **Deflection:** Deflection is the horizontal or vertical movement of the driver from the intended path of travel. Deflection is used to command a driver's attention and manage speeds. Being a physical sensation, deflection is the most visceral and powerful of the speed management tools. Whereas enclosure and engagement rely in part on psychology, deflection relies primarily on physics. Examples includes roundabouts, splitter medians (horizontal deflection), and raised intersections (vertical deflection). Deflection may not be appropriate if they hinder truck or emergency service vehicle access.

202.3 Speed Management Strategies

When selecting appropriate strategies from ***Table 202.3.1***, consider:

- context classification
- desired operating speed
- community vision
- multimodal needs (safety, operations)
- design and emergency vehicles
- access management

Descriptions of each speed management strategy are provided in the following sections of this chapter. Typically, the strategies provided in ***Table 202.3.1*** are most effective when several are used together.

Table 202.3.1 Strategies to Achieve Desired Operating Speed

Context Classification	Design Speed (mph)	Strategies
C1	55-70	Project-specific; see ***FDM 202.4***.
C2	55-70	Project-specific; see ***FDM 202.4***.
C2T	40-45	Roundabout, Lane Narrowing, Horizontal Deflection, Speed Feedback Signs, RRFBs and PHBs
	35	Techniques for 40-45 mph, plus On-street Parking, Street Trees, Short Blocks, Median Islands at Crossings, Road Diet, Bulbouts, Terminated Vista
	30	Techniques for 35-45 mph, plus Chicanes, Median Islands in curved sections, Textured Surface
	≤ 25	Techniques for 30-45 mph, plus Vertical Deflection
C3R, **C3C**	50-55	Project-specific; see ***FDM 202.4***.
	40-45	Roundabout, Lane Narrowing, Horizontal Deflection, Speed Feedback Signs, RRFB and PHB
	35	Roundabout, Lane Narrowing, Horizontal Deflection, Speed Feedback Signs, Median Islands in crossings, Road Diet, RRFB and Hawk, Terminated Vista
C4	40-45	Roundabout, Lane Narrowing, Horizontal Deflection, Speed Feedback Signs, RRFB and PHB
	35	Techniques for 40-45mph plus On-Street Parking, Street Trees, Short Blocks, Median Islands at Crossings, Bulbouts, Terminated Vista
	30	Techniques for 35-45 mph plus Chicanes, Median Islands in Curve Sections, Textured Surface
C5	35	Roundabout, On-street Parking, Street Trees, Short Blocks, Speed Feedback Signs, Median Islands in Crossings, Road Diet, Bulbouts, RRFB and HAWK, Terminated Vista
	30	Techniques for 35 mph plus Chicanes, Median Island in Curve Sections, Textured Surface
	25	Techniques for 30-35 mph plus Vertical Deflection
C6	30	Roundabout, On-Street Parking, Horizontal Deflection, Street Trees, Median Islands in Curve Sections, Road Diet, Bulbouts, Terminated Vista, Textured Surface
	25	Techniques for 30 mph plus vertical deflection

202.3.1 Roundabouts

Roundabouts are effective as a transition from a higher speed context to a lower speed context. On the State Highway System (SHS), modern roundabouts are standard, but smaller roundabouts (sometimes referred to as “mini-roundabouts”) may be appropriate in contexts where operating speeds of 25 mph or less are desired. See ***FDM 213*** for roundabout design criteria.

When used in series, roundabouts can help maintain a low speed condition as an alternative to vertical deflection, stop signs, or traffic signalization. To limit the potential of drivers accelerating between them, spacing should not exceed one-mile on low speed roadway and half-mile on very low speed roadways.

202.3.2 On-Street Parking

In addition to providing parking supply and separating pedestrians from the travel lane, on-street parking can be used to manage speeds when the parking lane is located directly adjacent to the travel lane. For best effect, the parking lane should be of the standard size for the type of parking used (parallel or reverse angle), and the travel lane should be of the minimum width that will accommodate the design vehicle. Effective speed management can be achieved by maximizing the engagement between the parking lane and the travel lane. Where parking is used for speed management, avoid the following:

- installing a bicycle lane between the parking lane and the travel lane
- travel lanes wider than 11 feet.

See ***FDM 210.2.3*** for on-street parking design criteria.

202.3.3 Chicanes

A chicane is a very low speed treatment using deflection of the roadway centerline to achieve horizontal deflection within existing curb. Chicanes place vertical barriers (e.g., curbs, on-street parking) to require vehicle operators to make frequent horizontal movements. To be effective, the chicane deflection should be the width of a parking lane or no less than half of the travel lane width. Transition distance between chicanes is typically 100 feet or more.

An example of a chicane strategy is the placement of on-street parking on alternating sides of the street. This alternating on-street parking pattern may be placed from one block to the next, or within a single block (depending on block length and transition distances). This creates a centerline shift, as illustrated in ***Figure 202.3.1***.

To accommodate a WB-62FL Design Vehicle, chicanes should not be shorter than one-block. For smaller trucks, buses and emergency vehicles, chicanes should not be shorter than half-block.

Figure 202.3.1 Concept Sketch - Midblock Chicane

202.3.4 Lane Narrowing

Use of narrow lanes (less than 12') alone has limited effect on operating speeds. This effect can, however, enhance engagement as traffic volumes increase. The visible narrowing of travel lanes may be used as a transition device to clearly indicate a change in context. For instance, narrowing two 12-foot lanes to two 11-foot or 10-foot lanes by shifting the lane lines slightly and introducing a hatch in the newly-created edge space has been shown to alert drivers of a change in condition or context. To maximize effectiveness, lane narrowing should be used in conjunction with other low speed design elements (e.g., introduction of parking, creation of a median, beginning a chicane).

See ***FDM 210.2*** for lane width criteria on the SHS.

202.3.5 Horizontal Deflection

Horizontal deflection is the redirection of the driver in the horizontal plane through the introduction of a curve, splitter island, or other redirection device. Horizontal deflection is the operating principle behind roundabouts and chicane treatments. Designers may conceive additional ways to introduce horizontal deflection using these same principles.

FDM 210.8.1 has criteria for horizontal deflection of tangent sections of roadway. ***FDM 212.7*** provides criteria for horizontal deflection through intersections.

202.3.6 Street Trees

To be most effective as speed management tools, street trees should be close to the roadway and should form a continuous "wall" effect. When used this way, the street trees reinforce a sense of enclosure. As with most of these tools, street trees along the roadway will be more effective when used in conjunction with other tools. For speed management purposes, designers are encouraged to use street trees whenever possible.

FDM 212.11 and ***FDM 215.2.4*** provide criteria on the placement of street trees. The installation of street trees may require a maintenance agreement with local agency.

202.3.7 Short Blocks

Short blocks of 500 feet or less manage speed by limiting driver acceleration distance between intersections. If used in conjunction with marked crosswalks, short blocks also create engagement. Accentuate the presence of the short blocks to reinforce low-speed and pedestrian-supportive contexts. Creation and enforcement of short blocks can take many forms, from the control of intersections on physically-short blocks to the simulation of short blocks achieved by introducing midblock crossings on longer block segments.

Where physical short blocks already exist, such as most C6 and C5 contexts and many C4 and C2T contexts, consider marking crosswalks at unsignalized intersections to reinforce the presence of the short blocks; see ***FDM 222.2.3.1*** for criteria on marking unsignalized crosswalks. This concept is illustrated in ***Figure 202.3.2***.

Where physical short blocks do not exist, installation of mid-block crossings can be used to simulate the short-block effect, as illustrated in **Figure 202.3.3**.

Figure 202.3.2 Concept Sketch – Mark Crossings to Emphasize Short Blocks

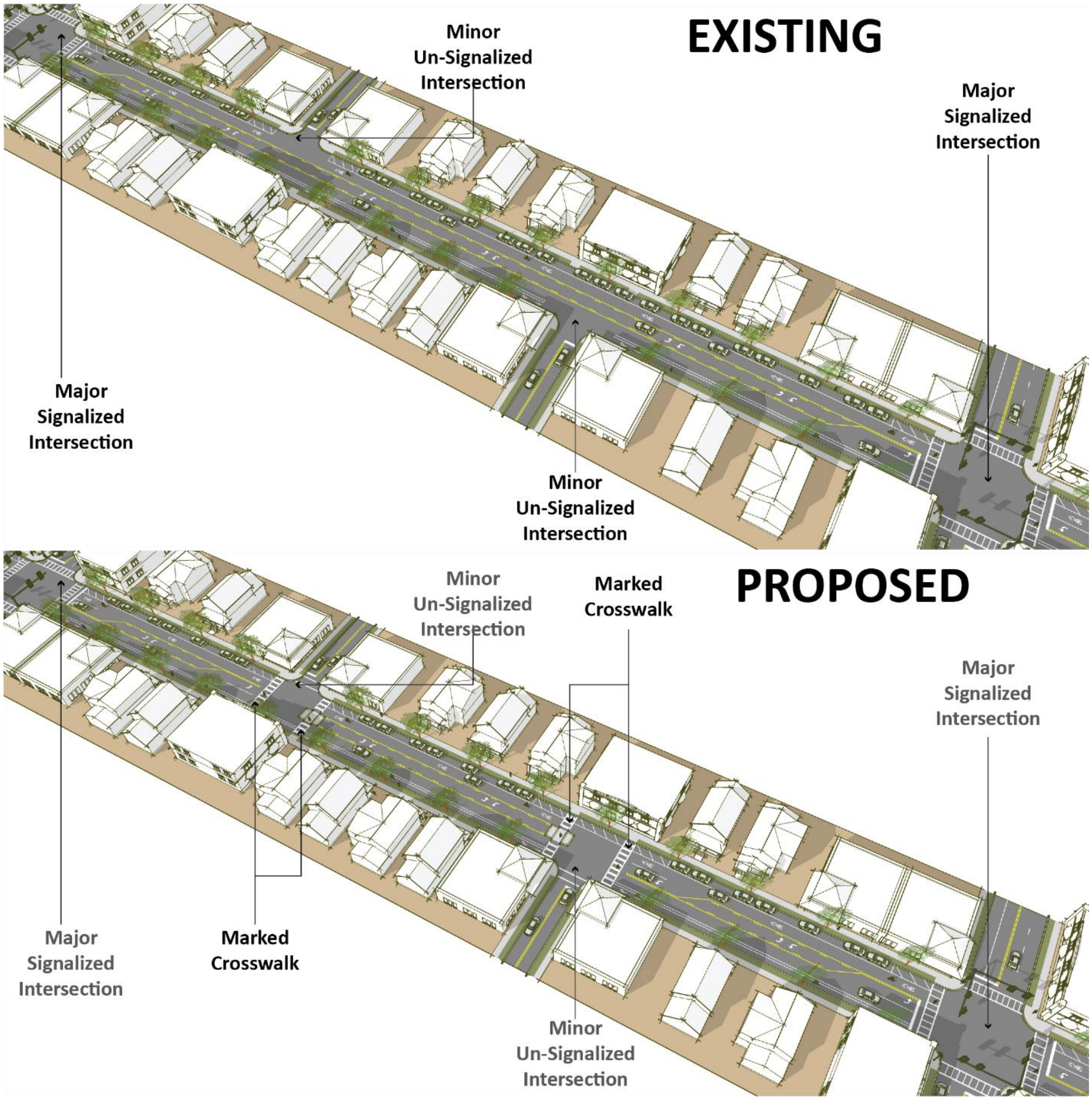
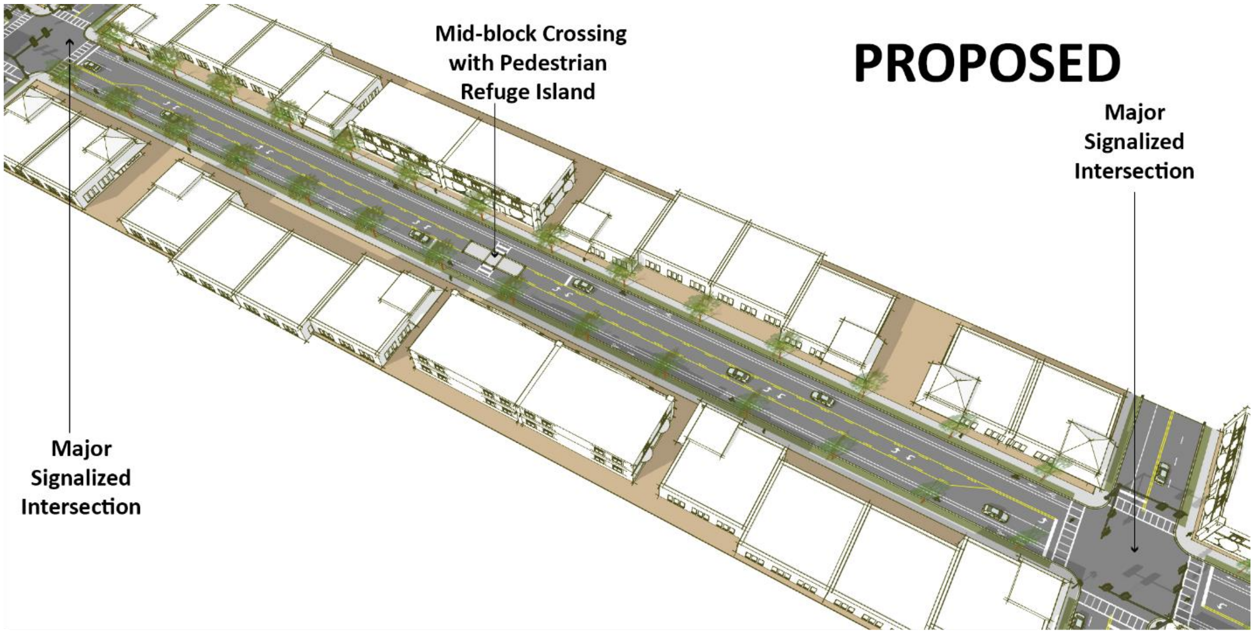


Figure 202.3.3 Concept Sketch- Add a Midblock Crossing to Long Block



202.3.8 Vertical Deflection

Like horizontal deflection, vertical deflection is a well-proven technique for speed management. Speed tables and raised intersections may be considered only for design speed 25 mph or less. High levels of engagement with local public works and emergency services is required when vertical deflection is proposed.

202.3.9 Speed Feedback Signs

Speed feedback signs are a traffic operations strategy that is effective in helping to enforce school zone speed limits. However, this strategy may also require active participation by law enforcement.

The signs provide immediate feedback to drivers when the speed limit is exceeded, which may help to reduce unintentional speeding. They are most effective at managing operating speeds for short distances (about 1,000 feet) following the sign and when combined with other measures such as high emphasis crosswalk markings and median islands. Speed feedback signs should be used only when other physical design interventions are not feasible or appropriate for the location or site conditions. Coordinate with the District Traffic Operations Engineer on the use of this device.

202.3.10 Speed Limit Pavement Marking

Speed limit messages placed directly on the pavement, and adjacent to speed limit signs reinforce a change in speed limit (e.g., at transition areas, on approach to a pedestrian crossing). This strategy should be considered when a speed limit reduction may be unexpected; e.g., transition from a C1 or C2 context to a C2T context, approach to a pedestrian crossing in a rural area. Coordinate with the District Traffic Operations Engineer on the use of speed limit pavement marking.

202.3.11 Median Islands

Median islands (refuge islands) at crossings can provide deflection as well as engagement to help manage operating speeds. Unlike continuous raised medians, median islands are short sections of island used in specific locations. When combined with a crosswalk, the median island provides refuge for pedestrians as well as speed management. See ***FDM 210*** and ***FDM 212.13.2*** for median criteria.

Median islands on curved roadway sections can prevent centerline-crossing by forcing drivers to stay in the travel lane. These are effective in locations where drivers increase speed by overrunning the centerline striping on a shorter-radius curve.

202.3.12 Curb Extensions (Bulb-Outs)

Curb extensions are portions of the curbline extended out into the roadway to provide engagement and deflection. Curb extensions are commonly used at either end of a parking lane. They also shorten crossing distance for pedestrians and may provide space for landscaping or community aesthetic features.

Curb extensions create engagement by extending the curb line to be adjacent to the travel lane. When used at the beginning of a parking lane or as part of a chicane, the curb extension also provides deflection. In some instances, longitudinally-extended bulbouts inside the existing curb lines may be used to narrow the entire length of a roadway segment. In this design, the existing drainage system is preserved and drainage provided through the new curb extensions to existing inlets. Curb extensions at intersections should be designed using a CADD-based vehicle turning path (e.g., AutoTurn) to verify the appropriate design and control vehicles are accommodated.

See ***FDM 222.2.6*** for curb extension criteria.

202.3.13 Rectangular Rapid Flashing Beacons and Pedestrian Hybrid Beacons

The Rectangular Rapid Flashing Beacon (RRFB) and Pedestrian Hybrid Beacon (PHB) traffic control devices are “beacons” rather than signals and consequently have a less restrictive warranting processes. When combined with marked crosswalks, they can be used to establish shorter block lengths. They may also create engagement and thereby help manage operating speeds. Coordinate with the District Traffic Operations Engineer on the application of these devices.

202.3.14 Terminated Vista

The terminated vista creates enclosure by providing an enclosed (terminated) view ahead (vista), indicating a street segment does not extend indefinitely. This is illustrated in ***Figure 202.3.4***. The terminated vista places a building, tree, artwork, or natural view in the driver’s central vision to indicate that a stop or change of direction is imminent.

The terminated vista is a valued and well-understood town planning tool to create a sense of place and enclosure for pedestrians. The effect on drivers is similar. Roundabouts are a common type of terminated vista, especially where a tall vertical element is included in the center island of the roundabout. Other terminated vistas can be created at T-intersections, median splitter islands, and off-set block configurations.

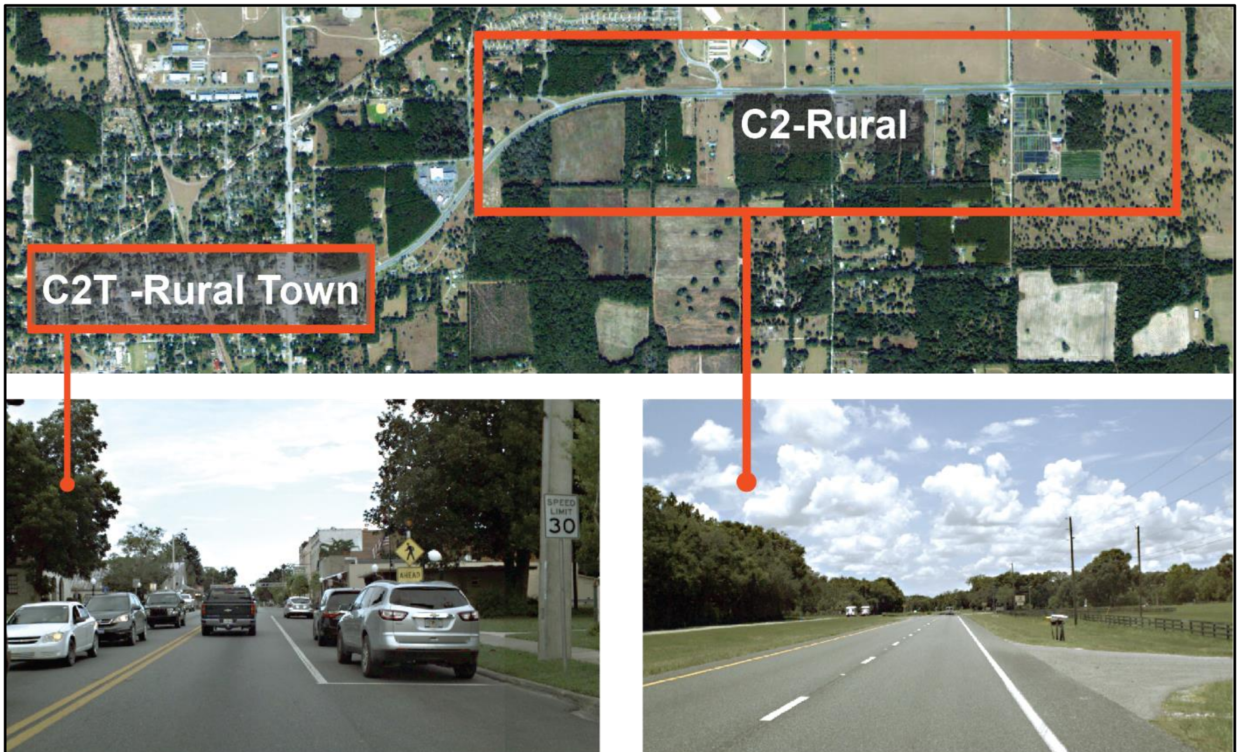
Figure 202.3.4 Concept Sketch – Terminated Vista Example

202.4 Transition Zones

Roadways may traverse more than one context classification. As the context changes, the design criteria for the roadway will also change. The transition from C1 (Natural) or C2 (Rural) context classification to a higher classification such as C2T (Rural Town) provides a potentially abrupt change in the recommended design speed and design users.

For example, the land use surrounding SR 26 through Newberry, Florida transitions from C2 (Rural) to C2T (Rural Town) over the course of a few blocks (see ***Figure 202.4.1***). Such conditions require a transition zone to alert drivers to the context change and to notify them to adjust their behavior and expectations accordingly. Changes in speed limit as part of transition zones must comply with the requirement of the ***Speed Zoning for Highways, Roads, and Streets in Florida***.

Figure 202.4.1 Example of Transition Zone (SR 26 through Newberry, FL)

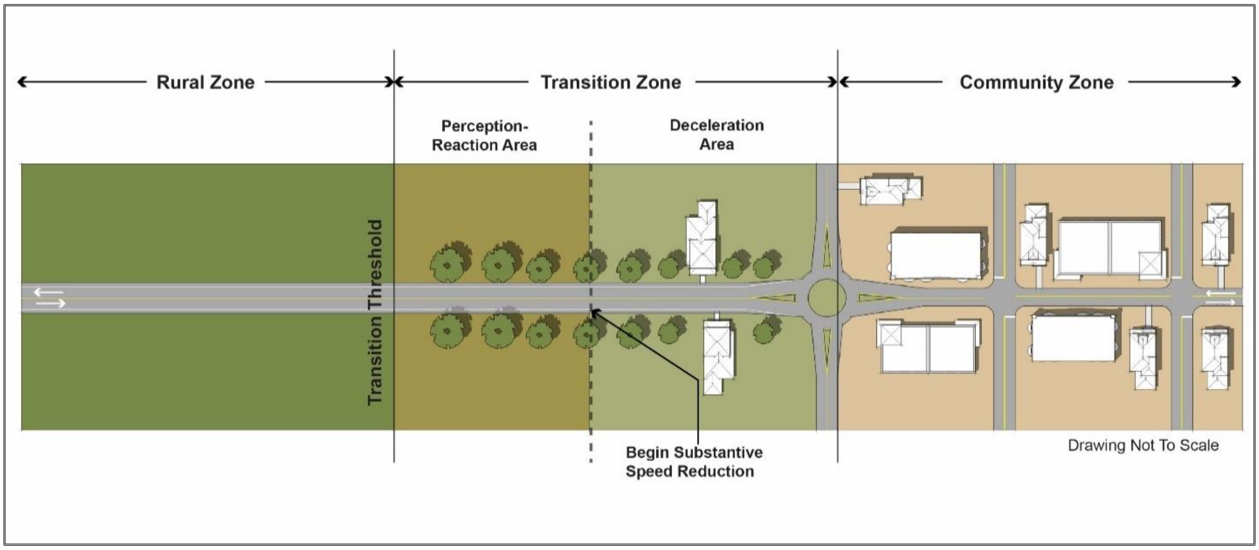


Downtown Newberry, FL C2T-Rural Town *East of Downtown Newberry, FL C2-Rural*

Transition zones have two distinct sections, as illustrated in ***Figure 202.4.2***:

1. Perception-Reaction Area and
2. Deceleration Area

Figure 202.4.2 Transition Zone from C1/C2 to C2T Context Classification



In the perception-reaction area, drivers are made aware of the need to reduce speed. This section will include visual cues to alert the driver of an upcoming deceleration. These cues may include:

- Signage, including warning signs such as “Reduced Speed Limit Ahead” signs, or gateways signs where appropriate.
- Pavement markings: lane narrowing can be highlighted with the use of a wider outside stripe. The speed limit may be placed on the pavement.
- Curb changes: from flush paved shoulders to curbed roadway.
- Architectural elements such as type, location, and spacing of lighting or landscaping.

In the deceleration area, drivers are expected to slow down to an operating speed that matches the context of the community being approached. In the deceleration area, there is a noticeable change in roadway characteristics. The length of the deceleration area is a function of design speed, sight distance, and design criteria of the new context classification. Transition from a high-speed to low-speed cross section can be accomplished through a variety of features, including but not limited to:

- Horizontal deflection (e.g., splitter islands, chicanes, roundabouts)

- Lane narrowing
- Lane elimination
- Introduction of curb and gutter
- Street enclosure through vertical landscaping
- Signage or gateway treatments, including speed feedback signs
- Speed limit pavement markings

A combination of elements is more effective for reducing speed. ***Figures 202.4.3*** and ***202.4.4*** provide an example of horizontal deflection and lane narrowing at the entrance of a rural town.

Figure 202.4.3 Example of a Transition Zone from 60 to 30 mph (SR 636, entrance to town of Wauchula, Florida)

Figure 202.4.4 Section Change Near Transition from 40 to 30 mph (Entrance to Wauchula, FL, showing lane narrowing)

Photo by FDOT District 1