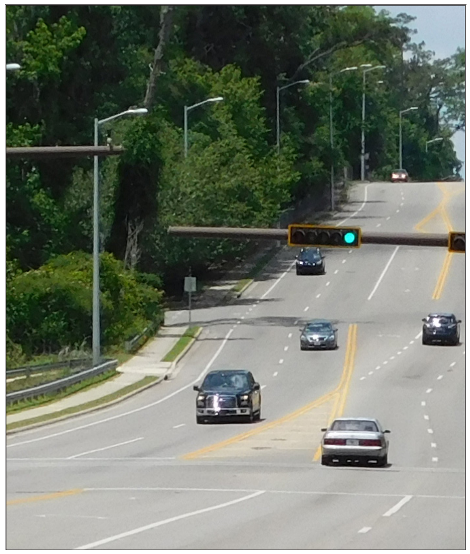
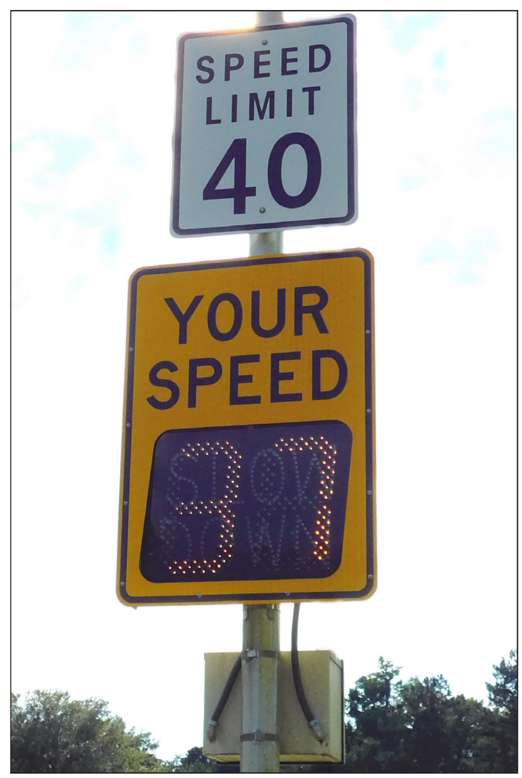
SPEED ZONING

Highways, Roads & Streets in Florida





FDOT

Florida Department Of Transportation
Traffic Engineering & Operations
July 2017

SPEED ZONING FOR HIGHWAYS, ROADS AND STREETS IN FLORIDA
TABLE OF CONTENTS

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SPEED ZONING FOR HIGHWAYS, ROADS AND STREETS IN FLORIDA
Chapter 1
MANUAL ADOPTION PROCEDURE

1.1 PURPOSE

To provide guidelines and recommended procedures for establishing uniform speed zones on State, Municipal, and County roadways throughout the State of Florida.

1.2 AUTHORITY

Chapter 316, Florida Statutes (F.S.) Sections 187, 189, and 1895 Florida Statues (F.S.) Rule 14-15.010, F.A.C., Manual on Uniform Traffic Control Devices (MUTCD).

1.3 SCOPE

This ***Manual*** affects the State Traffic Engineering and Operations Office, State Roadway Design Office, District Traffic Operations Offices, District Design Offices, Florida Counties and Municipalities, District School Boards and anyone else affected by the establishment of speed limits.

1.4 REFERENCE

Topic No. 025-020-002-i, Standard Operating System.

Federal Highway Administration's (FHWA) Manual on Uniform Traffic Control Devices (MUTCD), 2009 Edition, ***https://mutcd.fhwa.dot.gov/kno_2009r1r2.htm***

Manual on Uniform Traffic Studies, Topic No. 750-020-007-d, rev. January 2016, ***http://www.fdot.gov/traffic/TrafficServices/Studies/MUTS/MUTS.shtm***

1.5 DISTRIBUTION

This ***Manual*** is available free of charge at the Department's State Traffic Engineering and Operations Office website:
http://www.fdot.gov/traffic/speedzone/Speed_Zone_Manual.shtm.

1.6 REGISTRATION

Users of this ***Manual*** interested in receiving automatic notifications of revisions to the manual by e-mail may register online through the ***Department's Contact Management Database.***

1.7 REVISIONS AND ADDITIONS

(1) The District Traffic Operations Engineers, the Traffic Services Studies Group and the Director of Traffic Engineering and Operations will constitute the Manual Review Team.

(2) After consultation with the Manual Review Team and any other affected parties, items warranting immediate change will be made with the approval of the State Traffic Operations Engineer.

(3) All revisions will be coordinated through the Forms and Procedures Office prior to implementation.

1.8 TRAINING

None required.

1.9 FORMS

The Vehicle Spot Speed Study Form (Form 750-010-03), Pedestrian and Bicycle Volume Sheet Form (Form 750-020-09) and Gap Study Form (Form 750-020-08) are incorporated by reference into ***Rule 14-15.012 Florida Administrative Code (F.A.C)***, and any revisions, additions, or updates to this form must be coordinated with the Office of General Counsel for Administrative Code update. These forms are available from the ***Department's Forms Library***.

Chapter 2
INTENT OF SPEED ZONING

(1) The FDOT encourages the consideration and implementation of facilities that are designed and operated to enable safe access for all users, including pedestrians, bicyclists, motorists and transit riders of all ages and abilities. Paramount to this effort includes careful evaluation (or re-evaluation) of speed zone locations and proper selection of appropriate posted speed limits.

(2) The primary intent for establishing a speed zone is to improve vehicular and pedestrian safety by reducing the probability and severity of crashes. A speed limit sign notifies the driver of the maximum and/or minimum operating speed that is considered reasonably safe in optimum weather and visibility conditions. It is intended to establish the standard speed limits within which a normally prudent driver can perceive and react safely to driving problems encountered on the roadway.

(3) Speed limit signs are neither costly nor complicated traffic control devices, but more than any other message-conveying sign, they are responsible for communicating a basic element of uniform safe driving advice to the driver. Uniform traffic flow and corresponding safe roadway speed is an important parameter describing the state of a traffic stream and can only be achieved through consistent methods of establishing speed zones, uniform sign design and placement and an effective speed zone enforcement approach. This Manual seeks to fulfill a large measure of this need by explaining the principles, philosophies, and procedures of realistic speed zoning.

(4) The “statutory” or allowable speed limits mandated by state statutes prevail on the types of roads and/or locations identified within state, municipalities and county jurisdictions. Such speed limits may be altered by speed zoning thus creating specific or altered speed limits or restrictions for prescribed segments of highways, roads and residential streets. Statutory limitations however, establish maximum speed limits for state, county, and city road systems.

(5) Any alteration and posting of speed limits on municipal or county streets and roads, as set forth in ***Section 316.189, F.S.***, shall be based on an engineering and traffic investigation that determines such a change is reasonable and in conformity to criteria promulgated by Florida Department of Transportation

(FDOT). Altered speed limits established solely on the basis of opinion are contrary to the intent of the statute.

(6) This ***Manual*** includes guidelines and procedures for performing traffic engineering investigations related to speed zoning in addition to information on the philosophy of speed zoning and the identification of some of the factors to be considered in establishing realistic, safe, and effective speed zones to which meaningful enforcement can be applied.

(7) Throughout this and many other sources on vehicular speed, the term speed zone, speed limit, and speed restriction are used interchangeably. Miles per hour will be referred to as “mph”.

(8) Studies historically have shown that the observed 85th percentile speed generally reflects the collective judgment of the vast majority of drivers as to a reasonable speed for given traffic and roadway conditions.[1] Additionally, whenever minimum speed zones are used, the minimum posted speed should be within 5 mph of the observed 15th percentile speed.[1,2] The upper and lower 15% of the observed speeds are therefore generally considered too fast or too slow for most reasonable drivers under ideal conditions. These extreme high and low out-of-range operating speeds are reasons the practice of speed zoning strives to achieve its objective of providing realistic speed restrictions to which meaningful enforcement can be applied.

(9) Research has also shown that higher traveling speeds are not necessarily associated with an increased risk of being involved in a crash.[3] When drivers travel at the same speed in the same direction, even at high speeds, as on interstates, they are not passing one another and cannot collide as long as they maintain the same travelling speed. Conversely, when drivers travel at different rates of speed, the frequency of crashes increases, especially crashes involving more than one vehicle. The key factor is speed variance. The greater the speed variance or the distribution of speeds the greater the number of interactions among vehicles. Thus, drivers attempting passing maneuvers due to speed variance increase the risk of having collisions.

1 Methods and Practices for Setting Speed Limits: An Informational Report (FHWA-SA-12-004) http://safety.fhwa.dot.gov/speedmgt/ref_mats/fhwasa12004/
2 Texas Department of Transportation, Procedures for Establishing Speed Zones (November 2006).
3 Analyzing Crash Risk Using Automatic Traffic Recorder Speed Data (TRB, Iowa State University 2005) http://www.ctre.iastate.edu/pubs/midcon2005/StoutRecorders.pdf

Chapter 3
DRIVER BEHAVIOR

(1) There are many factors that influence a driver's choice for comfortably selecting an operating speed. The presence and density of adjacent vehicles, weather, road conditions, road geometry, traffic control devices, adjacent land use and other factors are examined in this ***Manual***. A driver's choice of speed is a balance between experience and safety and is often a subconscious reaction to the ambient surroundings.

(2) Human beings are complex and have a wide range of characteristics that can and do influence the driving task. Examples of these characteristics are the visual acuity factor, the reaction process, hearing and physical strength. One of the most important factors is the personality and psychology of the driver. This, however, is not easily quantified for speed zoning purposes and is dealt with primarily through enforcement and licensing procedures that attempt to remove or restrict drivers who periodically display inappropriate tendencies, as indicated by crash and violation experience. Drivers tend to pay less attention to speed limit signs, which they consider unreasonable unless there is an inordinate degree of enforcement. On the other hand, unreasonably low posted speed limits are commonly violated by drivers making enforcement difficult and operating speeds higher than what would exist with proper realistic posted speed limits.

(3) Most drivers on a road segment select a reasonably safe speed based on their conscious and subconscious reaction to many factors as previously mentioned. By obtaining a true measure or profile of the observed range of speeds, a realistic speed can be determined in terms of providing a posted speed limit beyond which enforcement can be applied. As an oversimplification of the procedure, it can be said that drivers, without knowing it, determine their own speed limit. Some motorists persistently drive fast (faster than what would be considered normal for the given conditions), while others drive persistently slow. Although both are disruptive to safe traffic operations, the former is the condition intended to be corrected by the implementation of speed zoning. The following factors have been found to influence a driver's choice of speed:

1) Time of day
2) Length of trip
3) Purpose of trip
4) Number of passengers

5) Type of vehicle
6) Presence and/or history of enforcement (personnel or officially marked vehicle)
7) The interval since witnessing a crash or results of a crash
8) Driver skill
9) Emotional condition of driver
10) Lane width
11) Speed of other vehicles
12) Adjacent land use and intensity
13) Pavement wetness (including standing and running water)
14) Pavement type and condition
15) Traffic volume
16) Presence of Pedestrians, especially children
17) Presence and location of cyclists
18) Ambient light
19) Type of passengers
20) Weather
21) Familiarity of driver with road
22) Condition of vehicle
23) Urgency of trip
24) Running speed for previous 5 or 10 miles of travel
25) Personality of driver
26) Vehicle parking
27) Recent traffic violation and points earned
28) Shoulder width and condition
29) Restrictive lateral clearance
30) Presence of snow, ice, mud, and/or sand on pavement
31) Pavement roughness
32) Alcohol and/or other drugs
33) Personal schedule of driver (Late or on time)
34) Traffic Control Devices
35) In-Vehicle Distractions (Cellular phones, etc.)

(4) Although the cause and effect of all these factors may not be exclusively covered in this ***Manual***, they should be recognized as factors which clearly influence the speed at which a driver travels at any given time.

Chapter 4
TRAFFIC ENGINEERING INVESTIGATIONS

(1) Florida Statutes require an engineering and traffic investigation to be conducted for any alteration of speed limits, mandated in Sections ***316.187*** and ***316.189 F.S.*** These investigations would include, but are not limited to, the measurements of vehicular speed and other traffic engineering evaluations as contained in this ***Manual***. These investigations are intended to be used as a guide when evaluating new potential speed zones or when periodically evaluating existing speed zones on a routine basis.

(2) As an alternative, ***Chapter 5 (Equipment, Conditions, and Data Collection Sites)*** and ***Chapter 14 (Speed Zone Locations)*** of this ***Manual*** explain exceptions to the practice of collecting and analyzing speed data.

4.1 BASIC INVESTIGATIONS

(1) The measurement of prevailing speeds of free-flowing traffic during good weather and roadway conditions is the prime requisite for an investigation and the establishment of a speed limit for any roadway segment. There are three types of common descriptive statistical measures utilized in determining the prevailing speed: ***85th*** percentile speed, upper limit of ***10 mph pace*** and average test run speed. ***(See Manual of Uniform Traffic Studies (MUTS), Chapters 12 and 13)***. The first two measures are determined from raw speed data collected at the investigation site called either a speed check or spot speed study. The third measure is from the average speed of a test run vehicle which is driven through the site a number of times.

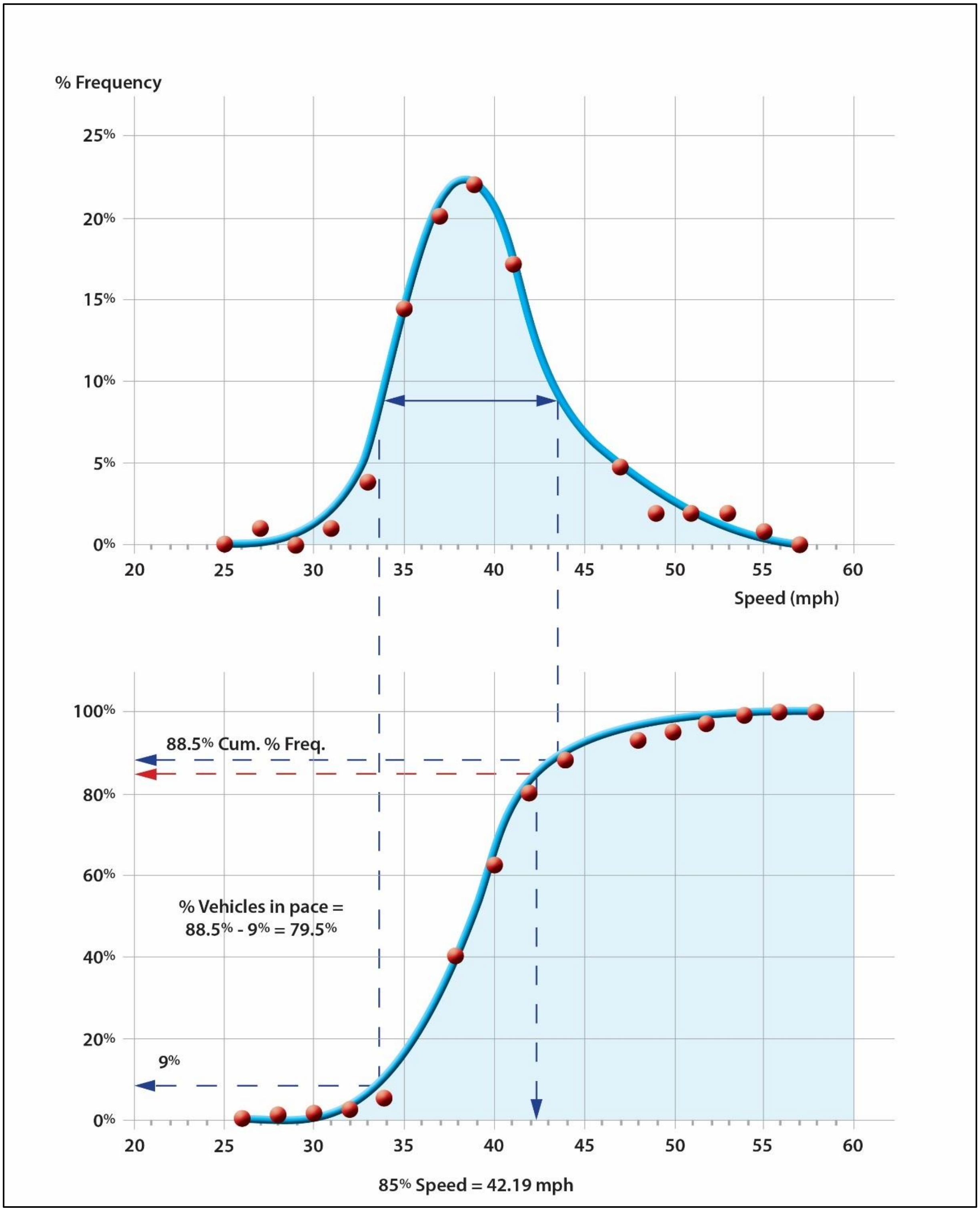
(2) The ***85th*** percentile speed is defined as the speed at or below which 85 percent of the observed free-flowing vehicles are traveling. The ***10 mph pace*** is defined as the 10 mph range containing the highest number of such vehicles contained in the study sample data. The average test run speed is measured using agency vehicles and is usually unnecessary to obtain unless the roadway segment observed has low volumes where a sufficiently large number of vehicles cannot be observed in a reasonable period of time.

(3) The speed frequency and cumulative frequency distribution curves ***(Figure 4-1)*** in addition to the field data collection sheet ***(Figure 7-1)*** reveal important information about the observed speed along a roadway segment. The less variation in vehicular speed at a particular location, the safer the conditions would be. If all vehicles would travel at or near the same speed, there would not be a reason for passing on a two-lane road and much less reason for lane changing on multi-lane roadways. This would result in lower rear-end, head-on, and sideswipe traffic crashes.

(4) Experience has shown that realistic speed limits developed by procedures as outlined in this ***Manual*** will reduce the variance of speeds even though the average, mean, or 85th percentile speed may not change appreciably. This reduced range will result in a higher percentage of vehicles within the 10 mph pace as illustrated by a narrow width bell shaped curve shown in ***Figure 4-1***, and a more sloping, almost vertical, appearance of the center (straight) portion of the S-curve on the bottom portion of the figure.

(5) In the example illustrated in ***Figure 4-1***, the observed 85th percentile speed is less than the upper limit of the 10 mph pace. If the observed 85th percentile speed falls above the upper limit of the 10 mph pace, the speed limit shall be posted at or near the upper limit of the 10 mph pace in accordance with ***Chapter 9 (Determining The Speed Limit)*** of this ***Manual***. In either case, the posted speed should not exceed the design speed for the selected facility (if known) or the maximum speed as allowed by Florida Statutes, except as allowed by ***Section 9.2(3)*** of this ***Manual***.

Figure 4-1
Speed Frequency and Cumulative Frequency Distribution Curves



Chapter 5
EQUIPMENT, CONDITIONS, AND DATA COLLECTION SITES

5.1 GENERAL INFORMATION

(1) Historically, spot speeds are generally measured using one of two methods:

(a) Measurement of travel times as vehicles traverse a short predetermined distance along a roadway segment.

(b) The use of hand-held or fixed-mounted radar, pneumatic tubes placed across travel lanes, or other electromagnetic wave detection devices. The Department's recommended method for speed data collection is the use of calibrated pneumatic tubes that collect 24 hour speed data.

(2) In the early days of vehicular speed enforcement, the primary technique used by police was to place two pneumatic round tubes across a travel lane separated a short distance apart, using a meter to measure the time between successive actuations to determine speed. The short distance between the two road tubes was called a "trap". This is the origin of the common word "speed trap" used today to describe any police speed monitoring location.

(3) For traffic engineering investigations, the simplest and cheapest techniques involve manual use of stopwatches to time vehicles as they traverse an easily recognized trap. This method, however, has been determined to have inherent random systematic errors called "parallax" created by human observation of the trap travel times. An improved and more accurate method to collect speed data today involves automatic time-stamp microprocessor traffic data recorders. These data collectors use the same trap methodology to detect speed, volume and vehicular classification utilizing road tubes placed at predefined spacing with advanced data storage and retrieval capabilities. Other technologies utilizing the trap method include low power infrared scanning and light beam interrupt.

(4) The second speed measuring and data collection method involves the use of hand-held or fixed-mounted devices. Presently, there are three distinct categories that utilize these types of remote sensing technologies, the Doppler-Shift, the Field Magnetic Interrupt and the Vehicular Acoustic Energy detection. Examples of the doppler-shift technologies are the hand-held or fixed-mounted radar units, pole-mounted microwave units and the fixed-mounted ultrasound units. The field magnetic interrupt technology applies to in-roadway inductive loops such as the permanent counting stations operated by the FDOT Transportation Statistics Office that have traffic classifiers capable of providing reliable speed data information. Currently, there is only one source for Acoustic Energy detection device used for speed sensing; however, as modern technology evolves, so will the type and method of speed data collection improve.

(5) The most commonly used device for directly measuring individual vehicle speeds is a radar or laser gun. This device may be handheld, mounted in a vehicle or mounted on a tripod; it is also commonly used by law enforcement agencies. The accuracy of laser and radar units is affected by two errors: round-off error and cosine angle error. Radar units typically display the measured speed in digital form rounded down to the nearest whole number of speed. For example, a reading of 55 mph would mean this estimate was actually between 55 and 56 mph. Laser units typically provide speeds with greater accuracy to one decimal point, but differences may still exist between manufacturers. The cosine angle error occurs because the angle of incidence of the beam to the travel direction of the target vehicle produces a reading on the unit that may be more or less than the actual speed. For more information on cosine angle error correction procedures, see ***Institute of Transportation Engineers (ITE) Manual of Transportation Engineering Studies, 2nd Edition, Chapter 5 (Spot Speed Studies), Section 2.2.2.1 Doppler Measurements.***

(6) Regardless of the method used, every effort must be made to disguise or conceal the fact that speeds are being recorded on any roadway segment, otherwise distorted data will be collected, the analysis of which can lead to unrealistically low speed limits due primarily to the driver’s reaction to a perceived speed trap. A speed survey should be made at times of the day when it is possible to measure a true free flowing traffic, but these conditions do not usually occur during peak traffic hours. An exception would be low volume facilities. Even in light traffic, vehicle platoons may form. In platoon flow, only the first vehicle should be recorded unless all are free flowing. Free flowing traffic is defined as a condition when drivers have relative freedom to choose a traveling speed without interference from other traffic or ambient weather.

(7) Judgment is extremely important when selecting a spot speed study location. A rural area with unchanging lanes, roadway width and character does not require more than one spot speed study. Conversely, more than one sample will need to be taken in areas where drivers are expected to accelerate or decelerate such as in horizontal curves, steep grades, lane merges, etc.

(8) As the land use urbanizes, traffic volumes increase, traffic regulations may change (such as curb parking restrictions), and/or there may be a change in frequency of intersections. The need increases for carefully selecting additional spot speed sites to capture the changes in conditions that affect drivers speed.

(9) The proximity to the following types of conditions should be avoided when selecting spot speed study sites because their effect on drivers will give a distorted or biased speed sample:

(a) Stop signs
(b) School crossing
(c) Railroad crossing
(d) Traffic signal
(e) Bump or dip in roadway
(f) Congested traffic
(g) Steep grade
(h) Construction activity on adjacent road
(i) Horizontal curve
(j) Poor sight distance
(k) Diverge and merging areas
(l) Narrow bridge
(m) Rest Areas
(n) Proximity of Limited Access Interchanges

(10) There are other situations involving the conditions in **Section 5.1(9)** that are sometimes unavoidable and preclude the use of spot speed studies. The following sections describe roadway characteristic conditions that may prove helpful when speed zone alterations are being considered. Other prohibitive locations such as variable speed limit segments and curving subdivision streets are addressed in detail under ***Chapter 14 (Speed Zone Locations).***

5.2 UNCOORDINATED, CLOSELY SPACED TRAFFIC SIGNAL ROADWAY SEGMENTS

(1) Due to the random side street demand and the mainline roadway cycling relationship of uncoordinated signals, there may be times when all signals will be green for a driver. The infrequency of this makes speed data collection a time consuming and tedious procedure and, at best, of questionable value.

Considering the types of streets having traffic signals, it is uncommon to have a speed limit less than the legislative blanket speed of 30 mph; however, by implementing speed zoning, higher speed limits may result.

(2) Selecting a speed limit for these conditions requires traffic engineering knowledge focused on understanding the purpose and function of speed zoning in the interest of safety and traffic operations. In some cases, it is desirable to conduct studies during low volume periods to obtain free flow conditions.

(3) Whenever traffic signals are interconnected for progression, it is advisable to establish a speed limit equal to or higher than the progression speed otherwise drivers may be lured into exceeding the lawful limit.

5.3 CLOSELY SPACED 4-WAY STOP CONTROLLED INTERSECTIONS

As with the condition in the previous section, spot speed studies conducted at closely spaced stop sign controlled intersections are of little value. A more valuable engineering investigation is to re-evaluate some or all of these intersections to determine if they truly meet 4-way stop control conditions ***(See Section 2B.05 of the MUTCD)***. Use of realistic speed zones ***(regulatory)*** and advisory speed ***(warning)*** as outlined in ***Chapter 16 (Other Speed Signs and Terms)*** is an important way to develop proper credibility and respect for implementing speed zoning.

Chapter 6
WHEN TO PERFORM STUDIES

6.1 GENERAL INFORMATION

(1) There are certain time-periods that will need to be considered to capture ideal spot speed data typical of the conditions that should govern realistic speed limits. Studies in Florida have shown wide fluctuations in traffic volumes by time-periods, which may help determine when, and when not to perform speed studies:

(a) Hour of day
(b) Day vs. night
(c) Weekdays vs. weekends
(d) Season of year
(e) Day of week

(2) For example, the measured speed of bumper to bumper, congested traffic is only an indication of an overburdened roadway and its ability to handle a limited capacity at a failing level of service. As traffic demand lessens, the speed begins to increase up to a point when an isolated driver is seldom influenced by any other vehicles. Care must be taken with identifying an appropriate time for the free flowing speed of vehicles whose drivers have a reasonable freedom of choice to travel at speeds predominately set, not by other drivers, but by unconstrained roadway conditions.

(3) Data collection for speed zoning should not occur in the vicinity of intensive enforcement activity or for a few days thereafter. However, data collected before, immediately after, and a week or two later, may prove useful information on the effectiveness of the enforcement. Concealment of survey equipment, observers, and vehicles is more critical than usual because of drivers' sensitivity to enforcement activities.

6.2 EXCEPTIONS

There are time periods other than the normal AM, Noon and PM peak hour traffic fluctuations where exceptions to the rule may be helpful in understanding speed zoning.

6.2.1 DAY VS. NIGHT

Many years ago, the practice of setting the night speed of 5 mph lower than the day speeds was common practice. While this is no longer necessary with improved vehicle capabilities, conditions may exist on individual roadways where different daytime versus nighttime speed limits may be desirable. Examples include coastal areas where combinations of climate consistently produce night time fog.

6.2.2 SEASONS

Although this ***Manual*** repeatedly cautions against performing speed studies when high traffic volumes preclude a free flowing condition, there are some locations in Florida (particularly beach areas) having hourly volumes during peak seasons at such high levels throughout most of the day that congestion becomes the norm and free flowing data is collectable only during the early morning hours.

6.2.3 OTHER APPROACHES

By accepting the fact that speed limits are a maximum speed for ideal conditions, collecting data during off peak hours and establishing the speed limit in accordance with ***Chapter 9 (Determining the Speed Limit)*** should be implemented. Another approach is to provide seasonal speed limits or other time period speed limits such as described in ***Chapter 16 (Other Speed Signs and Terms)***. Whether on a seasonal or daily basis, speed signs can be changed in accordance with the regulations legally established.

CHAPTER 7
SPOT SPEED SAMPLE SIZE

(1) At a minimum, spot speeds of 100 vehicles in each direction should be recorded; or, if traffic volumes are low, all free flowing vehicles during a two-hour time period should be the minimum sample size. When using radar devices, multiple spot speed locations should be recorded. The number of locations is dependent upon site conditions and shall be determined using engineering judgement.

(2) The **FDOT** has developed ***Form No. 750-010-03***, ***Vehicle Spot Speed Study (Figure 7-1 of this Manual)*** to facilitate consistent and uniform field data collection methods. This form is also available in spreadsheet format with built-in macros for automatic data reduction and calculation. Other computer generated reports are commercially available that produce similar outputs and are generally associated with the automatic data collection equipment listed in ***Chapter 5*** **(*Equipment, Conditions, and Data Collection Sites*)** of this manual.

(3) On some low volume roads and streets, a two hour study may contain a small number of measured speeds (up to 50 mph in both directions). It is with this limited data that special consideration should be given to the following:

(a) The best traffic engineering judgment is exercised.

(b) The analyst must be assured that the observer, equipment, and vehicle were sufficiently concealed to take a true, unbiased sample, and;

(c) The need of individual test runs to add depth to the limited data, by driving the road not as a technician, analyst, or engineer, but as a typical driver reacting to perceived conditions.

(d) A minimum of three test runs in each direction should be made and, if in an area where one end of the anticipated zone is adjacent to a higher speed zones, a substantially long running start should be given to acclimate the driver to the roadway environment. A short approach run, particularly from a stopped position, does not represent a normal situation.

(4) Measuring speeds by vehicle classification (cars, trucks, buses, etc.) is not necessary unless the specific speed of such vehicle is of concern.

Figure 7-1
Vehicle Spot Speed Study Form

State of Florida Department of Transportation

Form 750-010-03
TRAFFIC ENGINEERING
10/15

VEHICLE SPOT SPEED STUDY

General Information		Site Information	
Analyst/Observer:	K. Matthews	Location:	137 Miles East of Northfork Cr.
Agency or Company:		City:	
Date Performed:	6/4/2008	County:	Bedford
Time Period From:	9:00 AM To: 11:00 AM	Roadway ID:	Douglas Rd. - C.R. 949
Weather/Road Condition:	Dry, Good	Milepost :	28.83
Posted Speed (mph):	55 MPH	Remarks:	Concealment Quite Difficult

Vehicles traveling bound: Cum Total	Total	20 15 10 5	Speed (mph)	Vehicles traveling East bound: 5 10 15 20	Total	Cum Total	Both Directions: Total	Cum Total
			≥ 80					
			78 - 79.9					
			76 - 77.9					
			74 - 75.9					
			72 - 73.9					
			70 - 71.9					
			68 - 69.9					
			66 - 67.9					
			64 - 65.9					
			62 - 63.9					
			60 - 61.9					
			58 - 59.9					
			56 - 57.9					
			54 - 55.9					
			52 - 53.9		1	104		
			50 - 51.9		2	103		
			48 - 49.9		2	101		
			46 - 47.9		2	99		
			44 - 45.9		5	97		
			42 - 43.9		9	92		
			40 - 41.9		18	83		
			38 - 39.9		23	65		
			36 - 37.9		21	42		
			34 - 35.9		15	21		
			32 - 33.9		4	6		
			30 - 31.9		1	2		
			28 - 29.9			1		
			26 - 27.9		1	1		
			24 - 25.9					
			22 - 23.9					
			20 - 21.9					
			18 - 19.9					
			16 - 17.9					
			14 - 15.9					
			12 - 13.9					
			10 - 11.9					
			≤ 10					
			TOTALS					

Travel Direction 1 →	Speed Data Summary	EAST BOUND	← Travel Direction 2	Both Directions
	85th Percentile Vehicle	88.4		
	85th Percentile Speed	43.1		
	10 mph Pace	33 - 43		

Chapter 8
CALCULATING 85TH PERCENTILE SPEED

To calculate the 85th percentile speed, multiply the total number of vehicles whose speed has been measured and recorded on the form (sample size) by 0.85 which gives the 85th percentile point in the Cumulative (Cum) Total column of the ***Vehicle Spot Speed Study (Figure 7-1)***. Next, mark that point between the two cumulative speed numbers bins where this value falls. If it is one of the bin numbers, take the middle value as the 85th percentile speed and no further calculations are necessary. Otherwise, the 85th percentile speed is determined by graph or interpolating the nearby data points as illustrated in the following example.

8.1 EXAMPLE OF SPEED CALCULATION

Given the data shown in ***Figure 7-1***,

Sample Size = 104 vehicles

85th percentile point is: 104 X 0.85 = 88.4 vehicles

The 85th percentile point falls between (40 – 41.9) Bin and (42 – 43.9) Bin corresponding to 83 and 92 of the CUM TOTAL Column.

Using the middle value of the Bin column,

$$\frac{88.4-92}{92-83}=\frac{\mathrm{x}-43.9}{43.9-41}$$

85th % Speed (x) = 43.1 mph.

(1) The upper limit of the ***10 mph pace*** is determined from the same study sheet. This often can be estimated visually without calculations by looking at the pattern of tally marks. Another way to select the pace, or to verify the visual method, is to scan the data for the highest total number of vehicles within any 10 mph range.

(2) In ***Figure 7-1*** this pace is obvious, and runs from 4 in the (32 – 33.9) mph line to 9 in the (42 – 43.9) mph line. Again, by using the middle value of the bin numbers, the upper limit of this 10 mph pace is 43 mph. The number of vehicles within the 10 mph pace is 90 and the percentage of vehicles within the pace is 86.5%.

Chapter 9
DETERMINING THE SPEED LIMIT

9.1 CRASH DATA CONSIDERATIONS[1]

(1) It is important to understand how speed impacts safety, because setting speed limits is primarily a road safety measure. While the laws of physics make it very clear that speed and crash severity are inextricably linked (i.e., severity increases geometrically as speed increases), the variety of road design and operating characteristics can obscure the precise relationship between speed and crash occurrence.

(2) The most recent research on speed and crash occurrence strongly indicates that, all other factors being equal, increased speeds increase crash occurrence. The magnitude of the increase is dependent on the specifics of each case, with urban areas having the most pronounced relationship and controlled-access facilities the weakest.

(3) For a given roadway type, there is a strong statistical relationship between speed and crash risk for speeds in the range of 15 mph to 75 mph. When the mean speed of traffic is reduced, the number of crashes and the severity of injuries will almost always go down. When the mean speed of traffic increases, the number of crashes and the severity of injuries will usually increase. The relationship between mean travel speed and crash risk can be adequately described in terms of the following model:

$$CMF = \left(\frac{V_a}{V_b}\right)^x$$

CMF = Crash modification factor
V_a = Mean speed in the after condition
V_b = Mean speed in the before condition
X = 3.6 for fatal crash frequency
2.0 for injury crash frequency
1.0 for property-damage-only crash frequency 4.5 for fatalities
2.7 for personal injuries

(4) The relationship between speed and crash risk can be modified to some extent by road environment, vehicle-related factors, and driver behavior. But, the effects of speed on crash risk are consistent across different contexts.

(5) A change in the speed limit almost always changes the mean speed of traffic. However, the changes are not always proportional. For the most part, the change in the mean speed of traffic created by a change in speed limit is around 25 percent of the change in the speed limit. In other words, a speed limit increase or reduction of 6 mph yields about a 1.5 mph raising or lowering of the mean speed, respectively. When this statistic is combined with the power formula equating change in mean speed to crash risk, it is evident that lowering the speed limit will reduce crash risk, and raising the speed limit will increase crash risk.

(6) Whether the safety gains/losses associated with the change in the speed limit is worthwhile must be examined in the context of maintaining reasonable mobility, and other system objectives. In addition, the policy context must be considered because the relationship between travel speed and speed limits indicates that the percentage of violators increases when speed limits are lowered and decreases when speed limits are increased.

(7) It is not possible within the scope of this manual to give details on the evaluation and statistical analysis of traffic crash information. Before and after crash studies are a valid means of measuring degrees of success or failure of any traffic control device or physical change on a given roadway. However, caution must be exercised or false conclusions can be reached if the magnitude, time span or actual number of crashes (including fatalities, injuries and property damage) is not statistically significant to provide valid conclusions.

(8) In addition, crash and fatality rates should be computed to avoid comparison of crash information under different traffic volume conditions, whether it is two different years or months, or simply daytime versus nighttime crashes during the same time period. Crash experience on a section of road (unless a newly constructed or reconstructed road) should definitely be considered; but the fact that crashes have been known to increase on some roads and decrease on others after a speed limit is lowered, should be considered when applying crash data toward the choice of the numerical speed limit.

(9) Generally, a higher number of crashes occur when the speed differential is greatest. Individual speeds at the **85th** percentile level are by definition the safest speed for travel.

1 Methods and Practices for Setting Speed Limits: An Informational Report (FHWA-SA-12-004) http://safety.fhwa.dot.gov/speedmgt/ref_mats/fhwasa12004/

9.2 DESIGN SPEED

(1) AASHTO defines a roadway's design speed as *"Design speed is a selected speed used to determine the various geometric features of the roadway. The assumed design speed should be a logical one with respect to the topography, anticipated operating speed, the adjacent land use, and the functional classification of the highway."* This is the maximum speed prudent drivers would choose when ambient conditions are very good and traffic volumes are light.

(2) The selected design speed must be jointly approved by the District Design Engineer (DDE) and the District Traffic Operations Engineer (DTOE). This includes joint approval that the expected posted speed will not exceed the selected design speed. This is to be documented on the Typical Section Package as described in Section 16.2.3 of the ***FDOT's Plans Preparation Manual*** (forthcoming, 2018). When agreement between the DDE and DTOE on the Design Speed cannot be reached, the DDE and DTOE will forward the matter to the District Director of Transportation Development and District Director of Transportation Operations for final resolution. Note that in some cases it may be appropriate to select a higher design speed to match an expected posted speed and process Design Exceptions or Design Variations for those design elements that do not meet the criteria for the higher speed.

(3) The assumption that a posted speed limit should not exceed a roadway's design speed is not all conclusive. There will be some instances where the observed **85th** percentile speed measures more than the actual roadway design speed. As an example, four or six lane long-tangent urban arterials with traffic signals spaced ½ mile or more and with ample sight distance may exhibit operating speeds of 50 to 60 mph in a 45 mph design speed zone. In this situation, posting a speed limit higher than the roadway design speed is permissible. Careful engineering judgment should be exercised to determine the speed zoning under investigation and if consistency in design speed along these highways have been implemented.

(4) Any modification of posted speed limits after the construction of a State roadway project has been completed is a decision made under the authority of the DTOE, ***(Topic No. 750-010-011)***. This is based on consideration of the **85th** percentile speed and/or 10 mph pace as determined through engineering and traffic investigations described in ***Chapter 8 (Calculating the 85th Percentile Speed)***

of this ***Manual***. When it is determined from this speed study that a posted speed higher than the original design speed may be warranted, the DTOE working with the DDE must process Design Exceptions or Variations for those design elements that do not meet the criteria for the higher speed. When agreement between the DDE and DTOE cannot be reached, the DDE and DTOE will forward the matter to the District Director of Transportation Development and District Director of Transportation Operations for final resolution. Further explanation on how posted speed limits are developed can also be found on the State Traffic Operations web page:
http://www.fdot.gov/traffic/FAQs/SpeedLimitFAQ.shtm

9.3 POSTED SPEED

(1) According to ***Section 2B.13 of the MUTCD***, *"Speed zones (other than statutory speed limits) shall only be established on the basis of an engineering study that has been performed in accordance with traffic engineering practices. The Speed Limit (R2-1) sign shall display the limit established by law, ordinance, regulation, or as adopted by the authorized agency. The speed limits shown shall be in multiples of 5 mph."*

(2) Any alteration and posting of speed limits on municipal or county streets and roads, as set forth in ***Section 316.189 F.S.***, must be based upon an engineering and traffic investigation as promulgated herein by the FDOT. Altered speed limits established solely on the basis of individual or group opinions are contrary to the intent of the statute.

(3) The posted speed limit shall be rounded to the nearest multiple of 5 mph of the observed 85^{th} percentile speed or upper limit of the 10 mph pace, whichever is less. The 10 mph pace is the 10 mph band of travel speeds containing the largest number of observed vehicles. An observed 85^{th} percentile speed that exceeds the 10 mph pace could result from a small percentage of vehicles exceeding the posted speed limit to a greater degree than the average driver traveling within the 10 mph pace.

(4) With rounding, the posted speed limit should not differ from the $\mathbf{85^{th}}$ percentile speed or upper limit of the **10 mph pace** (whichever is less) by more than **3 mph**. Speed limits of more than 8 mph below the 85^{th} percentile speed are not authorized. A speed limit of 4 to 8 mph less than the $\mathbf{85^{th}}$ percentile speed shall be authorized if supported by a supplemental investigation, which identifies the following:

(a) There are road or roadside features not readily obvious to the normally prudent driver, such as length of section, alignment, roadway width, surface condition, sight distance, traffic volume, crash experience, maximum comfortable speed in curves, side friction (roadside development), signal progression, etc.;

(b) Other standard signs and markings have been tried but found ineffective; or

(c) To support a context classification target speed as defined in **Section 9.4** of this ***Manual***.

(5) The existing speed limit within a speed zone will not be changed if the 85th percentile speed or upper limit of the 10 mph pace is within +/- 3 mph of the posted speed limit, unless a supplemental investigation identifies the need for a change.

(6) The posted speed should not exceed the design speed for the selected facility (if known) and shall not exceed the maximum speed as allowed by Florida Statutes, except as allowed by **Section 9.2(3)** of this ***Manual***.

Example:

(7) An observed **85th** percentile speed equal to 42 mph would result in a 40 or 45 mph posted speed limit unless supplemental investigation conditions are met. The 40 or 45 mph limit then could be lowered 5 mph, thus producing a 35 or 40 mph posted speed limit (minimum potential speed limit). The maximum potential posted speed limit would be 45 mph unless the upper limit of the **10-mph pace** is less than 42 mph.

Extreme care must be taken to assure that the condition upon which the 5 mph reduction is based on is not one that a driver may have taken into account either consciously or subconsciously. Otherwise, it will be given double weight and result in an unrealistically low speed limit.

9.4 TARGET SPEED

Target speed is the speed at which vehicles should operate in a specific land use context (in accordance with ***FDOT Complete Streets Handbook***) and consistent with the level of multimodal activity generated by adjacent land uses, to provide mobility for all motor vehicles and a safe environment for pedestrians and bicyclists. The target speed is influenced by both elements of roadway design that are governed by design speed, as well as the form and function of the adjacent uses beyond the right-of-way. When determining the speed limit based on ***this Chapter***, consideration should be given to the land use context classification and target speed range as provided in the Appendix section of the ***Complete Streets Handbook***.

Chapter 10
SPEED ZONE SIGNS

(1) All speed zones and related roadway signs must be in compliance with requirements set forth in ***Part 2 of the MUTCD*** as adopted by the State of Florida, ***Rule 14-15.010, F.A.C***. On one-way streets and on divided roads with ample median space, placement of a pair of speed signs on the left and right sides of the one-way roadway improves communication with drivers. Dual signs are especially important at locations where the speed limit is lowered or varied due to downstream roadway conditions.

(2) The speed sign tabulation sheet in ***Chapter 17*** **(*Speed Zone Establishment and Records)***, lists only those signs essential to providing information to drivers of the change in numerical speed limits. Unless speed zones are short, additional signs should be placed to give reaffirming information to drivers, as well as the new information to drivers turning onto the road from a side street.

(3) The location of speed limit signs shall be in accordance with ***Section 2B.13 of the MUTCD*** which states, *"Speed limit (R2-1) signs, indicating speed limits for which posting is required by law, shall be located at the points of change from one speed limit to another. At the downstream end of the section to which a speed limit applies, a Speed Limit sign showing the next speed limit shall be installed. Additional Speed Limit signs shall be installed beyond major intersections and at other locations where it is necessary to remind road users of the speed limit that is applicable. Speed Limit signs indicating the statutory speed limits shall be installed at entrances to the State and, where appropriate, at jurisdictional boundaries in urban areas."*

(4) Speed reduction warning signs shall be in accordance with ***Section 2C.38 of the MUTCD*** which states: *"A Reduced Speed Limit Ahead (W3-5 or W3-5a) sign should be used to inform road users of a reduced speed zone where the speed limit is being reduced by more than 10 mph, or where engineering judgment indicates the need for advance notice to comply with the posted speed limit ahead."*

*"**Standard**: If used, Reduced Speed Limit Ahead signs shall be followed by a Speed Limit (R2-1) sign installed at the beginning of the zone where the speed limit applies. The speed limit displayed on the Reduced Speed Limit Ahead sign shall be identical to the speed limit displayed on the subsequent Speed Limit*

sign."

(5) Extreme care must be exercised in placing additional speed limit signs, with emphasis on locations where such reminder signs should not be placed; e.g., in proximity to a horizontal curve, railroad track, school zone, traffic signal, stop sign, narrow bridge, or any other type of roadway characteristic that may overload a driver's ability to process information and react accordingly.

10.1 VARIABLE SPEED LIMITS

(1) The traditional static maximum speed limit signs are posted based on ideal roadway and weather conditions. Under non-ideal conditions, such signs may not assist drivers with the challenge of determining a proper maximum safe driving speed. Furthermore, law enforcement agencies are required to make a subjective determination when citing a motorist driving unsafely and too fast for peril roadway conditions. Variable speed limit (VSL) systems are utilized to alleviate these situations and provide safe driving speed information based on prevailing upstream roadway conditions.

(2) VSL systems shall not be implemented without adequate speed enforcement. A record shall be maintained on the day, hour, and minute a VSL change is made, unless the sign message is changed on a predetermined schedule, such as time-of-day applications in advance of active school zones for rural high-speed approaches, in accordance with ***Section 15.4*** of this ***Manual***.

(3) VSL systems are a type of Intelligent Transportation System (ITS) that utilizes real-time traffic speed and volume detection, weather information, accident and congestion information, and road surface condition technology to determine optimal and appropriate speeds at which drivers should be traveling through the VSL zone. FDOT mandates that any automated system capable of adjusting or displaying posted speed limits on electronic signs require a human operator to review and accept system-generated speed limits prior to posting them on roadside signs.

(4) VSL applications that are set to specific time-of-day operation shall only require a traffic engineering study to verify VSL applicability and do not require human operator verification during active time-of-day VSL operation. A traffic regulation on file from the District Traffic Operations Engineer (DTOE) shall be approved documenting the VSL limits and time-of-day operation consistent with ***Section 15.4.2(2)*** of this ***Manual***.

(5) Deployed with success in other States and in Europe, a VSL is intended to regulate the flow of traffic, reduce traffic shockwave propagation and thereby improving efficiency and safety. VSL operates under the same premise as rice grains passing through a funnel: Depositing a bag of rice grains all at once will clog the funnel, whereas gradually pouring the grains enables them to pass quickly.

(6) VSL applications may be used for the following:

(a) To increase traffic flow by integrating vehicles gradually.

(b) To reduce abrupt traffic stoppage, resulting in fewer rear-end/side-swipe crashes.

(c) To make work zones safer for construction workers and motorists.

(d) To empower motorists with actionable information about real-time traffic conditions, enabling them to modify travel times, routes or modes.

(e) And in advance of school zones on rural high-speed roadways.

(7) In the event FDOT determines, based upon an engineering and traffic study, that the safe and orderly movement of traffic on any State Highway System will be facilitated by the establishment of a VSL, the Department may erect, regulate, and control signs on the State Highway System, or any portion thereof, which signs shall be designated as to permit display of different speed limits at various times of the day or night. The Speed Limit within the established variable speed limit zone at a particular time and place shall be that which is then and there displayed upon such sign.

10.1.1 VSL OPERATION AND SIGNAGE

In the event of a VSL system warning initiation notifying Traffic Management Center personnel of an adverse roadway conditions and a recommended system generated reduced speed limit has been evaluated and accepted, the electronic roadside posting procedure within the VSL speed limit zone shall be as follows:

(a) Reduce numeric speed limit by 5 mph from the maximum, unconditioned, posted speed limit and initiate yellow flashing beacon.

(b) Re-evaluate and observe traffic flow for optimal and safe performance.

(c) Reduce numeric speed limit by an additional 5 mph if necessary, however, and under no circumstances shall the reduced posted speed limit be more than 20 mph below the unconditioned maximum posted speed limit.

(d) Once the VSL system warnings have returned to normal operation and adverse roadway conditions have been alleviated, return posted speed limit to maximum unconditioned numeric value and turn off yellow flashing beacon.

Figure 10-1
Example VSL Speed Limit Signs Under Normal Condition (Left) and Reduced Speed Condition (Right)

Chapter 11
LENGTH OF GRADUATED SPEED ZONES

(1) A specific speed zone may be only a short segment of a graduated speed zone or may extend for many miles without changing.

(2) The State of Florida has no minimum required length for speed zones, but traffic engineering judgment should be applied for zones that are short to the extent that a driver is required to apply brakes to comply with the posted speed limit. Although deceleration rates vary with vehicle type and transmission, a minimum zone length, if the graduation of measured speeds is somewhat abrupt, should be based on normal engine and un-braked deceleration. When spot speed studies show abrupt drops in the **85^{th}** percentile speed, the 10 mph elements may be the better choice to increase the running length of zones.

(3) Exceeding a 10 mph change in speed from one zone to the next is discouraged and violates the purpose of providing smooth transitions in realistic graduated speed restrictions.

Chapter 12
AREA WIDE "BLANKET" SPEED RESTRICTIONS

(1) In accordance with ***Section 316.006(2), (3), F.S.***, chartered municipalities and counties have original jurisdiction over all streets and highways located within their respective boundaries, except for state roads. Counties and municipalities may also exercise jurisdiction over any private road or roads, or over any limited access road or roads owned or controlled by a special district, located within its boundaries if the county/municipality and party or parties owning or controlling such road or roads provide, by written agreement approved by the governing body of the municipality, for municipal traffic control jurisdiction over the road or roads encompassed by such agreement.

(2) ***Section 316.189, F.S.*** stipulates that the maximum speed within any municipality or county is 30 mph. Within residential districts, a municipality may set a maximum speed limit of 20 or 25 mph on local streets and highways after an investigation determines that such a limit is reasonable. Municipalities and counties may set speed zones altering such speeds, both as to maximum and minimum, after investigation determines such a change is reasonable and in conformity to criteria promulgated by the FDOT, except that no such speed zone shall permit a speed of more than 60 miles per hour.

(3) Although ***Section 316.003, F.S.*** provides definitions for business and residential districts, the identification of such districts should not be left to driver judgment; rather, speed limit signs should be located at frequent intervals to inform drivers, particularly in areas that marginally meet the requirements in the definitions and where no alteration has been made by speed zoning methods described in this manual.

(4) The word Municipal implies a domestic community or urban setting and, hence slower speed limits are State law. However, there are many municipalities that have rural or semi-rural conditions where the speed limit according to ***Section 316.189(1), F.S.***, is 30 mph. To alter these speed limits to a more realistic level, the methods and guidelines set forth in this manual must be used.

(5) ***Section 316.003, F.S.***, defines Business and Residence as follows:

(a) ***Section 316.003(7), F.S.***, Business District: *"The territory contiguous to, and including, a highway when 50 percent or more of the frontage* *thereon, for a distance of 300 feet or more, is occupied by buildings in use for business."*

(b) ***Section 316.003(60), F.S.***, Residence District: *"The territory contiguous to, and including, a highway, not comprising a business district, when the property on such highway, for a distance of 300 feet or more, is, in the main, improved with residences or residences and buildings in use for business."*

(6) This ***Manual*** sets forth the FDOT criteria to establish specific speed zones and in no way provides a means whereby a blanket speed limit, such as 25 mph, can be enacted by local ordinance (often with signs placed at city limits declaring, 25 mph, UNLESS POSTED). To do so is contrary to the intent of the statutory 30 mph Blanket Speed Limit, which only can be altered upward or downward on a location basis by the traffic engineering procedures described herein.

Chapter 13
UNIFORM SPEED ZONING AND ENFORCEMENT

(1) The quest for uniform traffic control devices (signs, signals, and markings) has been underway for more than 50 years in this country. Progress is on-going due to an excellent working relationship between the FDOT and the Federal Highway Administration (FHWA).

(2) Uniform traffic control devices are not effective unless enforcement of traffic laws and ordinances are perceived to be reasonable when applied to these devices and to driver performance. The State of Florida ranks very high in compliance to the ***Uniform Vehicle Code and the Model Traffic Ordinance*** developed by the National Committee on Uniform Traffic Laws and Ordinances. Developing uniform speed zoning methods throughout all of Florida's local jurisdictions would be of questionable value if the enforcement of these and other restrictions were not applied uniformly.

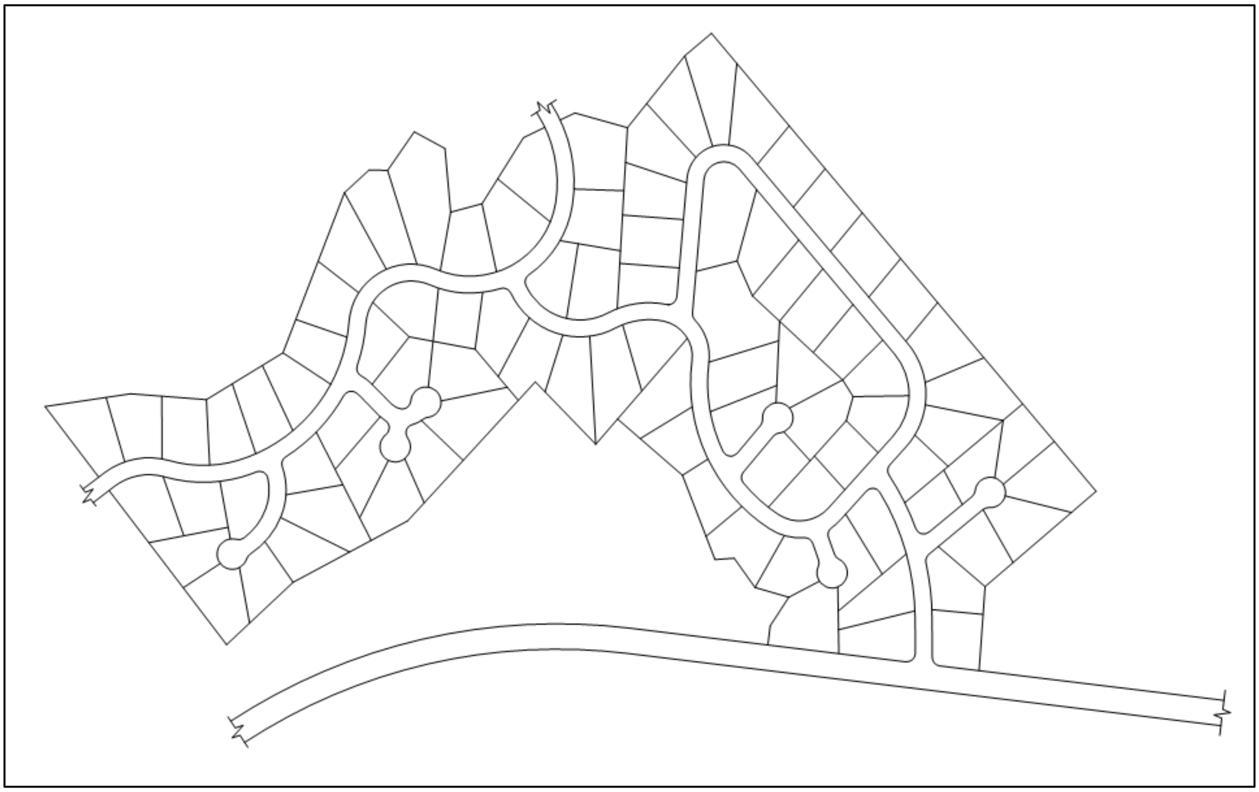
(3) The primary purpose of speed zoning is not intended to be a revenue producing program, but a safety measure.

Chapter 14
SPEED ZONE LOCATIONS

14.1 SUBDIVISION STREETS

(1) Street systems in older platted subdivisions are like the grid patterns common to urban areas, but many newer subdivisions are designed with streets that provide almost continuous horizontal curvature. In addition to their aesthetics, such winding streets discourage both higher driving speeds and through traffic. A typical subdivision pattern is illustrated in ***Figure 14-1***.

Figure 14-1
Typical Subdivision Pattern to Discourage Higher Driving Speeds



(2) Depending upon the design speed of the curves, the posting of speed regulatory signs with the blanket speed limit of 30 mph as provided in ***Section 316.189, F.S.***, may be inappropriate except that on tangent roadway sections with sufficient length that drivers would not be influenced by alignment curvature. ***Chapter 5 (Equipment, Conditions, and Data Collection Sites)***, cautions against making speed checks within horizontal curves and ***Chapter 16 (Other***

Speed Signs and Terms), refers to a method of arriving at an advisory speed for posting at horizontal curves. For continuous or near continuous curving roads of subdivisions streets, the use of spot speed studies, through data collection and computation of the **85th** percentile speed, is inappropriate for determining the posted speed.

(3) If a subdivision is not completed, an engineering decision can be made on an appropriate posted speed based on anticipated driving speeds on winding, curving street alignments.

(4) If the subdivision streets were completed, the third type of basic traffic investigation listed in ***Chapter 4 (Traffic Engineering Investigations)***, would apply. Test run speeds are used in lieu of data from the measured speed of many vehicles in order to arrive at a realistic speed limit.

(a) Except in rare cases, drivers' choice of speed is based on many factors, as outlined in ***Chapter 3 (Driver Behavior)***, of which speed signs are only one, and often a minor one.

(b) For speed limits to be of traffic safety value, they must be realistic and acceptable to most drivers. Use of realistic speed limits still results in a 10 to 20 percent violation rate.

(c) Use of unrealistically low speed limits usually results in high violation rates and large variance in speed, which negates speed zoning.

(d) High violation rates far exceed a practical citation rate unless a mass, concentrated enforcement effort is applied, usually without measurable residual effect.

(e) Design speed has the greatest impact on actual operating speed in and adjacent to horizontal curves, where the driver/vehicle/roadway relationship dramatically affects the driver physically by centrifugal force.

(5) For subdivision streets where adjacent development is anticipated within a reasonable time, design decisions should be based on traffic speed expected to occur from such development (residential home construction). Such design decisions would include cross section, degree of curvature, super elevation (if any), treatment of fixed objects, and/or tree removal.

(6) An engineer cannot assume that a residential land use with a well-designed road, particularly a main road fed by a network of other streets and/or carrying traffic through the subdivision, will operate at 30 mph. It is not uncommon for such streets to become semi-arterial and posted with 25 or 30 mph signs plus one of the many versions of CHILDREN PLAYING or PLAYGROUND signs ***(MUTCD W15-1)***. These signs may have no measurable benefits on traffic and may even have a negative safety effect by appeasing residents' concern about safety for children.

14.2 STATE PARKS

(1) The street system within State Parks presents a unique situation of determining the appropriate speed to be posted.

(2) ***Section 316.187(2) (c), F.S.*** authorizes the FDOT to set maximum and minimum speed limits for travel over other roadways under its authority as it deems safe and advisable (not to exceed a maximum limit of 60 mph). Since the intent of State parks roadways is to produce an attitude of relaxation and leisure, the maximum posted speed limit shall be 25 mph unless as stipulated under Section 14.3(3) below.

(3) However, at more congested centers and near park buildings, beaches, picnic, campground, and play areas, the appropriate posted speed limit is 15 mph. These speeds, 15 and 25 mph, are based on engineering judgment due to the types of activities that are expected within their respective zones. An engineering and traffic investigation is still necessary in order to determine the limits of each speed zone. Speed limits with State Parks, other than 15 or 25 mph, shall not be posted unless and until such speed is deemed appropriate on the basis of an engineering study.

14.3 WORK ZONES

(1) The goal of traffic control for construction, maintenance, and utility operation within Temporary Traffic Control (TTC) work zones, is to route traffic through such areas in a manner as closely and safely comparable to normal roadway conditions. ***Section 6A.01 of the MUTCD*** states the following: *"TTC plans and devices shall be the responsibility of the authority of a public body or official having jurisdiction for guiding road users. There shall be adequate statutory authority for the implementation and enforcement of needed road user regulations, parking controls, speed zoning, and the management of traffic* *incidents. Such statutes shall provide sufficient flexibility in the application of TTC to meet the needs of changing conditions in the TTC zone."*

(2) ***Section 337.11(14) F.S.*** states *"Each contract let by the department for performance of road or bridge construction or maintenance work must contain a traffic maintenance plan which shows the appropriate regulatory speed signs and traffic control devices for the work zone area as defined in* ***Section 316.003, F.S.****"*

(3) Regulatory speed establishment or change thereof must be made on the basis of an engineering and traffic investigation as required by ***Section 316.187, F.S.*** Preparing and documenting the engineering and traffic investigation for work zones is significantly different than for the establishment of normal regulatory speeds. This is due to the changing phases of work zones and that it is neither appropriate nor feasible to establish regulatory speeds in work zones based on the **85th** percentile criteria. Regulatory speeds through work zones must be established on existing or anticipated field conditions using engineering judgment. The field conditions that should be considered are:

(a) Traffic volumes
(b) Time of day
(c) Construction phasing
(d) Lane restrictions
(e) Lane shifts and transitions
(f) Type of construction
(g) Proximity of construction workers
(h) Use of barriers
(i) Type of equipment
(j) Flagger usage
(k) Pedestrian activity and volume
(l) Detour geometry

(4) Other conditions may need to be addressed on a project by project basis. The design engineer of record will conduct an engineering and traffic investigation of the work zone project and maintain engineering records consisting of the design and the Maintenance of Traffic control plans as a subset of the approved construction plans. If a roadway condition under construction warrants a change in the posted regulatory speed limit, the field engineer recommending the change must provide a signed and sealed engineering and traffic investigation report addressing the conditions requiring the proposed change in the existing regulatory posted speed limit.

(5) Regulatory speed signs shall be used on all construction, maintenance, and utility operations, whenever practical, in lieu of advisory speed plates. There may be circumstances when advisory speeds are posted until such time as regulatory speeds can be justified and installed. Such circumstances may include roadway emergencies where maintenance personnel must respond immediately or for unforeseen circumstances in a construction work zone which may warrant speed reduction.

(6) Speed limits shall not be reduced more than 10 mph below the posted regulatory speed except in emergency situations or extremely unusual conditions. When reductions exceed 10 mph, the reduction shall be accomplished in 10 mph increments. When establishing the appropriate regulatory speed for each phase of the maintenance of traffic, the engineer should generally establish one speed for the entire phase and avoid instances that would require multiple changes of regulatory speeds within each phase.

(7) In no case will the speed limit be reduced below the minimum regulatory speed established by Florida Statute for that class of facility.

14.4 REST AREAS

(1) Advisory exit, ramp and curve speed signs are covered in ***Section 2C.14 and 2C.15 of the MUTCD***. However, the appropriate regulatory speed limits within the rest area itself are not addressed.

(2) Determining speed limits in the rest area through traffic observation studies is generally not feasible. Since there are numerous parking maneuvers and uncontrolled pedestrian movements, the engineer's experience and judgment will play an important part in establishing a reasonably safe speed limit through this area.

(3) In rest areas, posted speed limits shall be 15 mph for congested portions of the rest area and a posted speed limit of 25 mph in the other portions is generally appropriate.

14.5 ENVIRONMENTALLY SENSITIVE AREAS

(1) Department coordination will be required between the District Traffic Operations Office and the District Environmental Management Office when speed limits are to be established or increased on facilities which pass through, or are adjacent to, public lands being managed for wildlife protection.

(2) Coordination will include an evaluation of the history of transportation related wildlife mortality along the proposed area; updated statewide maps and/or lists that show environmentally sensitive areas; and an assessment of the speed limit's ability to lessen the impact of traffic on wildlife.

(3) It will be the responsibility of the applicable FDOT District Environmental Office to coordinate with any local, state, or federal agency having management responsibilities over the adjacent land. Lands to be considered as those "managed for wildlife values" shall be all state and federal wildlife refuges, management areas, forests, parks, and lands owned by the water management districts. Also included shall be those privately owned lands which have been previously identified by the FWC as areas of a high incidence of transportation related wildlife mortality.

Chapter 15
ESTABLISHING SCHOOL ZONES AND SCHOOL CROSSINGS

15.1 DEFINITIONS

The definitions contained herein are consistent with ***Part 7 of the MUTCD:***

Eligible Safe Routes To School (SRTS) Crossing. A pedestrian crossing for a roadway segment approaching, adjacent to, and beyond school buildings or grounds, or along which school related activities occur, where the segment is eligible for FDOT's SRTS program to provide safe walking environments within a *2-mile* radius of school campuses.

School Area. Areas along streets and highways that include school buildings or grounds, a school crossing, or school related activity adjacent to the street or highway.

School Crossing. The location of a crossing where school children cross that portion of a street or highway that is within or adjacent to a School Area or School Zone and is also marked.

School Speed Limit. The reduced posted speed limit within a school zone that is active at the time just before, during, and after school activities, pursuant to ***Section 316.1895, F.S.,*** which has been identified through an engineering study and has been properly signed and marked in accordance with this manual.

School Zone. That portion of a street or highway located within a school area that includes an established school speed limit posted thereof with signs and flashing beacons. A school zone may be established at other locations when justified by an engineering study. School zones are not to be applied in a blanket manner for all streets and highways within a school area.

15.2 ELIGIBLE SCHOOL ZONE LOCATIONS

(1) Only public or private elementary, middle schools (Jr. High), or federally funded Headstart facilities providing a full-time educational program are eligible for the markings, signs, and other traffic control devices referenced in this Chapter.

(2) High schools should be addressed on a case by case basis and justified by an engineering study.

(3) Except as noted above, other educational institutions and facilities are not eligible for the traffic control devices referenced in this Chapter. These include universities, vocational technical schools, junior colleges, community colleges, nursery schools, and day cares. These institutions may be considered for other types of traffic control devices such as PEDESTRIAN CROSSING Sign ***(MUTCD W11-2)***.

15.3 ESTABLISHING SCHOOL ZONES

(1) School zones are determined based on an engineering study of the specific site. At a minimum, the engineering study should include a ***Vehicle Spot Speed Study*** ***(Figure 7-1 of this Manual),*** a ***Gap Study*** ***(Manual on Uniform Traffic Studies (MUTS) Chapter 8),*** and a ***Pedestrian and Bicycle Volume Sheet Form*** ***(MUTS Chapter 9)***.

(2) Reduced speed limits for school zones are necessary due to the fact that children have difficulties with the following:

- **(a)** Lack of experience and premature judgement;
- **(b)** Seeing and evaluating traffic conditions because of their height;
- **(c)** Processing information because of their limited peripheral vision and visual acuity;
  Perceiving correctly the direction and sound of traffic; and
- **(d)** Understanding the use of traffic control devices and crosswalks.

(3) In addition to the posted speed limit, the observed 85th percentile speed, and 10 mph pace, the decision to establish a school zone should take the following conditions into consideration:

- **(a)** Age of children
- **(b)** Normal approach speed of traffic
- **(c)** Sight distance
- **(d)** Number of vehicles
- **(e)** Width of street
- **(f)** Presence of other traffic control devices
- **(g)** Use of adult crossing guards.

(4) School zones and signalized intersections are independent traffic control devices, and the use of one neither requires nor precludes the use of the other. Whenever possible, if a school crossing is warranted, it should be located at a signalized intersection. However, all traffic control signal installations must meet one or more of the ***MUTCD's*** signal warrants.

(5) When school zones are warranted on the state highway system, a speed limit regulation shall be established by the District Traffic Operations Engineer (DTOE).

15.4 SCHOOL TRAFFIC CONTROL REGULATIONS

(1) The requirements for installation of traffic control devices for all new school areas, school crossings and school zones shall become effective upon adoption of this manual on or before July 1st, 2017. For existing school areas, school crossings and school zones, the requirements set forth in this chapter shall have a compliance date of July 1st, 2022. All existing school pavement markings shall be updated in accordance with this Chapter during the next resurfacing cycle when pavement markings are replaced.

(2) The spacing for all school-related traffic control devices shown in the figures contained in this Chapter shall be in accordance with ***Table 15-1.***

Table 15-1
Device Spacing For School Advance Warning Signs, School Crossings and School Zones

Posted Speed (MPH)	School Advance Warning Sign Placement		
	Distance A	Distance B	
		15 MPH*	20 MPH
35 or less	100 ft	100 ft	100 ft
40	125 ft	100 ft	100 ft
45	175 ft	125 ft	100 ft
50	250 ft	200 ft	175 ft
55	325 ft	275 ft	225 ft

*Based on 10 MPH from ***MUTCD Table 2C-4***.

15.4.1 SCHOOL AREAS AND SCHOOL CROSSINGS

(1) When a school crossing is located at a signalized intersection, the traffic engineer should determine if traffic turning movement restrictions are justified. Permissive left-turns may be restricted during school zone operating hours and right-turn-on-red may be prohibited at some intersections based on engineering judgement. Field observations and analysis of all such crossings are recommended.

(2) Where a school zone is not warranted based on engineering study, SCHOOL ENTRANCE WARNING signs shown in ***Figure 15-2*** may be considered on a case-by-case basis for schools with low volumes of walking students. Supplemental plaques indicating an advisory speed 10 mph below the posted speed, AHEAD, or defining a distance may also be used.

Figure 15-2
School Entrance Warning Sign (FTP 33-06)

(3) Supplemental flashing beacons may be used with School Signs ***(MUTCD S1-1)*** to enhance conspicuity on roadway approaches with posted speeds of 45 mph or greater and without school zones. In rural areas where roadway approach speeds are 45 miles per hour or greater, flashing beacons should be used to increase the conspicuity of school crossings or school entrances without school zones.

(4) ***Figure 15-3*** depicts the signing and marking requirements for a marked school crossing at a signalized intersection without a school zone.

(5) ***Figure 15-4*** depicts the signing and marking requirements for a marked school crossing at a stop controlled intersection without a school zone.

(6) If a 2-lane, 2-way roadway with a posted speed limit of 45 mph or less has an established school crossing without a school zone, Rectangular Rapid Flashing Beacons (RRFB) are optional at the location of the school crossing, as shown in ***Figure 15-5***, for only those school crossings located on the State Highway System. For established school crossings without a school zone that are not located on the State Highway System, the local maintaining agency must receive approval from the Federal Highway Administration (FHWA) for the use of any RRFB at crosswalks.

(7) For marked crosswalks within 2-miles of a school that do not include a school zone, the In-Street Pedestrian Crossing sign ***(MUTCD R1-6a)*** with supplemental SCHOOL plaque ***(MUTCD S4-3P)*** may be used as shown in ***Figures 15-4 and 15-5***.

(8) The location of In-Street Pedestrian Crossing signs ***(MUTCD R1-6a)*** shall be in accordance with ***Section 2B.12 of the MUTCD*** which states, *"If used, the In-Street Pedestrian Crossing sign shall be placed in the roadway at the crosswalk location on the center line, on a lane line, or on a median island. The In-Street Pedestrian Crossing sign shall not be post-mounted on the left-hand or right-hand side of the roadway."*

(9) Additionally, ***Section 2B.12 of the MUTCD*** requires that *"An In-Street or Overhead Pedestrian Crossing sign shall not be placed in advance of the crosswalk to educate road users about the State law prior to reaching the crosswalk, nor shall it be installed as an educational display that is not near any crosswalk."*

(10) Where a school bus stop is not visible for a distance of 500' in advance of the student pick up or discharge area, the SCHOOL BUS STOP AHEAD sign ***(MUTCD S3-1)*** shall be installed in advance of the location as shown in ***Figure 15-6***. These signs are intended for use only where terrain and roadway features limit the approach sight distance and where there is no opportunity to relocate the student pick up or discharge area to another location with adequate visibility.

Figure 15-3
School Crosswalks at a Signalized Intersection Without a School Zone

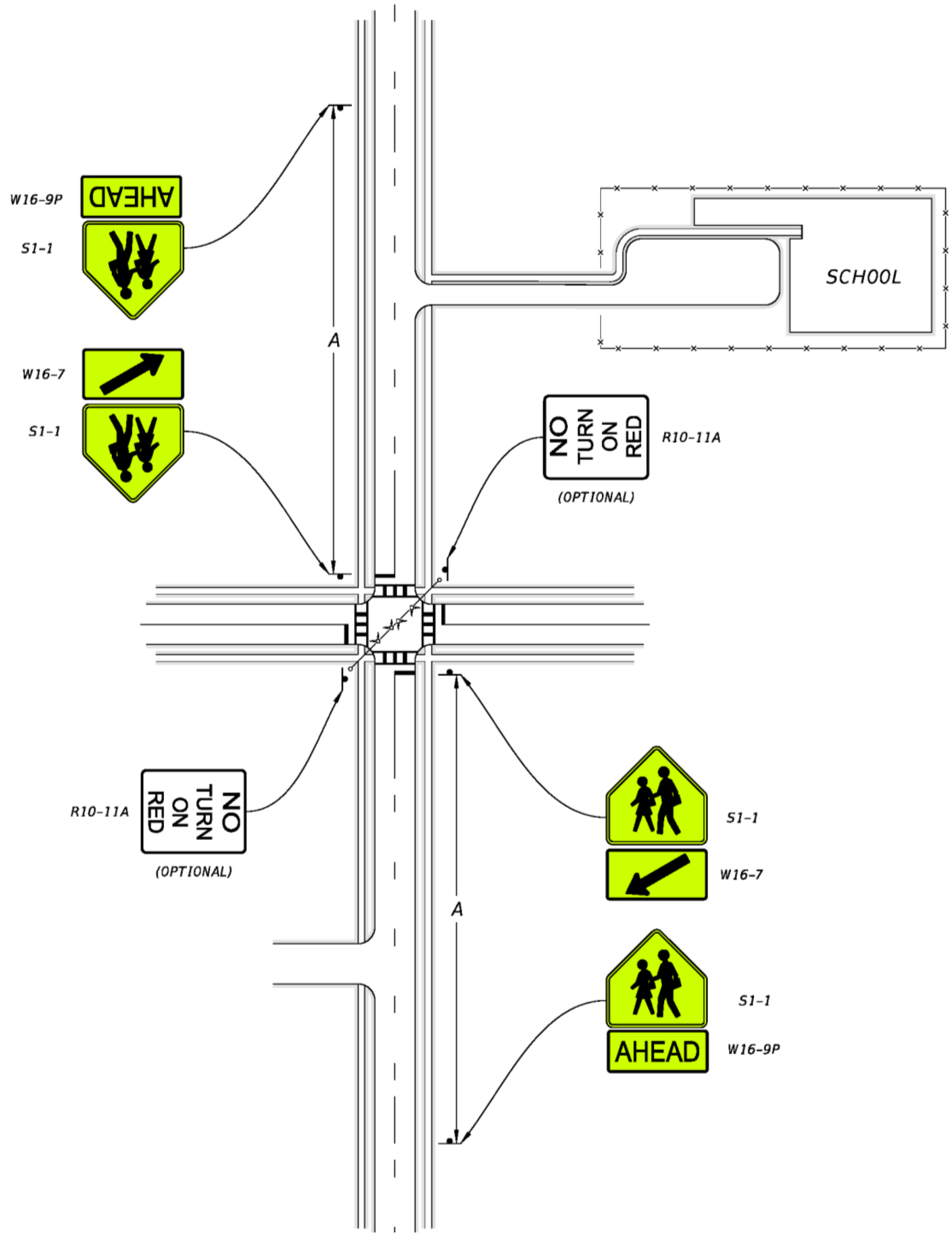


Figure 15-4
School Crosswalks at a Stop Controlled Intersection Without a School Zone

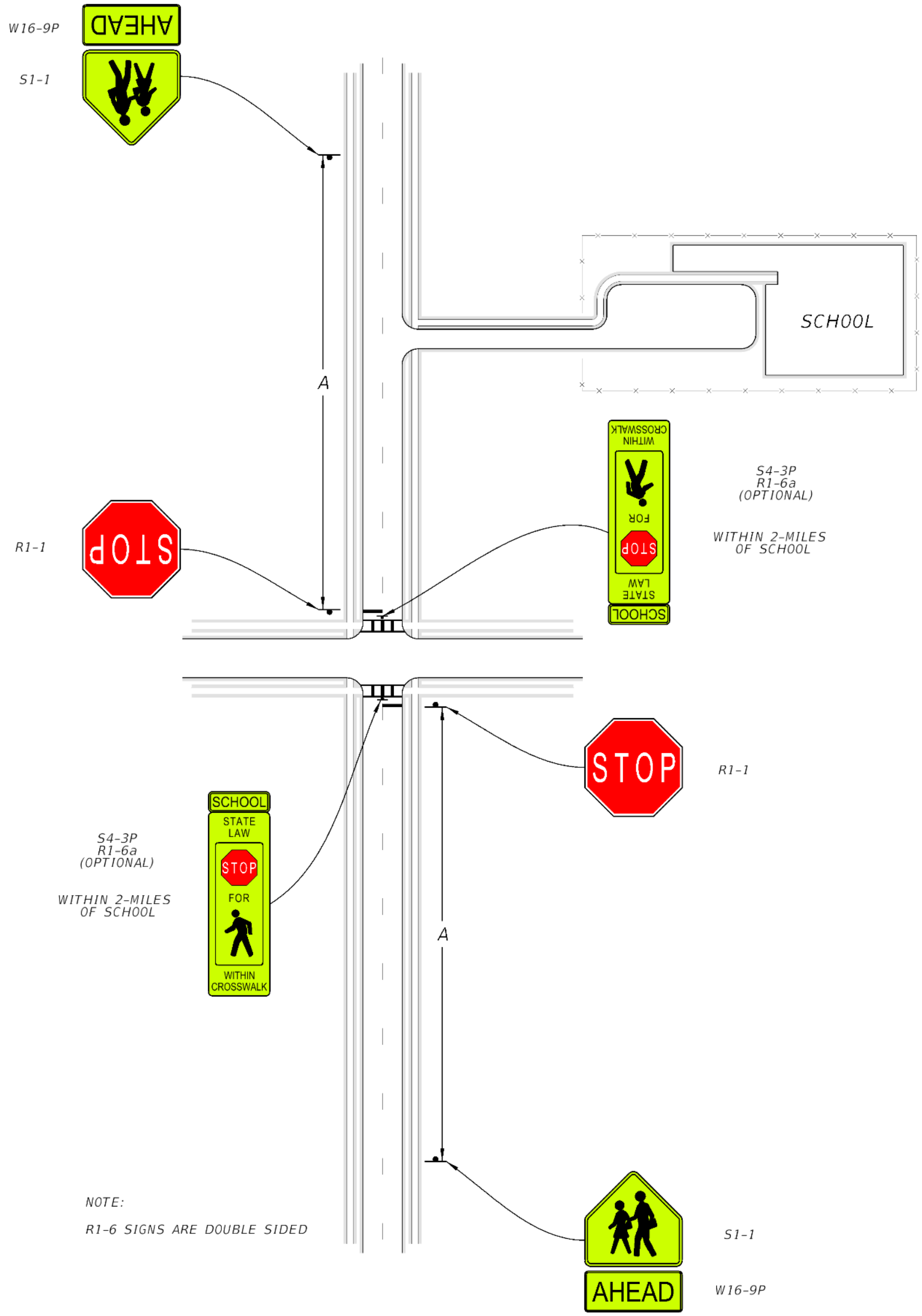


Figure 15-5
Midblock School Crosswalks Without a School Zone

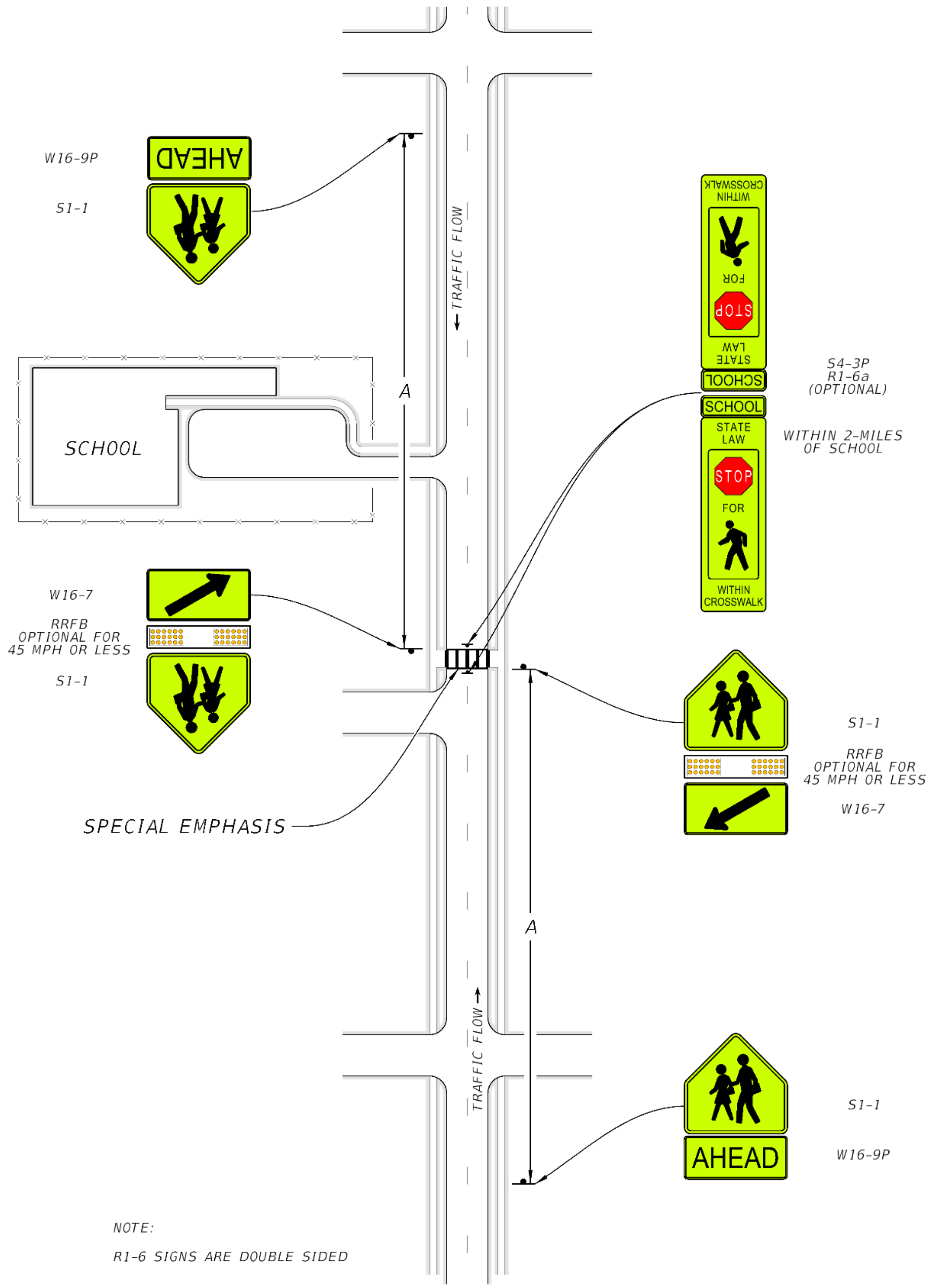
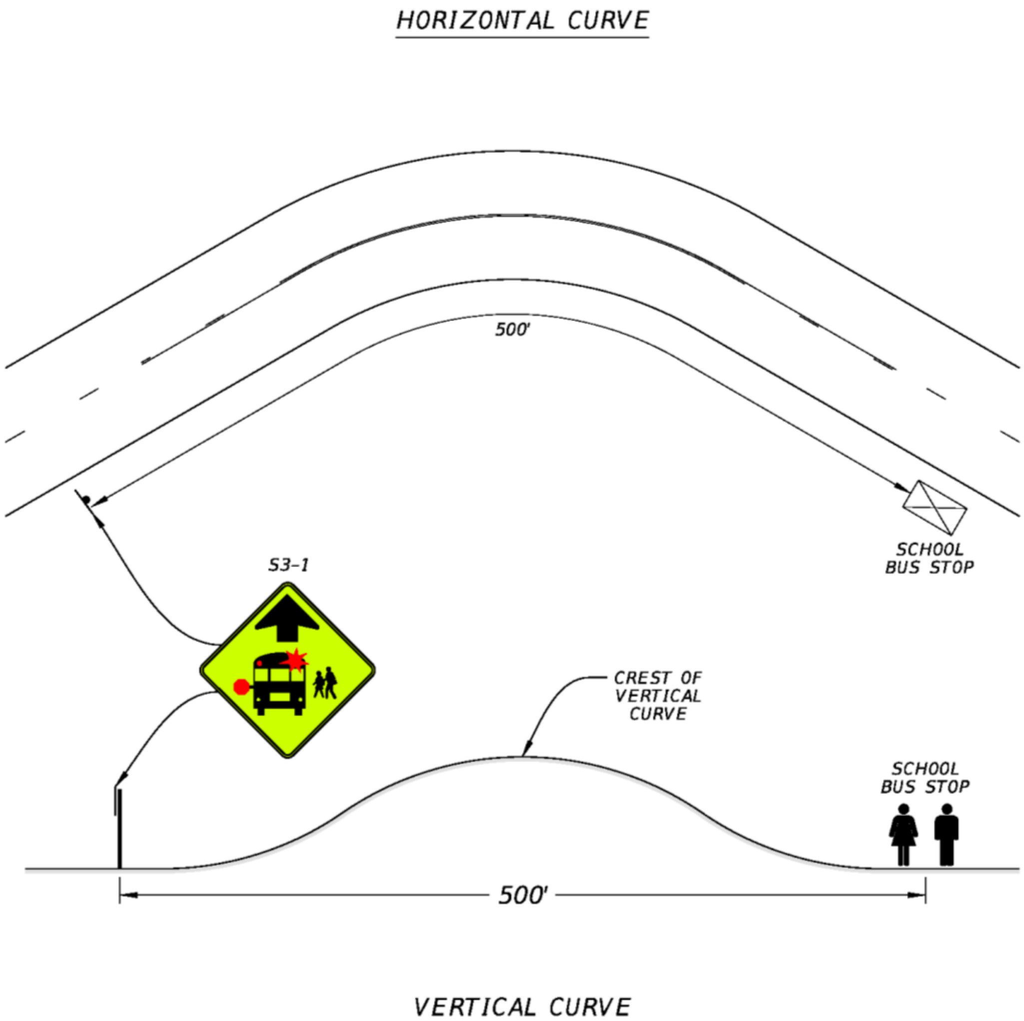


Figure 15-6
Traffic Control Devices at Typical School Bus Stop Locations



15.4.2 SCHOOL ZONES

(1) Establishment of school zones shall be in accordance with ***Section 316.1895, F.S.***, and all traffic control devices used for school areas, school crossings and school zones, including flashing beacons, signs and pavement markings, are described in this Chapter***.***

(2) In accordance with ***Section 316.1895, F.S.***, *"A school zone speed limit may not be less than 15 miles per hour except by local regulation. No school zone speed* *limit shall be more than 20 miles per hour in an urbanized area, as defined in **Section 334.03, F.S.** Such speed limit may be in force only during those times 30 minutes before, during, and 30 minutes after the periods of time when pupils are arriving at a regularly scheduled breakfast program or a regularly scheduled school session and leaving a regularly scheduled school session."*

(3) For posted speeds of 35 mph or greater, a school zone speed limit of 20 mph shall be used. For posted speeds less than 35 mph, a 15 mph school zone speed limit shall be used, except as allowed in ***Section 316.1895, F.S.***

(4) In rural areas where roadway approach speeds are 45 mph or greater, a Variable Speed Limit (VSL) application may be used in advance of the school zone consistent with ***Section 10.1*** of this ***Manual***.

(5) In accordance with ***Section 316.1895(6), F.S.***, as of July 1, 2008, for any newly established school zone or any school zone in which the signing has been replaced, a sign stating SPEEDING FINES DOUBLED signs as shown in ***Figures 15-7A and 15-7B*** shall be installed within the school zone. The SPEEDING FINES DOUBLED sign shall be mounted on the same pole with the SCHOOL ZONE FLASHING BEACON assembly.

Figure 15-7A
Speeding Fines Doubled Sign (Ground-Mounted Option – FTP 38-06)

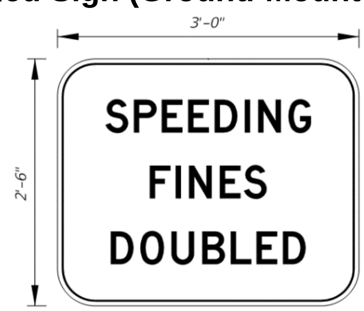
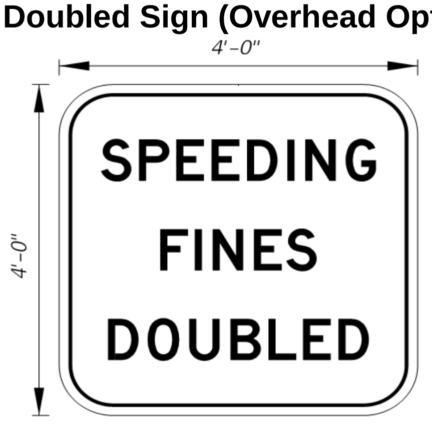


Figure 15-7B
Speeding Fines Doubled Sign (Overhead Option – FTP 39-06)



(6) For all school zones, the beginning point of the school zone shall be identified using the SCHOOL ZONE FLASHING BEACON assembly shown in ***Figures 15-8A through 15-8D*** and a "SCHOOL" pavement message as shown in ***Figures 15-14A and 15-14B***. The end point of the school zone shall be identified using END SCHOOL ZONE sign ***(FTP 34-06)*** shown in ***Figures 15-9A or 15-9B***. Sign plaques indicating the specific periods of the day and/or days of the week when the reduced school speed limit is in effect shall not be permitted.

Figure 15-8A
15 MPH School Zone Roadside Flashing Beacon Assembly (MUTCD S5-1)

Figure 15-8B
20 MPH School Zone Roadside Flashing Beacon Assembly (MUTCD S5-1)

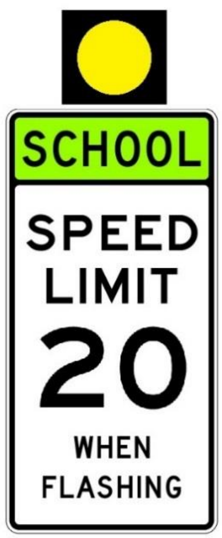


Figure 15-8C
15 MPH School Zone Flashing Beacon Assembly (Overhead Option FTP 31-06)

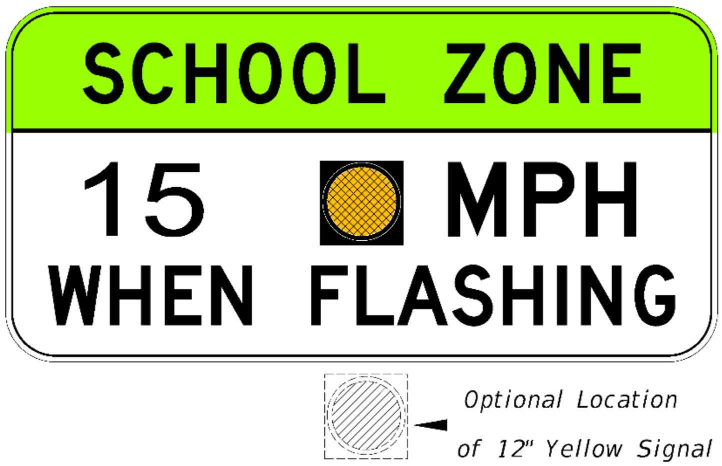


Figure 15-8D
20 MPH School Zone Flashing Beacon Assembly (Overhead Option FTP 31-06)

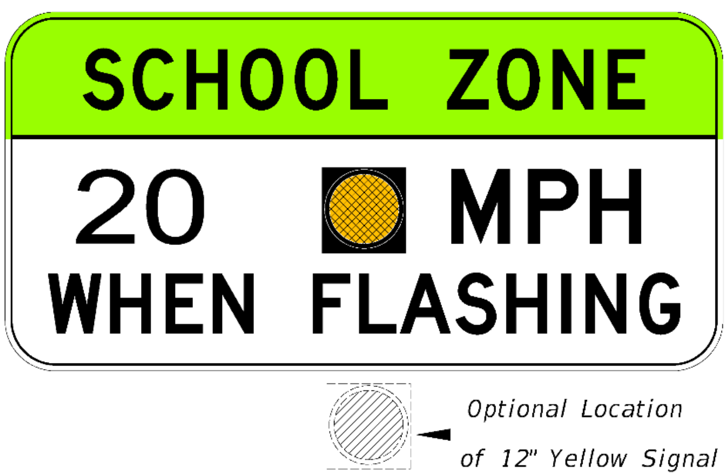


Figure 15-9A
End School Zone Sign (Ground-Mounted Option – FTP 34-06)

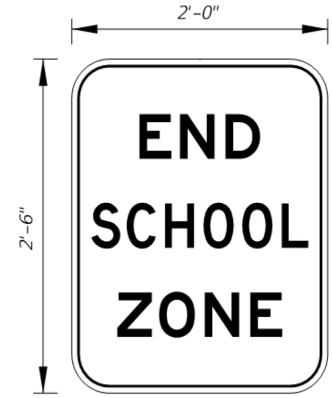
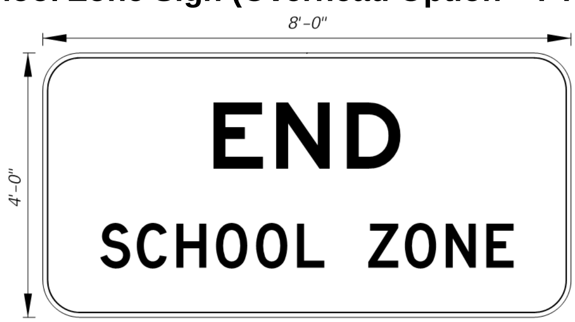


Figure 15-9B
End School Zone Sign (Overhead Option – FTP 32-06)



(7) For 2-way roadways with one travel lane in each direction, the begin and end points for school zone limits shall be identified using roadside options for the flashing beacon assembly ***(MUTCD S5-1)***, the SPEEDING FINES DOUBLED sign ***(FTP 38-06)*** and the END SCHOOL ZONE sign ***(FTP 34-06)*** shown in ***Figures 15-7A, 15-8A or 15-8B and 15-9A***.

(8) For multilane roadways with 2 or more travel lanes in each direction, the begin and end points for school zone limits shall be identified using the overhead options for the flashing beacon assembly ***(FTP 31-06)***, the SPEEDING FINES DOUBLED sign ***(FTP 39-06)*** and the END SCHOOL ZONE sign ***(FTP 32-06)*** shown in ***Figures 15-7B, 15-8C or 15-8D and 15-9B***.

(9) For multilane divided roadways with 2 or more travel lanes in each direction, where engineering judgement determines an overhead structure is not suitable or cannot be installed due to site restrictions, the roadside flashing beacon assembly ***(MUTCD S5-1)***, the SPEEDING FINES DOUBLED sign ***(FTP 38-06)***

and the END SCHOOL ZONE sign ***(FTP 34-06)*** shall be installed on both the right shoulder and the raised median as a substitution for the overhead structure.

(10) For multilane roadways with 2 or more travel lanes in each direction, where engineering judgement determines an overhead structure is either not suitable, cannot be installed due to site restrictions or a raised median of sufficient width does not exist, an additional school zone flashing beacon assembly may be installed in advance of the school zone limits as shown in ***Figure 15-10***. The advanced school zone flashing beacon assembly shall consist of the School Advance Crossing sign ***(MUTCD S1-1)*** with AHEAD plaque ***(MUTCD W16-9P)*** and alternating flashing warning beacons above and below the sign assembly. Placement for the additional advanced school zone flashing beacon assembly shall be in accordance with ***Table 15-1*** of this ***Chapter***.

Figure 15-10
School Advance Crossing Sign with Flashing Beacon Assembly Used for Additional School Zone Warning on Multilane Roadways

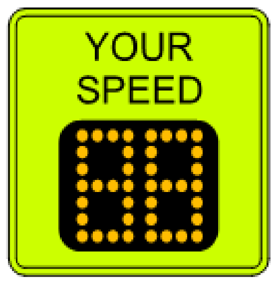
(11) Where multiple schools are in close proximity and located on the same roadway, combining multiple school zones should be given the following considerations:

(a) Length of each school zone;
(b) Start and end time of the school period; and
(c) Separation between the school zones.

(12) School zones should be kept as short as practical and should not necessarily extend along the entire highway frontage of the school property. Research has shown that speeds are approximately 1 mph higher for every 500 feet driven within a school zone and longer school zones are associated with greater speed variability within the zone.[1] Consideration should be given to supplement the initial flashing beacon on the approach with an additional school zone flashing beacon assembly if the school zones are more than ¼ mile (1,320 feet) long.

(13) Electronic Speed Feedback signs as shown in ***Figure 15-11*** (see also ***Section 16.3(2)*** of this ***Manual***) on the Department's ***Approved Product List (APL)*** may be used in conjunction with the roadside SCHOOL ZONE FLASHING BEACON assembly shown in ***Figure 15-8A and 15-8B*** provided they meet the guidelines set forth in ***Part 7B.15 of the MUTCD*** and this Manual. Electronic Speed Feedback signs used at school zones shall only be activated during the hours when the school zone speed limit is in effect.

Figure 15-11
Electronic Speed Feedback Signs for School Zones



(14) When Electronic Speed Feedback signs are used, they shall be mounted on the same pole with the SCHOOL ZONE FLASHING BEACON assembly shown in ***Figure 15-8A or Figure 15-8B*** only, and the SPEEDING FINES DOUBLED sign placed 100 feet downstream of the SCHOOL ZONE FLASHING BEACON assembly as shown in ***Figures 15-12 and 15-13***. Electronic Speed Feedback signs shall not be used in conjunction with overhead (spanwire or cantilever) school zone flashing beacon assemblies. When Electronic Speed Feedback signs are not used, the SPEEDING FINES DOUBLED sign shall be mounted on the same pole with the SCHOOL ZONE FLASHING BEACON assembly.

(15) For marked crosswalks within a school zone, the In-Street Pedestrian Crossing sign ***(MUTCD R1-6c)*** may be used, as shown in ***Figure 15-12 and 15-14***.

(16) Illustrations of traffic control devices for school zones with and without school crossings are included as ***Figures 15-12 through 15-14*** in this Chapter.

1. Fitzpatrick, K., N.A. Brewer (Speeds in School Zones Report #0-5470-1)

Figure 15-12
Typical School Zone With School Crossing (2- or 3-Lane, 2-Way) (40 mph or less) Mid-block or on Thru Street at an Intersection

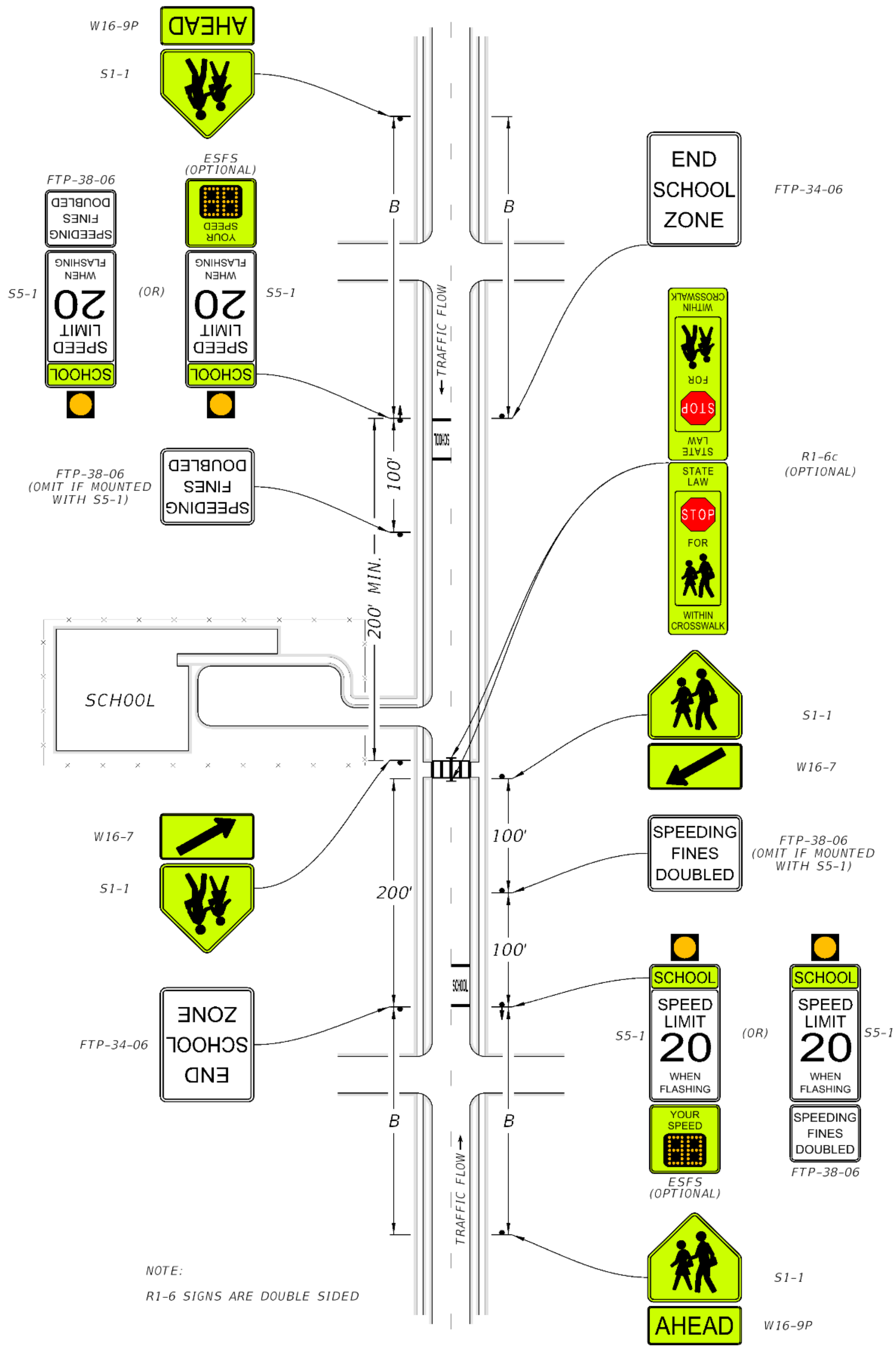


Figure 15-13
Typical School Zone Fronting the School Property Without a School Crossing

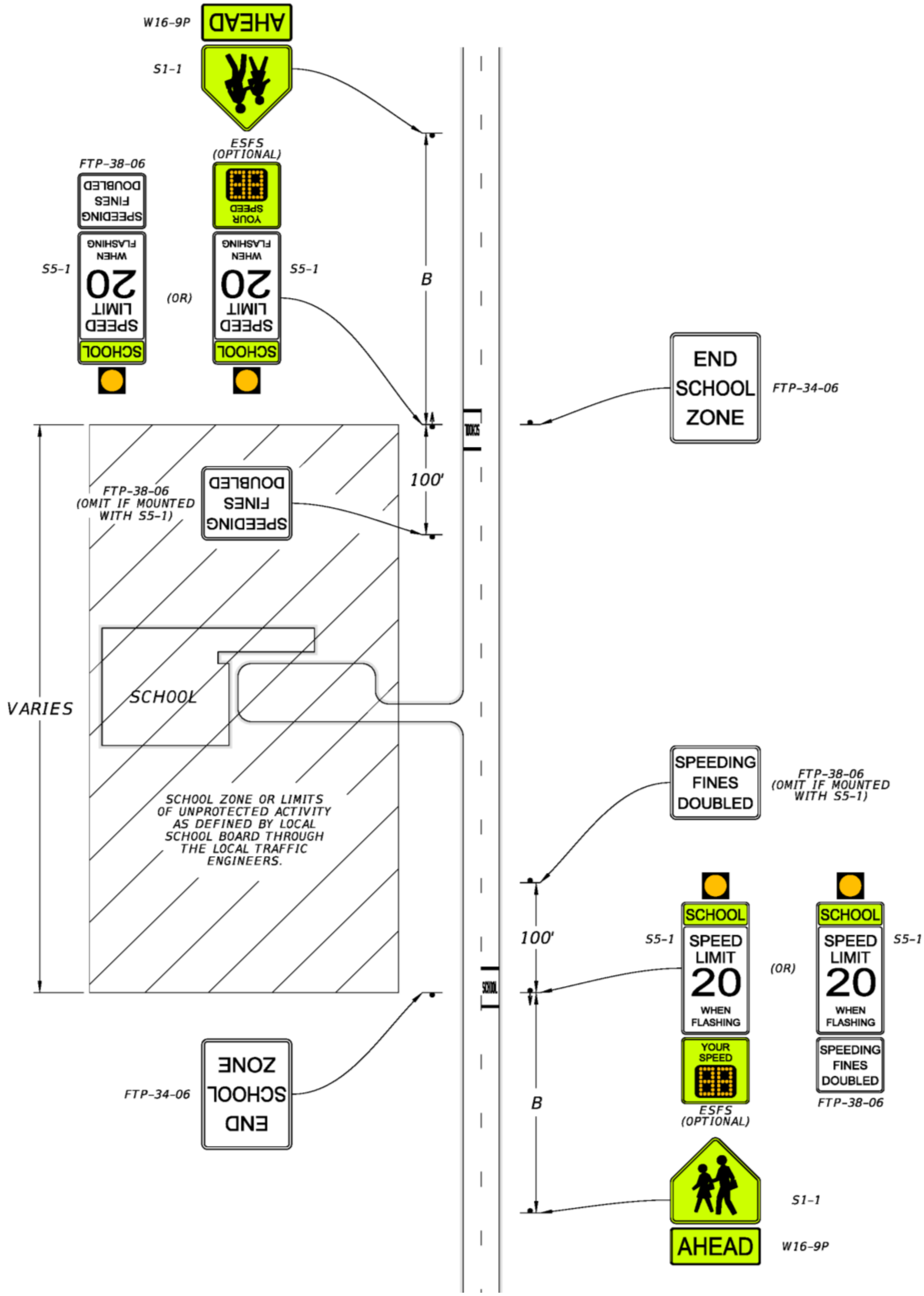
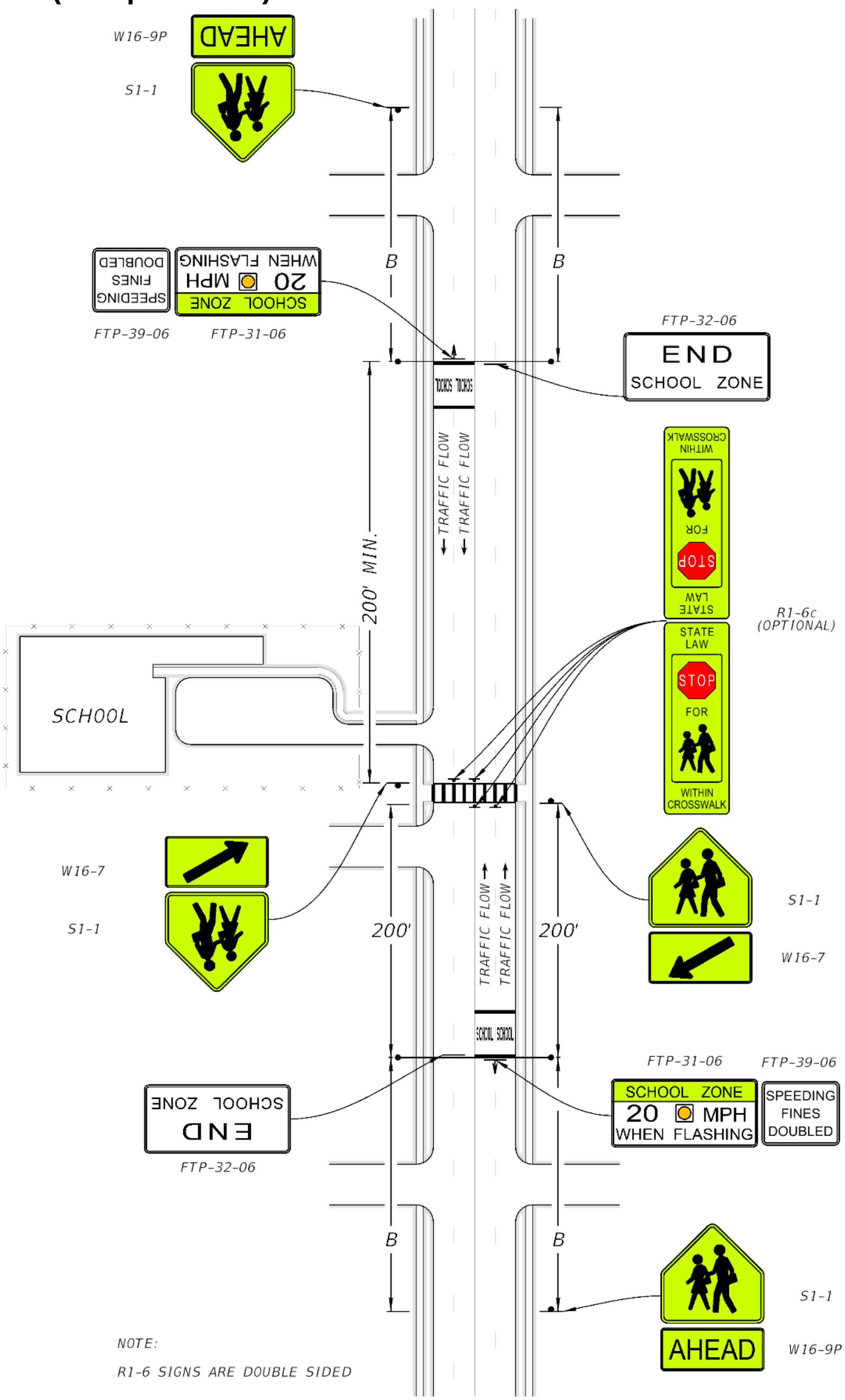


Figure 15-14
Typical School Zone With School Crossing (4- or 5-Lane Undivided) (40 mph or less) Mid-block or on Thru Street at an Intersection



15.5 TRAFFIC CONTROL DEVICES

(1) Standard school-related traffic control devices such as signs, markings, and signals must comply with the ***Part 7 of the MUTCD***, except as amended herein through the approval of specific signs and markings, as shown in this Chapter***.***

(2) All traffic control devices shall be listed on the Department's Approved Product List (APL) or Innovative Product List (IPL), in accordance with ***Section 316.0745 F.S.***

(3) Additional traffic control device requirements for flashing beacon assemblies are provided in the ***Department's Design Standards, Index No. 11862*** for the given conditions that apply.

(4) Sign sheeting materials shall comply with ***Section 700 of the Department's Standard Specifications*** for retro-reflective sign sheeting. All school-related sign sheeting shall meet minimum Type IV yellow-green fluorescent sheeting. Signs having fluorescent yellow-green sheeting should not be mixed with signs having yellow retroreflective sheeting.

(5) The "SCHOOL" pavement message placed at the beginning of all school zones shall comply with ***Figures 15-15A and 15-15B***. The double lane "SCHOOL" pavement message shown in ***Part 7C of the MUTCD*** may be substituted for 2 lane approaches only, on a case-by-case basis. The SCHOOL pavement message shall not extend into the opposing travel lanes.

Figure 15-15A.
School Pavement Message Details

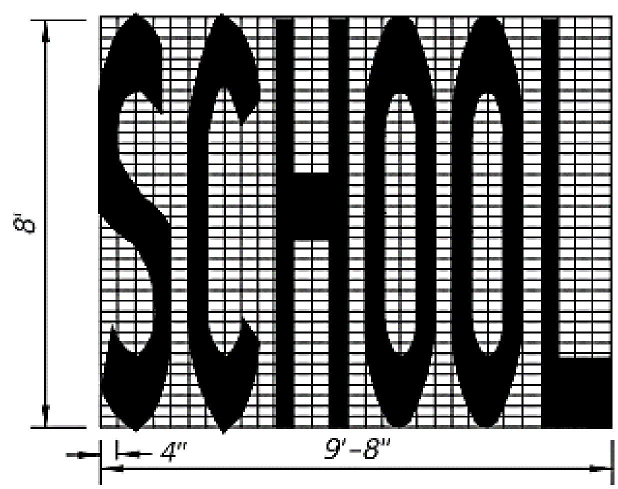
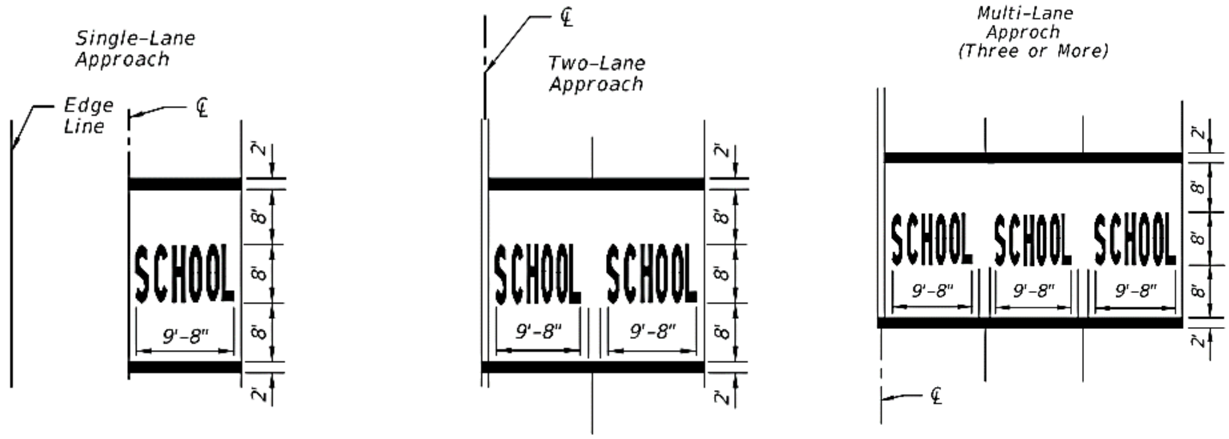


Figure 15-15B
School Pavement Message Layouts for Single and Multi-Lane Approaches



15.6 RESPONSIBILITIES AND MAINTENANCE

(1) ***Section 1013.33, F.S.*** places the basic responsibility for school site planning with each local school board in cooperation with the appropriate municipal, county, regional, or state agencies.

(2) In accordance with ***Section 316.1895, F.S.***, school zones shall be maintained by the respective government entity having responsibility. Maintenance and replacement of traffic control devices shall be done in a timely manner.

(3) Before the start of the school year, the Department recommends local agencies should arrange for an annual inspection by an appropriate expert in traffic control, of school zones under their jurisdiction. This person should be a representative of the city or county engineering department who fully understands the standards for signing and pavement markings for school zones in accordance with this Chapter.

15.7 PORTABLE SIGNS AND TRAFFIC CONES

(1) Portable signs indicating the begin and end points of school areas, school zones or the location of school crossings shall not be used on roadways in Florida.

(2) In lieu of portable signs, school officials may use approved 36-inch orange traffic cones or 28-inch approved school zone vertical panels within the roadway during approved school hours, when the need to emphasize school zones or school crossings exists. These devices shall be placed in both directions on the centerline at the advance school zone crossing sign when accentuation is needed. On multilane divided roadways, these devices may be placed on each lane line of the school zone or school crossing. The legend "SCHOOL" may be printed on the cone in four inch black vertical lettering.

(3) Traffic cones must be used in accordance with ***Section 6F.59 of the MUTCD***.

(4) Stop Paddles ***(MUTCD R1-1)*** may be used by adult crossing guards only. Stop Paddles shall be in accordance with ***Section 7D.05 of the MUTCD*** including:

(a) The STOP paddle shall be an octagonal shape.

(b) The background of the STOP face shall be red with at least 6-inch series upper-case white letters and border.

(c) The paddle shall be at least 18 inches in size and have the word message STOP on both sides.

(d) The paddle shall be retro-reflectorized or illuminated when used during hours of darkness.

Chapter 16
OTHER SPEED SIGNS AND TERMS

In addition to the speed zoning procedures and speed signs discussed in this manual, there are several other speed signs that merit inclusion and acknowledgement. They fall into three main categories; Advisory Speed (Warning), Road or Bridge Special Temporary Speed Restrictions (Regulatory), and Electronic Speed Feedback (Regulatory).

16.1 ADVISORY SPEED (WARNING)

(1) Advisory speed signs are warning signs and are intended to display recommended maximum comfortable and safe speed rather than the maximum legal speed as displayed on regulatory signs used for speed zoning. Hence, their colors are black legend on yellow background (black legend on orange background for work site application) rather than black legend on white background. ***Section 2C.08 of the MUTCD*** illustrates two types of these signs.

(2) The Advisory Speed plaque ***(MUTCD W13-1P)*** may be used to supplement any warning sign to indicate the advisory speed for a condition. The use of the Advisory Speed plaque for horizontal curves shall be in accordance with the information shown in ***Section 2C.08 of the MUTCD***. Per this section, "The Advisory Speed plaque shall also be used where an engineering study indicates a need to advise road users of the advisory speed for other roadway conditions. If used, the Advisory Speed plaque shall carry the message XX MPH. The speed shown shall be a multiple of 5 mph. Except in emergencies or when the condition is temporary, an Advisory Speed plaque shall not be installed until the advisory speed has been determined by an engineering study."

(3) Advisory speed signs are not meant to show a speed beyond which a vehicle will spin out (if on a horizontal curve) or bottom out (if used for a dip or hump in the roadway). Rather, they allow for a comfortable margin of safety because of variations in vehicle and pavement characteristics.

(4) Road user surveys have indicated a lack of faith in the numerical values posted on horizontal curve speed signs. As experienced with realistic speed limit signs, advisory speed warning signs can gain driver confidence and credibility and become effective tools only when uniformly used.

(5) Advisory speed warning signs are not to be used as enforceable speeds, although a violation of them is sometimes used by enforcement officers in support of other traffic violation charges.

(6) The displayed advisory warning speed:

- **(a)** Is approximately 75 percent of the maximum safe speed for an average passenger car;
- **(b)** Is the speed at which driver discomfort begins;
- **(c)** Is the speed beyond which loose items may shift in a vehicle;
- **(d)** Is based on an average passenger car, typically loaded;
- **(e)** May be too high for a top-heavy truck;
- **(f)** May be too low for a sports car;
- **(g)** May be too high with loose gravel, sand, or ice on the road.

(7) A special type of spot speed study is conducted to determine the maximum speed at which a horizontal curve can be negotiated comfortably. The equipment includes a driver, and a test car with ball bank indicator. For more detail on the study techniques, refer to Chapter 10 (Advisory Speed Study) of the ***MUTS***.

(8) For information on the availability of equipment and more detail on study techniques for advisory speeds, contact the Department's District Traffic Operations Office found on the State Traffic Engineering and Operations Office website:
http://www.fdot.gov/traffic/Contacts/Contacts-District.shtm.

(9) Advisory speed signs used to supplement warning signs such as DIP ***(MUTCD W8-2)***, BUMP ***(MUTCD W8-1)***, HILL ***(MUTCD W7-1)***, etc., are based on test runs using an average passenger car and traffic engineering judgment.

(10) This test run method in addition to the ball-bank indicator is also applicable to spiral curve ramps which are not equal tangent circular curves or broken back curves (two or more consecutive curves with short tangents between them).

(11) The need for advanced mainline signing of advisory ramp or exit speeds increases proportionately to the difference between the mainline speed and the advisory speed. The greater the difference, the greater the need for more advance signing. However, ***Section 2E-10 of the MUTCD*** cautions that mainline warning signs when placed on an overhead sign structure or on its support, must be considered as one of the maximum of three signs which can be displayed.

Furthermore, advisory Exit Speed signs are not recommended for typical diamond interchange ramps. Signs for these straighter, higher speed exit ramps should be STOP AHEAD ***(MUTCD W3-1)*** or SIGNAL AHEAD ***(W3-3)*** as symbols or an optional message sign, whichever is appropriate.

16.2 ROAD OR BRIDGE SPECIAL RESTRICTIONS (REGULATORY)

(1) Due to the physical deterioration or damage to road pavements, sub grades, or bridge structures, it may be necessary to reduce the speed limits and/or vehicle load limits temporarily until reconstruction and/or repair work can be scheduled and completed. Usually, the speed reduction would apply to heavier vehicles, but in the interest of public safety, as well as minimizing further road or bridge damage, a regulatory speed for passenger cars also may become necessary.

(2) The engineering choice of speed limits for this purpose is not addressed by this manual, but the procedures for locating signs, identifying the zones, etc., is covered.

16.3 ELECTRONIC SPEED FEEDBACK SIGNS

(1) An Electronic Speed Feedback sign (also called a driver feedback sign, changeable message sign, or variable message sign) is an interactive sign that displays vehicle speed as drivers approach. The purpose of this type of sign is to reduce vehicle speed by making drivers aware of their approaching speed relative to the posted speed or school speed zone limit. ***Section 2B.13(19) of the MUTCD*** permits the use as follows: *“A changeable message sign that displays to approaching drivers the speed at which they are traveling may be installed in conjunction with a Speed Limit sign”*.

(2) Electronic Speed Feedback signs (see also ***Section 15.4.2(11)*** of this ***Manual***), may be used in conjunction with advisory signs or plaques provided that they meet the following guidelines: ***Section 2B.13 of the MUTCD*** “If a changeable message sign displaying approach speeds is installed, the legend YOUR SPEED XX MPH or such similar legend should be shown. The color of the changeable message legend should be a yellow legend on a black background or the reverse of these colors”.

Chapter 17
SPEED ZONE ESTABLISHMENT AND RECORDS

(1) Although Florida Statutes prescribe certain procedures to gain official approval for speed zone alterations on the State Highway System, once the studies and recommendations have been made, such procedures are not prescribed for county and city roads and streets.

(2) ***Section 335.10, F.S.***, as amended, requires the FDOT to prescribe regulations (including speed zones) for vehicles operating on the State Highway System. The Department's Traffic Regulation Approval Process, ***Topic Number 750-010-011***, complies with this statutory requirement. Notice of speed zoning changes are provided in writing by certified mail, return receipt requested, to each local governmental entity where the regulation will apply, at least 14 days prior to implementation. Formal documentation of such notices is maintained in the FDOT District Offices.

(3) Any speed zone alteration on county or city roads or streets should be approved by action of a council or commission and entered into the records for that body, unless that agency authorizes and delegates an officer or person (by title) to determine and maintain a record system on speed zoning as determined by that office or person in accordance with the methods outlined in this manual.

(4) Records typically should contain a Speed Zone Map or Straight Line Diagram as shown in ***Figure 17-1A*** and ***17-1B***; a Spot Speed Study summary (as shown in ***Figure 17-2***); the Speed Zone Regulation including the date approved, from-to mileposts, the numerical limits and physical locations as shown in ***Figure 17-3***; and the locations and dates of Speed Regulation Sign Installations.

(5) It may seem excessively precise to carry milepost values to three decimal places, but each 0.001 mile is 5.28 feet. Descriptions of sign locations sometimes require even more than 5.28 feet accuracy, such as a sign to be located on a lot line between two residences or in a critical location to avoid driveways, other signs, and obstructions which might block it from view. So even with milepost, a State Plane Coordinate node or a specific physical description may be crucial.

(6) Changes in street characteristics and adjacent land use conditions commonly require a re-examination of speed limits. Although the most common numerical change is downward (assuming the existing limits are realistically established by the methods outlined in this manual), it is not uncommon for a speed limit to rise, particularly when major construction changes to the roadway and improvements to traffic control devices (signs, signals, lighting, and markings) cause traffic operational efficiency and safety to increase.

(7) It is advisable to change from one numerical speed zone to another just upstream and downstream from an intersection such as 35 mph, from 12th Street South to Frederick Street (Traffic Signals 99, 100, 101 and 61, as shown in ***Figure 17-1B***), because this leaves no doubt as to the speed limit within the intersections where crashes are most likely to occur.

17.1 RECORD KEEPING AND CONTINUITY

(1) Officials are sometimes asked to provide records showing the official approval of speed zone alterations in litigation proceedings on some traffic crash or speed citation cases. Litigants may ask for the date the signs were put up, along with work order completion forms signed by the person doing the sign installation, or his supervisor. In addition, the Department maintains records of speed zone locations in the Roadway Characteristics Inventory (RCI) database, and typically a technical memorandum to the District Traffic Operations Engineer (DTOE) documenting the engineering support for the speed zone. Such records provide more accurate evidence in court for proper adjudication of traffic crash and speed citation cases.

(2) It would seem obvious that a speed zone once begun must end and, unless the road ends, must co-terminate with another speed zone. It is not uncommon on rural roads to find a realistic speed become unrealistic, simply because it isn't explicitly terminated. Without any additional speed signs for miles beyond, this practice can confuse drivers and enforcement officers.

(3) Care also must be exercised to assure a speed zone does not change simply because the road or street enters another agency's jurisdiction. Coordination of speed zoning between the two agencies and use of the methodology in this manual will provide the highest degree of uniformity and safety.

Figure 17-1A
Straight Line Diagram

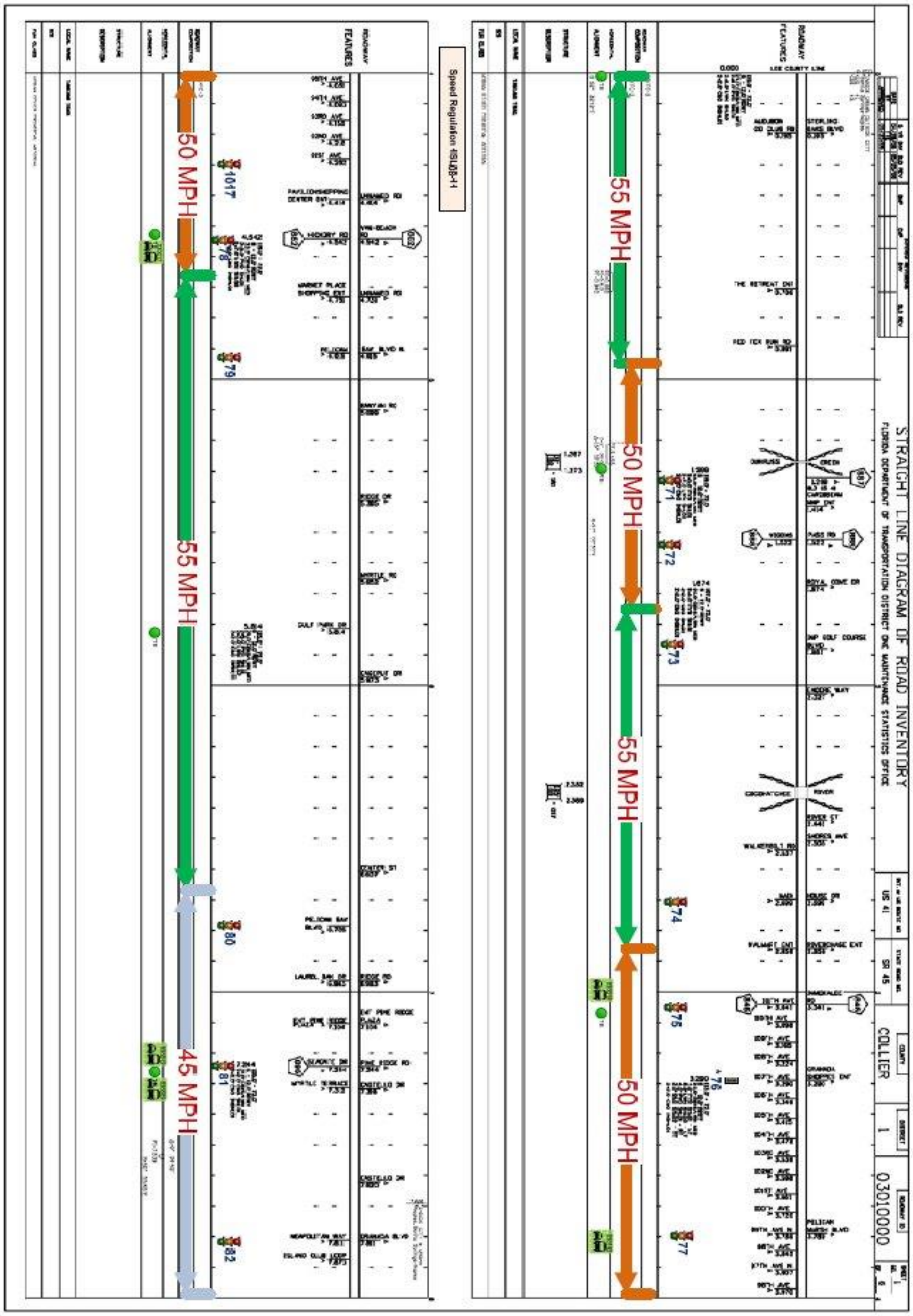


Figure 17-1B
Straight Line Diagram

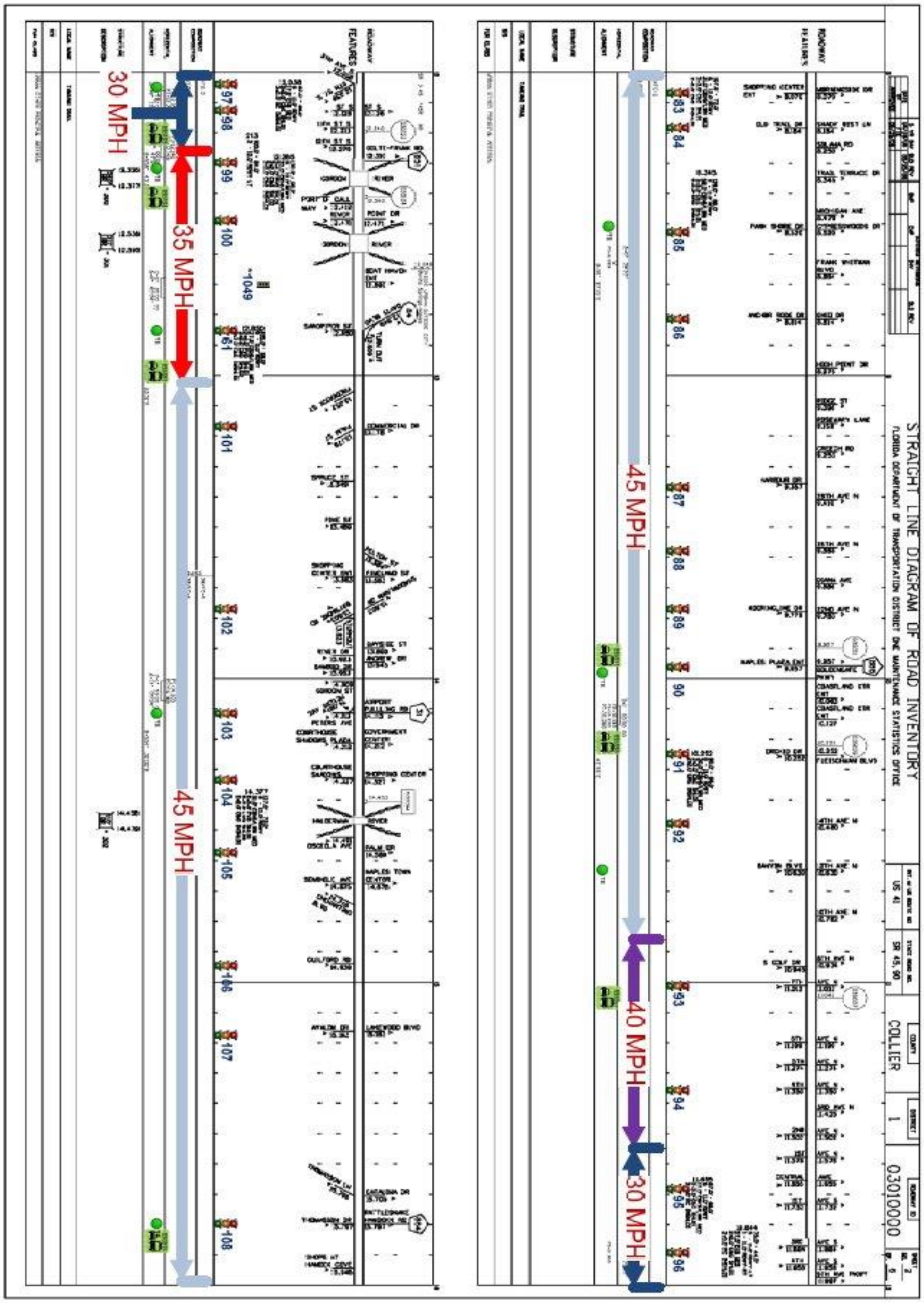


Figure 17-2
Spot Speed Studies

SPOT SPEED STUDIES					
State Road No. 45		Roadway ID: 03010000		District: 1	County: Collier
Study	**Date**	**Direction**	**85th %**	**MilePost**	**Study Location**
1	05/22/06	NB	54	0.564	750 ' N. of The Retreat Entrance
		SB	56		
2	05/22/06	NB	49	1.200	523' N. of Old US 41
		SB	50		
3	05/22/06	NB	55	2.80	449' N of Riverchace Entrance
		SB	57		
4	05/22/06	NB	48	3.538	Corner of 103rd Ave.
		SB	51		
5	05/23/06	NB	52	5.514	100' N. of Gulf Park Drive
		SB	55		
6	05/23/06	NB	42	7.791	100' N. of Neapolitan Way
		SB	48		
7	05/23/06	NB	43	9.233	100' N. Creech Road
		SB	47		
8	05/23/06	NB	25	11.844	200' N. of 3rd Avenue
		SB	24		
9	04/18/08	NB	46	13.783	100' N. of Shadowlawn Drive
		SB	42		
10	04/18/08	NB	51	15.372	1000' S. of Avalon Drive
		SB	51		

Figure 17-3
Speed Zone Regulation

SPEED ZONE REGULATION				
Traffic Regulation Number 1SL08-11		**Date Approved: 11/24/2008**		
State Road No. 45	**Roadway ID:** 03010000	**District:** 1		**County:** Collier
Milepost From	**Milepost To**	**Speed (MPH)**	**Length (Mi)**	**Location**
0.000	0.964	55	0.964	From County line to 1,760' North of C.R. 887.
0.964	1.735	50	0.771	From 1,760' North of C.R. 887 to 1,125' South of C.R. 888.
1.735	2.862	55	1.127	From 1,125' South of C.R. 888 to 945' South of C.R. 846.
2.862	4.666	50	1.804	From 945' South of C.R. 846 to 650' South of C.R. 862
4.666	6.685	55	2.019	From 650' South of C.R. 862 to 530' North of Pelican Bay Boulevard.
6.685	10.816	45	4.131	From 530' North of Pelican Bay Boulevard to 690' North of S. Golf Drive.
10.816	11.566	40	0.750	From 690' North of S. Golf Drive to 60' North of 1st Avenue North.
11.566	12.265	30	0.699	From 60' North of 1st Avenue North to 230' North of Goodlette Frank Road.
12.265	13.037	35	0.7.22	From 230' North of Goodlette Frank Road to 79' North of Frederick Street.
13.037	16.224	45	3.187	From 79' North of Frederick Street to 980' South of Valleystreem Drive.
16.224	19.883	55	3.659	From 980' South of Valleystreem Drive to 240' North of Price Street/Triangle Boulevard.