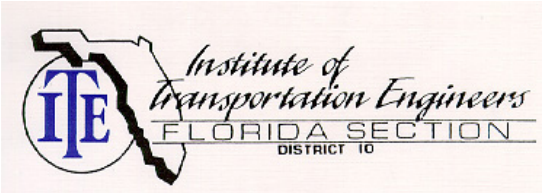

Traffic Information Program Series

TIPS

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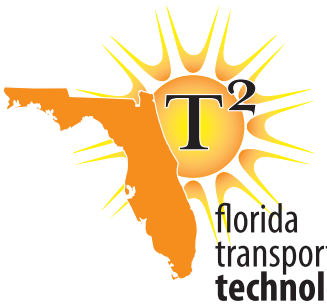

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FLORIDA TECHNOLOGY TRANSFER
TRAFFIC INFORMATION PROGRAM SERIES (TIPS)
From the Florida Section (District 10) of the
Institute of Transportation Engineers

The Florida Section (District 10) of the Institute of Transportation Engineers has produced a series of information and fact sheets that address common questions relating to transportation. The Traffic Information Program Series (TIPS) answer frequently asked questions about many aspects of transportation planning, traffic operations and traffic control. The TIPS are written in lay language so they serve as an information source not only for transportation professionals, but for the general public as well.

The TIPS are produced as a public service by the Florida Section of the Institute of Transportation Engineers, John T. Izzo, P.E., editor. The TIPS are published in the Florida Section Institute of Transportation Engineers newsletter, FSITE, and are reprinted by the Florida Technology Transfer (T2) Center at the University of Florida.

If you have a hot TIP you'd like to share with others, contact the T2 Center and we'll put you in touch with the TIPS coordinator.

TRAFFIC INFORMATION PROGRAM SERIES (TIPS)

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WON'T A 'TRAFFIC SIGNAL' REDUCE CRASHES AT OUR INTERSECTION?

Traffic signals don't always prevent crashes. In many instances, the total number of crashes and injuries increase after they're installed.

Where signals are used unnecessarily, the most common results are a reduction in right-angle collisions but an increase in total crashes, especially the rear-end type collision. In addition, pedestrians are often lulled into a false sense of security.

In deciding whether a traffic signal will be an asset and not a liability, traffic engineers evaluate the following criteria:

1. Does the number of vehicles on intersecting streets create confusion or congestion?
2. Is traffic on the main street so heavy that drivers on the side street will try to cross when it is unsafe?
3. Does the number of pedestrians trying to cross a busy main street create confusion, congestion or hazardous conditions?
4. Does the number of school children crossing a street require special controls for their protection? If so, is a traffic signal the best solution?
5. Will the installation of a signal allow for continuous, uniform traffic flow with a minimum number of vehicle stops?
6. Does an intersection's crash history indicate that a signal will reduce the possibility of a collision?

Traffic engineers compare the existing conditions against nationally accepted minimum standards established after many years of studies throughout the country. At intersections where standards have been met, the signals generally operate effectively with good public compliance. Where not met, compliance is generally reduced resulting in additional hazards.

While a properly placed traffic signal improves the flow and decreases crashes, an unnecessary one can be a source of danger and annoyance to all who use an intersection: pedestrians, cyclists and drivers.

WON'T A 'STOP SIGN' SLOW TRAFFIC ON OUR STREET?

Stop signs installed in the wrong places for the wrong purposes usually create more problems than they solve.

One common misuse of stop signs is to arbitrarily interrupt traffic, either by causing it to stop or by causing such an inconvenience that motorists are forced to use other routes. Studies made in many parts of the country show that there is a high incidence of intentional violations where stop signs are installed as "nuisances" or "speed breakers". These studies showed that speed was reduced in the immediate vicinity of the "nuisance" stop signs. But, speeds were actually higher between intersections than they would have been if these signs hadn't been installed.

At the right place and under the right conditions, a stop sign tells drivers and pedestrians who has the right of way. Nationally recognized standards have been established to determine when stop signs should be used. These standards, or "warrants", take into consideration, among other things, traffic speed and volume, sight distance and the frequency of traffic "gaps" which will allow safe vehicle entry or pedestrian crossing.

Most drivers are reasonable and prudent. But, when confronted with unreasonable restrictions, they frequently violate them and develop a general contempt for all traffic controls--often with tragic results.

WHY NOT LOWER THE SPEED LIMIT TO REDUCE HAZARDS IN OUR AREA?

An unrealistically low speed limit can actually lead to crashes. Here's why:

- First, many studies conducted over several decades in all parts of the country have shown that a driver's speed is influenced more by the appearance of the roadway and the prevailing traffic conditions than it is by the posted speed limit.

- Second, some drivers will obey the lower posted speed while others will feel it's unreasonable and simply ignore it. This disrupts the uniform traffic flow and increases crash potential between the faster and the slower drivers.

- Third, when traffic is traveling at different speeds, the number of breaks in traffic to permit safe crossing is reduced. Pedestrians also have greater difficulty in judging the speed of approaching vehicles.

Florida Statutes, Chapter 316.183, is entitled "Unlawful speed."

Section 316.183(1), states "No person shall drive a vehicle on a highway at a speed greater than is reasonable and prudent under the conditions, and having regard to the actual and potential hazards, then existing."

Section 316.183(2) states "On all streets or highways, the maximum speed limits for all vehicles must be 30 miles per hour in business or residence districts, and 55 miles per hour at any time at all other locations. However, with respect to a residence district, a county or municipality may set a maximum speed limit of 20 to 25 miles per hour on local streets and highways after an investigation determines that such a limit is reasonable."

Florida Statutes, Chapter 316.187 is entitled "Establishment of state speed zones."

Section 316.187(1) authorizes the Florida Department of Transportation (FDOT) to set maximum and minimum speed limits. Section 316.187(2)(a) states "The maximum allowable speed limit on limited access highways is 70 miles per hour."

Florida Statutes, Chapter 316.189 is entitled "Establishment of municipal and county speed zones."

Section 316.189(1) states "The maximum speed within any municipality is 30 miles per hour." It also states "A municipality may set speed zones altering such speeds, both as to maximum, not to exceed 60 miles per hour, and minimum, after investigation determines such a change is reasonable and in conformity to criteria promulgated by the Florida Department of Transportation..."

Section 316.189(2) states “The maximum speed on County roads is: (a) In a business or residence district, 30 miles per hour in the daytime or nighttime; provided that with respect to districts a county may set a maximum speed limit of 25 miles per hour after an investigation determines that such a limit is reasonable…” This section also states “However, the board of county commissioners may set speed zones altering such speeds, both as to maximum and minimum after such investigation determines such a change is reasonable and in conformity to criteria promulgated by the Florida Department of Trans-portation, except that no such speed zone shall permit a speed of more than 60 miles per hour.”

The Florida Statutes can be found on the web at:

http://www.flsenate.gov/Statutes/

WON'T A 'CHILDREN AT PLAY' SIGN HELP PROTECT OUR KIDS?

At first consideration, it might seem that this sign would provide protection for youngsters playing in a neighborhood. It doesn't.

Studies made in cities where such signs were widely posted in residential areas show no evidence of having reduced pedestrian crashes, vehicle speed or legal liability. In fact, many types of signs which were installed to warn of normal conditions in residential areas failed to achieve the desired safety benefits. Further, if signs encourage parents with children to believe they have an added degree of protection--which the signs do not and cannot provide--a great disservice results.

Obviously, children should not be encouraged to play in the roadway. The "children at play" sign is a direct and open suggestion that it is acceptable to do so.

Federal standards discourage the use of "children at play" signs.

Specific warnings for schools, playgrounds, parks and other recreational facilities are available for use where clearly justified.

WHY CAN'T WE USE 'SPEED BUMPS' ON OUR BLOCK?

The speed bump is an increased hazard to the unwary ... a challenge to the daredevil ... a disruption of the movement of emergency vehicles ... and the cause of an undesirable increase in noise.

Courts have held public agencies liable for personal injuries resulting from faulty design. Because speed bumps have considerable potential for liability suits, many officials have rejected them as a standard traffic control device on public streets.

In addition, tests of various experimental designs have demonstrated the physical inability of a speed bump to successfully control all types of light-weight and heavy-weight vehicles. The driver of a softsprung sedan is actually encouraged to increase speed for a better ride over a bump that may cause other motorists to lose control.

The control of speeding in residential neighborhoods is a widespread concern which requires persistent law enforcement efforts ... not speed bumps.

WHEN ARE WE GOING TO GET SOME BIKEWAYS IN OUR NEIGHBORHOOD?

Each year, in Florida nearly 5,000 bicycle crashes result in about 100 fatalities and more than 4,000 injuries. Florida crash statistics show that the majority of the riders killed are adults.

Crash statistics for the State of Florida can be found at the Florida Department of Highway Safety and Motor Vehicles web site:

http://www.hsmv.state.fl.us/reports/crash_facts.html

Bikeways have raised a lot of interest in the past few years. Some agencies have built separate off-road bike paths. Many more have painted bike lanes on streets. Others have installed green "Bike Route" signs without the special lanes.

The cost of both building and maintaining bikeways can be a deterrent to many bike programs. Initial cost can range from a few dollars to paint a lane to a large budget to build a separate path including special bridges where needed.

Before embarking on a bikeway program, responsible agencies should look at the total picture of bicycle operation and safety. Bike lanes and signs alone cannot solve the problem of bicycle crashes; in some places they have increased the problem by giving riders a false sense of security.

An overall bicycle safety program should include: enforcement of traffic laws; bike safety training in the schools at an early age; follow-up training every year in the schools; and involvement of the parents of minor children who violate traffic laws or exhibit dangerous riding habits.

The bike program for a community should include three principle points:

1. Education in safe riding.
2. Enforcement of rules of the road.
3. Development of well-engineered bike lanes and bike paths.

This will involve the active participation of:

1. The schools.
2. Law enforcement agencies.
3. The traffic engineers and,
4. You, the citizen.

For more information contact: State Pedestrian/Bicycle Program; Florida Department of Transportation, 605 Suwannee St. MS 82, Tallahassee, FL 32388-0450; Phone (850) 487-1200 or at web site: http://www11.myflorida.com/safety/ped_bike/ped_bike.htm

ARE "TRAFFIC CONTROL DEVICES" ON PRIVATE PROPERTY REQUIRED TO MEET STATE STANDARDS?

State law requires traffic control devices, including those signs and pavement markings on private property where the public is invited, to meet State standards adopted by the Florida Department of Transportation (FDOT). Florida Statutes, Section 316.0747 state: "It is unlawful for any non-governmental entity to use any traffic control device at any place where the general public is invited, unless such device conforms to the uniform system of traffic control devices adopted by the Department of Transportation pursuant to this Chapter."

The "Manual on Uniform Traffic Control Devices" (MUTCD) published by the U.S. Department of Transportation is the national standard for Traffic Control Devices. The Florida Department of Transportation has adopted the MUTCD as the State standard by Rule 14-15.10. The entire MUTCD can be found on the web at:

http://mutcd.fhwa.dot.gov

The "Manual on Uniform Traffic Control Devices" (MUTCD) may be purchased from the Institute of Transportation Engineers(ITE), 1099 14th St., N.W., Suite 300 West, Washington D.C. 20005-3438. Phone: (202) 289-0222, Fax (202) 289-7722

The ITE Home page web site is at: http://www.ite.org

The ITE Bookstore is at: http://www.ite.org/bookstore/index.asp

The MUTCD states that:
Parking space striping must be white.
Lane Lines between traffic lanes in the same direction must be white.
Centerlines between traffic in opposing directions must be yellow.
Arrows on the pavement must be white.
Crosswalks and Crosswalk lines must be white.
Stop Lines (Stop Bars) must be white.
Street Name Signs should have 6 inch high lettering and should be retro-reflective.

Sign Height Standard:
The MUTCD states: "Signs installed at the side of the road in rural districts shall be at least 5 feet, measured from the bottom of the sign to the near edge of the pavement. Where parking or pedestrian movements occur, the clearance to the bottom of the sign shall be at least 7 feet. Directional signs on expressways and freeways shall be installed with a minimum height of 7 feet. If a secondary sign is mounted below another sign, the major sign shall be installed at least 8 feet and the secondary sign at least 5 feet above the level of the pavement edge. All route signs, warning signs, and regulatory signs on expressways and freeways shall be at least 7 feet above the level of the pavement edge."

Lateral Offset Standard:

Another concern of citizens is the lateral placement of STOP signs from the roadway. The MUTCD states: “The minimum lateral offset from the edge of the shoulder (or if no shoulder exists, from the edge of the pavement) to the near edge of a roadside-mounted sign shall be 6 feet. Roadside-mounted sign supports shall be breakaway, yielding, or shielded with a longitudinal barrier or crash cushion if within the clear zone. The minimum lateral offset from the edge of the shoulder (or if no shoulder exists, from the edge of the pavement) to the near edge of overhead sign supports (cantilever or sign bridges) shall be 6 feet. Overhead sign supports shall have a barrier or crash cushion to shield them if they are within the clear zone.”

HAVE YOU THOUGHT ABOUT THE IMPACT OF 'HIGHWAY SIGNS' ON TRAFFIC SAFETY?

As a motorist or pedestrian, have you noticed changes in traffic signs you see along the roadways? New colors, shapes, symbols and messages are now helping you as the result of many years of worldwide research and engineering development by Transportation Engineers.

The MANUAL ON UNIFORM TRAFFIC CONTROL DEVICES (MUTCD) gives Transportation Engineers the uniform standards to safely assist motorists as they travel. It defines a series of uniform signs which are clear in their messages as applied on the nation's roadway system.

Symbols have replaced word messages whenever appropriate. The MUTCD has adopted standard sign and pavement marking colors and shapes to help today's motorists to better understand the rules of the road.

The use of specific colors is designed to promote instant recognition of sign and pavement markings messages.

The color RED, is used exclusively to indicate a stop or prohibition. The red "STOP" and "DO NOT ENTER" signs are examples of a "Stop message", while red on white parking signs indicate that parking is not allowed.

GREEN is the color which indicates a "Go" condition, or gives the motorist directional guidance. Virtually all guide signs on the Interstate System have a green background and local roadways are following suit. A parking regulation sign with green text indicates that parking is allowed.

BLUE is a sign color which directs motorists to services that are available. The "H" hospital sign, the telephone symbol sign, as well as food-gas-lodging signs which are located at many highway interchanges are examples of this use.

YELLOW is used for warning signs which alert the motorist to a changing condition in the roadway ahead. "SIGNAL AHEAD", "SCHOOL CROSSING", "LOW CLEARANCE", and "NO PASSING" zone signs are examples.

A BLACK LEGEND ON A WHITE BACKGROUND indicates a regulation. "LEFT LANE MUST TURN LEFT" and "SPEED LIMIT 55" are typical examples.

ORANGE signs indicate that a motorist is approaching a construction and/or maintenance area.

BROWN is the background color for information about public parks and recreational areas.

Transportation Engineers have also reserved the shape of traffic control signs for specific types of messages. With only a quick glance, a motorist can tell the type of message by the shape of the sign.

The DIAMOND shaped sign is always used to issue a warning to the motorist. This diamond sign can warn of a pedestrian crossing, traffic signals, slippery pavement or curve in the roadway.

A RECTANGULAR sign with its longer side vertical signifies a traffic regulation. "KEEP RIGHT", "DO NOT PASS" and "NO U TURN" signs are examples.

RECTANGULAR SIGNS with the longer dimension horizontal are intended to give guidance information. "BIKE ROUTE", "FOOD-PHONE-GAS-LODGING", and directional signs fall into this category.

An OCTAGON is only used for a "STOP" sign and has no other legal use relative to traffic control devices.

An INVERTED TRIANGLE is the only way the Transportation Engineer signifies a "YIELD" condition.

A PENNANT shaped sign indicates that "NO PASSING" is allowed.

A PENTAGON sign is restricted to school zones. A pentagon sign with the silhouette of children walking signifies the beginning of school property while the same sign, with the addition of a crosswalk shown on it, indicates the school crossing point.

A CIRCULAR sign is used only at railroad crossings.

Strict criteria have been developed by the Florida Department of Transportation to control the use of traffic generator signs such as those used to guide traffic to business establishments.

Transportation Engineers attempt to minimize the amount of time a motorist's eyes must be diverted from the roadway to perceive sign messages. The next time you take a ride through your area, take a good look at the highway signs. They are examples of how Transportation Engineering research works to make your driving safer.

HAVE YOU THOUGHT ABOUT THE IMPACT OF HIGHWAY 'PAVEMENT MARKINGS' ON TRAFFIC SAFETY?

Pavement markings have definite and important functions to perform in the area of traffic control. They may be used to supplement the regulations or warnings of other devices, such as the use of stop bars in conjunction with traffic signs or signals. They may be used alone to produce results that cannot be obtained by any other device, such as guidance on winding roads and around fixed objects near the highway.

The Federal Highway Administration adopted the "MANUAL ON UNIFORM TRAFFIC CONTROL DEVICES" to provide a standard for traffic control devices. This manual has been adopted by most states including Florida.

Pavement markings are generally yellow or white in color. Yellow lines delineate the separation of traffic flows in opposing directions or mark the left boundary of the travel path at locations of particular hazard. White lines delineate the separation of traffic flows in the same direction.

Solid lines are restrictive, with double lines indicating maximum restriction. Broken lines are permissive. Line width also has importance, indicating the degree of emphasis with which the local traffic authorities are placing on traffic control. Some of the more common markings are:

A solid yellow line delineates the left edge of a travel path. It indicates a restriction against passing on the left or delineates the left edge of pavement on a divided street or highway, where there is inadequate clearance to the left of the line for making emergency stops. A double line consisting of two solid yellow lines delineates the separation between travel paths in opposite directions where passing is prohibited in both directions. Crossing this marking with care is permitted only as part of a left-turn maneuver.

A broken yellow line is used to delineate the left edge of a travel path where travel on the other side of the line is in the opposite direction. The usual application is as the center line of a two-lane, two-way roadway where overtaking and passing is permitted.

A double line consisting of a broken yellow line and a solid yellow line delineates a separation between travel paths in opposite directions where overtaking and passing is permitted for traffic adjacent to the broken line and is prohibited for traffic adjacent to the solid line. It is used on two-way, two and three-lane roadways to regulate passing.

A broken white line is used to delineate the edge of a travel path where travel is permitted in the same direction on both sides of the line. Its most frequent application is as a lane line.

A solid white line is used to delineate the edge of a travel path where travel in the same direction is permitted on both sides of the line but crossing the line is discouraged. The solid white line is also used as a pavement edge marking. A wide solid white line is used for emphasis where the crossing requires unusual care. It is often used as a line to delineate left or right turn lanes.

A double solid white line is used to delineate a travel path where travel in the same direction is permitted on both sides of the line, but crossing the line is prohibited. It is used as a channelizing line in advance of obstructions which may be passed on either side.

On occasion, a broken line is used to delineate the extension of a line through an intersection or interchange area. It has the same color as the line it extends.

Raised Reflective Pavement Markings (RPM's) have been found to be very effective in marking roadway centerlines and lane lines especially at night and during periods of rain.

Circumstances sometimes require more unusual treatments. Reversible lanes, inbound in the morning and outbound at night, and the reservation of a left-turn only lane in the center of a highway are examples of such conditions. A double broken yellow line delineates the edge of a lane in which the direction of travel is changed from time to time. In "left turn only" lanes, yellow markings are placed with solid lines on the outside and broken lines on the inside of the lane. Traffic adjacent to the solid line may cross this marking only as part of a left-turn maneuver.

Pavement markings such as shoulder markings, word and symbol markings, stop lines, crosswalk lines and parking space markings are white with the following two exceptions:

1. Transverse median markings are yellow.

2. Line, word and symbol markings visible only to traffic proceeding in the wrong direction on a one-way roadway are red. This type of marking is found on exit ramps or high speed, limited access roadways.

ARE THERE GUIDELINES FOR THE PROPER INSTALLATION OF MAILBOXES AND NEWSPAPER DELIVERY BOXES?

Each year, 70 to 100 people are killed in crashes involving rural mailboxes. Many victims that are not killed are often blinded and disfigured for life because mailboxes and their supports penetrate the windshield and hit the victim in the face.

Mailbox owners are limited only by their imagination. Steel tractor wheels, water pumps, milk cans filled with concrete, chains and massive I-beams are a few devices used to support mailboxes. Although such supports may be artistic to some, most are serious roadside hazards to motorists.

In a publication entitled "The Law and Roadside Hazards" Sponsored by the Insurance Institute for Highway Safety, it is stated that "Private individuals and corporations, as well as governmental entities, may be liable for their roles in creating or maintaining highway hazards."

The use of massive rigid mailbox supports such as bricks around the mailbox, heavy metal posts, concrete posts, and items of farm equipment, such as milk cans filled with concrete must not be used.

In Florida, uniform minimum standards and criteria for the design construction and maintenance of all public streets, is presented in the "Manual on Uniform Minimum Standards for Design, Construction and Maintenance for Streets and Highways." This publication, referred to as the "Green Book", developed by the Florida Department of Transportation, states that guidelines for the location of mailboxes and the types of support are given in the AASHTO publication "A Guide for Erecting Mailboxes on Highways - 1984". The FDOT "Green Book" also states that Geometric Design Objective #6 is to: "Provide a hazard-free environment that is "forgiving" to a vehicle that has badly deviated from the travel path or is out of control."

The following support and location standards for mailboxes and newspaper delivery boxes are from the AASHTO to publication entitled "A Guide for Erecting Mailboxes on Highways" (5-24-84):

TYPE OF SUPPORTS

WOOD POSTS: 4" diameter if round; 4 x 4" if rectangular

METAL PIPES: 2" inside diameter (maximum) standard steel, or aluminum.

NUMBER OF SUPPORTS: Use only 1 support for 1 box or group boxes.

Supports Should:

1. Yield or collapse if struck.

2. Bend or fall away from vehicle.

3. Not create severe deceleration.

4. Not be fitted with an anchor plate (metal post).

5. Not be embedded over 24" into the ground.

6. Not be set in concrete.

LOCATION OF MAILBOXES OR NEWSPAPER DELIVERY BOXES

1. Should be on right side of road in direction of delivery travel.

2. Servicing vehicle should be removed from roadway.

3. Mailbox face should be no closer than edge of shoulder (8'from roadway).

4. Mailbox should not block sight distance.

5. Mailbox should be behind existing guardrail if possible.

6. Should be mounted 3' to 4' above the mail stop surface.

WHAT CAN A CITIZEN DO TO HELP REDUCE TRAFFIC CRASHES?

In Florida, over 250,000 traffic crashes each year account for approximately 3,000 fatalities and 235,000 non-fatal injuries. Crash statistics for the State of Florida can be found at the Florida Department of Highway Safety and Motor Vehicles web site:
http://www.hsmv.state.fl.us/reports/crash_facts.html
Citizens can do their part to help reduce the high cost of traffic crashes by taking the following actions:

DRIVE CAREFULLY - Concentrate on driving and use seat belts; do not speed or drink and drive.

DON'T TAKE CHANCES - Play it safe. Drivers should not try to "beat the light" or "beat the train" at railroad crossings. Drive defensively at all times.

REPORT ROADWAY HAZARDS as soon as possible to city, county or state officials responsible for road maintenance and safety. Roadway hazards that should be reported are:

1. Traffic signs obstructed by vegetation.
2. Traffic signal malfunctions.
3. Traffic signs down or damaged.
4. Obstructions, potholes, bumps or dips in roadway.
5. Shoulder washouts.
6. Water ponding on roadway.

PROPERTY OWNERS SHOULD KEEP VEGETATION TRIMMED to insure that good intersection and driveway sight distance are provided and that traffic control signs are visible.

REPORT ACTS OF VANDALISM to law enforcement, traffic engineering and maintenance officials.

SUPPORT TRAFFIC SAFETY OFFICIALS to insure that they have adequate budgets for staff, equipment and supplies to do their job properly.

TURN ON VEHICLE HEADLIGHTS between dusk and dawn and anytime visibility is reduced by rain, smoke, fog, etc.

KEEP VEHICLES IN GOOD MECHANICAL CONDITION by regularly checking brakes, tires, wipers and other safety equipment.

OBEY TRAFFIC CONTROL DEVICES such as signs, signals and pavement markings. These devices were installed to enhance safety.

WHY DO THEY HAVE TO REMOVE THOSE NICE TREES NEXT TO MY ROADWAY?

Each year in the U.S. there are approximately 130,000 crashes involving trees and shrubbery. These crashes result in more than 3,000 fatalities and 58,000 injuries. Trees must sometimes be removed near a roadway in order to improve the driver's, bicyclist's or pedestrian's view of the road.

Many traffic crashes involving trees occur when vehicles run off roadways with little or no roadside clear zone. The roadside clear zone has been defined by the Florida Department of Transportation (FDOT) as "that area outside the traveled way available for use by errant vehicles." Vehicles frequently leave the traveled way during avoidance maneuvers, due to loss of control by the driver or due to collisions with other vehicles. Common circumstances that may cause a driver to run off the roadway can be driver or environment related. Driver related contributing circumstances which may cause a vehicle to stray off the roadway include: improper passing, alcohol or drug involvement, falling asleep, driver inattention, or driver distraction. Environment related contributing circumstances which may cause a vehicle to run off the roadway include: debris in roadway, glare, holes or ruts in roadway, slippery surface, water ponding or animal in path of the vehicle.

A manual was developed by the Florida Department of Transportation to provide uniform minimum standards and criteria for the design, construction and maintenance of all public streets. The manual often referred to as the "FDOT Greenbook," is entitled "Manual of Uniform Minimum Standards for Design, Construction and Maintenance for Streets and Highways." The standards presented in the manual are intended to provide the basic guidelines for developing and maintaining a highway system. One of the items is entitled Chapter 3.B, Design Objectives, states that one of the specific objectives is to "Provide an environment that minimizes hazards, is as hazard free as practical, and is 'forgiving' to a vehicle that has deviated from the travel path or is out of control." Chapter 3.C.7.f.1 of the manual states that "The minimum permitted widths are provided in Table 3-12. These are minimum values only and should be increased wherever practical."
The FDOT Greenbook can be obtained at web site:

http://www11.myflorida.com/rddesign/Florida%20Greenbook/Florida%20Greenbook%202002.htm

In summary, trees in the roadside clear zone can be harmful in two ways: Trees can prevent vehicle recovery to the roadway and increase injury severity and property damage when crashes do occur. Good traffic engineering practice and state standards require that an adequate roadside clear zone be provided on all new road construction projects. This requires the roadside clear zone to be clear of trees and other fixed objects.

WHY ARE THOSE ORANGE SIGNS AROUND ROAD CONSTRUCTION SITES?

Whenever work is done on or near the roadway, drivers are faced with changing and unexpected traffic conditions. These changes may be hazardous for drivers, workers and pedestrians unless protective measures are taken.

Drivers and pedestrians should take special care to observe signs, signals, pavement markings and flagmen, near roadway construction sites. These traffic control devices are installed to assist and safely guide and protect motorists, pedestrians and workers in a traffic control zone.

Most traffic control zones are divided into the following areas:

Advance Warning Area - tells traffic what to expect.

Transition Area - moves traffic out of its normal area.

Buffer Space - provides protection for traffic and workers.

Work Area

Termination Area - lets traffic resume normal driving.

Regulatory Signs are typically rectangular in shape with the long dimension vertical. The standard color scheme is black lettering on a white background. A red circle with a diagonal slash may be used in conjunction with a black diagram to indicate a prohibited maneuver. Red is used as a predominant color for STOP, YIELD, DO NOT ENTER and WRONG WAY signs.

Warning Signs are used to give notice of conditions that are potentially hazardous to traffic. These signs are used particularly when the danger is not obvious or cannot be seen by the motorist. Warning signs are typically diamond-shaped with one diagonal vertical. Permanent warning signs have a black legend on a yellow background. Construction and maintenance warning signs are a special series with the black legend on an orange background. The orange color is used to indicate the temporary nature of the condition and the additional potential hazard of the worksite. Traditionally, work activities have included construction, maintenance, and utility operations. However, orange color warning signs may have application for all work activities within the right of way such as survey crews or temporary weighing stations.

Guide Signs show destinations, directions, distances, services, points of interest and other geographical information. Directional signs and street name signs, when used with detour routing, may have a black legend on an orange background. Special information signs relating to the work being done shall have a black message on an orange background.

HOW DO 'TRAFFIC SIGNALS' WORK?

When installed under conditions that justify its use, a traffic signal is a valuable device for traffic control. However, an ill-advised or poorly designed signal is not only annoying, but can be dangerous to pedestrians, cyclists and drivers. Therefore, it is essential that, before traffic signals are installed, engineering studies be made by qualified personnel.

A traffic signal provides alternate right-of-way for different traffic movements at an intersection. It provides a degree of control that is second only to physical barriers. A good general guide is to use the least traffic control required to provide for the safe and efficient movement of vehicles and pedestrians. Specifications for signals and their placement as well as warrants for their use are contained in a publication entitled "Manual on Uniform Traffic Control Devices" published by the U.S. Department of Transportation.

A signal that minimizes vehicle stops and delay also cuts fuel consumption and emissions. The signal controller switches the signal indications on and off to assign right-of-way correctly and safely. Two basic kinds of controllers are used: pretimed (also known as fixed-time) and traffic-actuated.

Pretimed controllers operate on a predetermined, regularly repeated sequence of signal indications. They are used frequently where traffic volumes are predictable and stable.

Traffic-actuated controllers differ from pretimed controllers in that their signal indications are not of fixed length, but change in response to variations in traffic demand. They are frequently used where traffic volumes fluctuate widely or irregularly, or where interruptions to major-street flow must be minimized.

Signal Timing is the division of the cycle into seconds for each of the phases. It assigns right-of-way to alternate traffic movements in order to reduce traffic delay and crash-producing conflicts. Signal timing is constrained by the cycle length - the time for one complete sequence of the signal indications. Cycle lengths usually fall between 45 and 120 seconds.

There are three common techniques for coordinating traffic signals to operate as a system. This is done to improve the progressive flow of traffic along an arterial street or in a network, any of which can work with either pretimed or actuated controllers.

The simplest system is the basic programmed system in which a master controller simply sends a periodic pulse to all intersections to instruct the local controllers that this is the system reference point.

The second method, called "time based coordinators," replaces the central controller and the interconnecting communications completely and places a very accurate timer directly at each location.

The third system uses a sophisticated central computer control that exerts more external control on the individual controllers.

WHY ARE THOSE STOP SIGNS SO HIGH?

Traffic engineers have received calls from concerned citizens asking "Aren't those new STOP signs rather high?" In Florida, as in most states, the standard for signs, signals and pavement markings is the "Manual on Uniform Traffic Control Devices" (MUTCD). This publication by the U.S. Department of Transportation, serves as the standard for the installation of all traffic control devices.

Mounting Height Standard:
The MUTCD states: "Signs installed at the side of the road in rural districts shall be at least 5 feet, measured from the bottom of the sign to the near edge of the pavement. Where parking or pedestrian movements occur, the clearance to the bottom of the sign shall be at least 7 feet. Directional signs on expressways and freeways shall be installed with a minimum height of 7 feet. If a secondary sign is mounted below another sign, the major sign shall be installed at least 8 feet and the secondary sign at least 5 feet above the level of the pavement edge. All route signs, warning signs, and regulatory signs on expressways and freeways shall be at least 7 feet above the level of the pavement edge. Overhead signs shall provide a vertical clearance of not less than 17 feet to the sign, light fixture, or sign bridge, over the entire width of the pavement and shoulders except where a lesser vertical clearance is used for the design of other structures. The vertical clearance to overhead sign structures or supports shall not be greater than 1 foot in excess of the minimum clearance of other structures."

"Why must signs be so high?" One major reason is the improved visibility that results. In urban areas, parked vehicles and other obstructions can obscure signs that are too low. Also, pedestrians are not likely to collide with properly mounted signs under conditions of reduced visibility (darkness). In rural areas, bushes and even weeds can block signs that are installed too low. Another reason for installing signs high enough is the improved condition and life of the sign. A sign that is 7 feet above the ground is less susceptible to vandalism. It is also less likely to be sprayed with dirt from passing vehicles. And finally, signs mounted at their correct height have been found to command more respect, resulting in higher compliance and lower violation rates, than those that are too low.

Lateral Offset Standard:
Another concern of citizens is the lateral placement of STOP signs from the roadway. The MUTCD states: "The minimum lateral offset from the edge of the shoulder (or if no shoulder exists, from the edge of the pavement) to the near edge of a roadside-mounted sign shall be 6 feet. Roadside-mounted sign supports shall be breakaway, yielding, or shielded with a longitudinal barrier or crash cushion if within the clear zone. The minimum lateral offset from the edge of the shoulder (or if no shoulder exists, from the edge of the pavement) to the near edge of overhead sign supports (cantilever or sign bridges) shall be 6 feet. Overhead sign supports shall have a barrier or crash cushion to shield them if they are within the clear zone."

WHY ARE 'TWO-WAY LEFT-TURN LANES' USED?

The two-way left-turn lane, a device for increasing capacity and safety, is being more frequently used throughout Florida and other states. As its name implies, this is a marked lane that is used for left turns by traffic going in both directions on a street. A significant benefit can result when it is used on streets that are lined with commercial development and many driveways.

Despite the initial apprehension which a driver may have, the safety record of these lanes appears to be good. One study showed that where no median was previously provided, the installation of continuous two-way left-turn lanes reduced total crashes by about 33% with reductions of 45% and 62% for head-on and rear-end type crashes, respectively.

Another study reported that the "head-on collision," which has been a primary concern among those considering the installation of a continuous two-way left-turn lane, has proved to be an uncommon occurrence and of negligible concern.

Drivers use the two-way turn lane by entering only when they are making the left turn. They do not drive in the lane and therefore do not create a significant potential for head-on collisions. However, by pulling into the left-turn lane when making a turn into a driveway, the driver removes himself from the through lane and this eliminates potential rear-end, side-swipe and lane-changing crashes. These turn-lanes also increase the capacity of the street.

Both Federal and State manuals on traffic control devices specifically provide for the two-way left-turn lane. The markings for the two-way left-turn lanes are yellow and consist of a dashed line and a solid barrier line on each side of the lane. The solid line is on the outside of the two-way left-turn lane and the dashed line is on the inside. This marking tells the driver in the through lane that he cannot cross the line for the purpose of passing another moving car, although he can cross into the lane for the purpose of turning left.

A two-way left-turn lane can change into a single direction left-turn lane at major intersections through a change in marking. The lane markings on the right side change from the yellow solid-dashed combination into a standard white lane line used to separate traffic moving in the same direction. The lane markings on the left would change into a double yellow, the standard used to prohibit passing in either direction.

White pavement arrows may be used in addition to the lane and barrier markings to remind drivers that left turns are made in both directions from the lane. Signs must also be used to supplement the pavement markings.

The use of this relatively new traffic control treatment will increase as more officials become familiar with it. The two-way left-turn lane is not a cure-all. However, it is another one of the devices being used by Traffic Engineers to increase the capacity as well as the safety of our existing street system.

WHY LIMIT THE NUMBER OF DRIVEWAYS?

The fewer driveways on an urban or rural roadway, the more effectively it will serve its primary function. As traffic volume and roadside development increase, increasing numbers of driveways cause crash rates to gradually increase. It has been estimated that about 12% of crashes on major urban routes are related to commercial driveways.

One accident study showed that as the number of driveways per mile increased, the crash rate increased:

Driveways Per Mile	Crashes Per Million Vehicle Miles
.2	1.25
2.0	2.70
20.0	17.80

Access control on highways would include strict criteria for the spacing of median openings on divided roadways. Typical median crossovers are spaced 330' apart in urban areas and 660' apart in rural areas. Access to highways from residential, commercial and public property should be equitably managed to achieve both highway safety and reasonable access.

Traffic engineers recognize that elimination of unexpected events and the separation of decision points simplifies the driving task. Access control reduces the variety and spacing of events to which the driver must respond. Controlled access has resulted in improved traffic operations and reduced crashes.

Based on an analysis of data from 30 states, a report to the U.S. Congress concluded that full control of access has been the most important single design factor ever developed for crash reduction.

The effect of control of access on crashes and fatalities in urban and rural areas is shown below:

Crash Rate Per Million Vehicle Miles

	Urban		Rural	
Access Control	Total	Fatal	Total	Fatal
Full	1.86	0.02	1.51	0.03
Partial	4.96	0.05	2.11	0.06
None	5.26	0.04	3.32	0.09

The above study indicates that crash and fatality rates on facilities with full control of access were about one-half on rural highways and one-third on urban locations when compared to facilities without access control.

WHY ARE 'TURN LANES' USED?

Turn lanes at intersections are designed primarily to separate turning traffic from through traffic. With turn lanes, through traffic is not delayed by vehicles waiting to turn. By removing the turning vehicles from a through lane, traffic flow and safety are improved. Turn lanes may also be used to decelerate vehicles leaving the major street.

Studies have shown that channelization of intersections, with turn lanes, produced an average of 32.4 percent reduction in all types of crashes. Crashes involving personal injuries decreased by over 50 percent. One study showed that intersection channelization projects had produced an average benefit/ cost ratio of 2.31. Turn lanes at major driveways can also improve efficiency and safety especially on high volume or high speed roadways. Studies have shown a 52% decrease in rear end crashes as well as 6% decrease in left turn crashes.

One of the most significant features affecting an intersection's operation is the treatment of left-turning vehicles. Accommodation of left turns can be one of the most critical design factors since safety and the level of service are greatly influenced.

A left turning vehicle can conflict with: a) Opposing through traffic; b) Crossing traffic; c) Through traffic in the same direction.

The major crash types involved with left turning vehicles are rear end, angle and sideswipe crashes in the same direction. The capacity of a roadway may be greatly influenced by how left turning vehicles are handled. Studies have shown the effect of left-turn lanes on crash rates at intersections. The results of one study are shown below:

Intersection Type	Crashes Per Million Entering Vehicles
Unsignalized - without left turn lanes	4.3
Unsignalized - with left turn lanes	1.1
Signalized - without left turn lanes	2.5
Signalized - with left turn lanes	1.6

Crash types associated with right-turning vehicles are rear-end, side-swipe and pedestrian. An accident study of driveway crash types related to turning movement is shown below:

Movement	Number of Crashes	% of Total
Entering driveway by left turn	246	43
Entering driveway by right turn	26	15
Leaving driveway by left turn	65	27
Leaving driveway by right turn	35	15

The use of right-turn lanes at intersections can significantly affect operations. At signalized intersectons, an increase in the level of service can be provided by an addition of a separate right-turn lane. At unsignalized intersections, right-turn lanes can serve to safely remove turning vehicles that are decelerating from the through traffic.
In general, the treatment of right-turning vehicles is less critical than left-turning vehicles due to the higher right-turning vehicle speeds and the uninterrupted nature of the right-turn maneuver.

WHY ALL THE FUSS ABOUT DRUNK DRIVING?

Each year in Florida there are approximately 250,000 traffic crashes. About 24,000 are alcohol related crashes that account for about 1,000 fatalities. Alcohol related fatalities represent about 33 % of all traffic fatalities. The amount of alcohol in the bloodstream is called the "Blood Alcohol Level (BAL)." In Florida, a person is legally drunk when the BAL is .08 or more. However, a person's driving is impaired starting at about .05 BAL. The body can burn off only about one ounce of alcohol, about one drink, per hour. The BAL is affected by a person's body weight, loss of sleep, amount of food in the stomach and other physical and emotional factors.

If a law officer has reason to suspect a person is Driving Under the Influence (DUI), the person may be requested to submit to: a breath alcohol test, a urine test for controlled substances and a blood test for blood alcohol or for controlled substances. If a person refuses a required breath, urine or blood test, it will result in loss of a person's driver's license and prosecution for DUI.

On July 1, 1982, one of the nation's toughest laws on drunken driving took affect in Florida. This law provided for strict penalties if convicted of drunken driving.

First Convictions provided for:
Fines of at least $250 (up to $500); with BAL of .20 or more or with a minor in the vehicle up to $1,000
Jail Term up to 6 months; with BAL of .20 or higher or with a minor in vehicle, up to 9 months.
Driver's license revoked at least 6 months (up to 1 year)
Community service of 50 hours is required
DUI school for 12 hours is required - paid for by the person convicted

Repeated Convictions can provide for:
Fines of up to $2,500, jail term of up to 1 year, driver's license revoked up to 10 years and DUI school can require further treatment without court approval

Paying the Toll for DUI can be a sobering experience:

ITEM	APPROX. COST
Vehicle Towing	$30-50
Bond release from jail	$250
Attorney's fees if you plead guilty	$350-700
Attorney's fees if you plead not guilty	$750-2,000
Witness fees	$200-300
Fine for 1st conviction	$250-500

Court Costs	$26-50
Probation costs	$120-300
Alcohol Safety Educational School	$50-125
Driver's license reinstatement fee	$35
Approximate annual insurance rate increase for 3 years	$1,000

DRIVERS SHOULD REMEMBER TO STOP DRINKING BEFORE REACHING THE LIMIT. Once you know your limit, stick to it when you plan on driving. If you do exceed your limit, don't risk driving. Be responsible and stay where you are until you can drive safely, or have a sober person drive. Or take a cab - it's worth the wait. Protect your friends, too - don't let them drive drunk. Help friends when they have had too much. If it's at a party, offer friends a non-alcoholic beverage. Let friends stay at your home until they are able to drive. Give friends a ride, or call a cab. The body burns off about one ounce (one drink) of alcohol per hour. It takes about four hours to cancel the effects of four drinks. Nothing will speed this up--not exercise, not food, not even a cold shower.

WHAT IS THE LAW IN REGARD TO SCHOOL SPEED ZONES AND SCHOOL BUSES?

Florida Statutes, Chapter 316.1895 is entitled "Establishment of school speed zones, enforcement; designation." Section 316.1895(5) states that "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. Such speed limits 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."

Statute 316.1895(6) states that "Permanent signs designating school zones and school zone speed limits shall be uniform in size and color, and shall have the times during which the restrictive speed limit is enforced clearly designated thereon. The Department of Transportation shall establish adequate standards for the signs."

Different types of speed limit signs are used for school zones in Florida.
Some have flashers which serve the purpose of advising motorists when the school zones are in effect. When these flashers are set and used properly, they are very effective. They alert the motorist to the need for caution and slower driving when the appropriate conditions exist. A school speed limit sign without flashers, while not as helpful to the motorist, is just as legally binding as the flasher sign. Drivers are reminded to be especially alert during those hours when children are on the streets.

Florida Statutes, Chapter 316.172 is entitled "Traffic to stop for school bus."
This law states:

(1)(a) "Any person using, operating, or driving a vehicle on or over the roads or highways of this state shall, upon approaching any school bus which displays a stop signal, bring such vehicle to a full stop while the bus is stopped, and the vehicle shall not pass the school bus until the signal has been withdrawn."

(1)(b) "Any person using, operating, or driving a vehicle that passes a school bus on the side that children enter and exit when the school bus displays a stop signal commits a moving violation, punishable as in Chapter 318 …"

(2) "The driver of a vehicle upon a divided highway with an unpaved space of at least 5 feet, a raised median, or a physical barrier is not required to stop when traveling in the opposite direction of a school bus which is stopped in accordance with the provisions of this section."
Florida Statutes, Chapter 316 can be viewed at the web site:
http://www.flsenate.gov/statutes/

WHAT ARE DRIVERS' RESPONSIBILITIES WHEN A TRAFFIC CRASH OCCURS?

The Florida Driver's Handbook states the driver's responsibility after a traffic crash are:

1. Stop. If you are in a crash while driving, you must stop. If anyone is hurt, you must get help. You must also be ready to give your name, address, and vehicle registration number; as well as show your drivers license to others involved in the crash.

2. Report the crash. If the crash causes injury, death, or property damage of at least $500, it must be reported. Call the local police, the Florida Highway Patrol, or the County Sheriff's Office. If the crash involves a charge of driving under the influence (DUI) or results in death, injury, or property damage to the extent a wrecker must tow a vehicle away, the officer will fill out a report.

If the crash is investigated by an officer, you, the driver need not make a written report. If property damage appears to be over $500 and no report is written by an officer, you must make a written report of the crash to the Department of Highway Safety and Motor Vehicles within 10 days.

3. Move your car if it is blocking traffic. If your car is blocking the flow of traffic, you must move it. If you cannot move it yourself, you must get help or call a tow truck. This is true anytime your vehicle is blocking the flow of traffic whether it has been involved in a crash or not.

4. Appear in court. If you are charged in a driving crash, you may have to go to court. The officer who comes to the scene of the crash will file charges against any driver who violated a traffic law. Anyone who is charged will have a chance to explain to the court what happened. The court will then decide what the penalty will be. Anyone who is not charged with violating the law may have to come to court as a witness.

A driver convicted of leaving the scene of a crash involving death or personal injury will have his or her license revoked. The driver is also subject to criminal penalties.
If while driving, you hit a vehicle with no one in it or if you damage any object that belongs to someone else, you must tell the owner. Give the owner your name, address, and tag number in person or in a note attached to the object that was hit.

WHAT ARE THE RULES FOR HANDICAPPED PARKING?

Florida Statute (F.S.) 553.5041, entitled “Parking spaces for persons who have disabilities”, is the State standard for parking spaces provided for disabled persons. Section 553.5041(4) states “The number of accessible parking spaces must comply with the requirements in ADAAG’s 4.1.” The ADAAG is the “Americans with Disabilities Act Accessibility Guidelines.” These Guidelines present the minimum number of accessible parking spaces as shown below:

Total Parking Req’d. Handicapped Total Parking Req’d. Handicapped
Spaces in Lot Parking Spaces Spaces in Lot Parking Spaces

Total Parking Spaces in Lot	Required # of Handicapped Parking Spaces	Total Parking Spaces in Lot	Required # of Handicapped Parking Spaces
1 to 25	1	201 to 300	7
26 to 50	2	301 to 400	8
51 to 75	3	401 to 500	9
76 to 100	4	501 to 1000	2% of total
101 to 150	5	1001 +	20% plus 1 for each 100 over 1000
151 to 200	6		

F.S. 553.5041(5)(c)1 states: “Each parking space must be no less than 12 feet wide. Parking access aisles must be part of an accessible route to the building of facility entrance. In accordance with ADAAG s. 4.6.3, access aisles must be placed adjacent to accessible parking spaces; however, two accessible parking spaces may share a common access aisle. The access aisle must be striped diagonally to designate it as a no-parking zone.”

The Florida statutes can be viewed at web site: http://www.flsenate.gov/Statutes/
F.S. 553.5041(6) states: “Each such parking space must be prominently outlined in blue paint and must be repainted when necessary, to be clearly distinguishable as a parking space designated for persons who have disabilities and must be posted with a permanent above-grade sign of a color and design approved by the Department of Transportation which is placed on or at a distance of 84 inches above the ground to the bottom of the sign and which bears the international symbol of accessibility meeting the requirements of ADAAG s. 4.30.7 and the caption 'PARKING BY DISABLED PERMIT ONLY'.”

An approved Florida Department of Transportation (FDOT) sign is 12 inches wide by 18 inches high, designated FTO-25 in accordance with FDOT Design Standards 17355 sheet 3. Design requirements for this reflective sign are: 1 inch Series "C" letters on blue background with white legend and border on top, and a bottom portion of white background with black opaque legend and border.

FDOT standards require the blue outline to be a 6 inch wide blue stripe to be 2 inches inside of the standard 6 inch white stripe as shown in FDOT Design Standard 17346 sheet 10. This standard states “Use of pavement symbol in accessible parking spaces is optional, when used the symbol shall be 3 feet or 5 feet high and white in color.” Blue pavement markings shall be tinted to match shade 15180 of Federal Standard 595a.

F.S. 316.1955 entitled “Enforcement of parking requirements for persons who have disabilities” states: “It is unlawful for any person to stop, stand, or park a vehicle within, any such specially designated and marked parking space provided in accordance with s. 553.5041, unless such vehicle displays a parking permit issued under s. 316.1958 or s. 320.0848, or a license plate issued under …”

F.S. 316.1959 entitled “Handicapped parking enforcement” states: “The provisions of handicapped parking shall be enforced by state, county, and municipal authorities in their respective jurisdictions whether on public or private property in the same manner as is used to enforce other parking laws and ordinances by said agencies.” F.S. 316.008(4) provides for a fine up to $250.00 for drivers who illegally park in designated handicapped parking spaces.

An “Application for Disabled Person Parking Permit” (Form HSMV 83039) may be obtained through the Florida Department of Highway Safety and Motor Vehicles, Division of Motor Vehicles, Neil Kirkman Building, 2900 Apalachee Parkway, Tallahassee, Florida 32399-0620, or at a local tag office.

WHY ARE 'FIRE LANES' NEEDED?

A "Fire Lane," also called an "Emergency Access Lane" is a driving lane adjacent to a commercial development that is reserved to provide for emergency access. Parking or standing in a Fire Lane is prohibited.

The Standard Building Code, Section 602.6, provides the standard for Fire Lanes. The Code states "Every building hereafter constructed shall be accessible to fire department apparatus by way of access roadways with all-weather driving surface not less than 20 ft. of unobstructed width, with adequate roadway turning radius capable of supporting the imposed loads of fire apparatus and having a minimum vertical clearance of 13 ft-6 in." The Fire Prevention Code also states that "The required width of access roadways shall not be obstructed in any manner, including the parking of vehicles.

Installation of "NO PARKING" signs or other appropriate notice, or of approved obstructions inhibiting parking, may be required and if installed, shall be maintained. The owner (or his representative) of a building which is adjacent to the fire lane shall be responsible for keeping the fire lane free of obstructions."

The primary purpose of a Fire Lane is to allow emergency personnel and equipment easy access to a facility.

A secondary benefit of providing a "Fire Lane" or "Emergency Access Lane" is to improve both pedestrian safety and traffic circulation.

Pedestrian Safety is improved because pedestrians are more visible to drivers since parked cars do not obstruct the view of the driver.

Traffic Circulation will be greatly improved through the use of a "Fire Lane" on the main roadway adjacent to a commercial development. No parking or standing in a "Fire Lane" will decrease the interruption of traffic and will increase the roadway capacity.

No national standard for Fire Lane signing or marking has been developed; however, many jurisdictions have developed local standards. A typical standard for signing and marking Fire Lanes is presented below:

Signing shall be with 12" x 18" "NO PARKING - FIRE LANE" signs with red lettering on a white background. These signs shall be similar to the "Manual on Uniform Traffic Control Devices" (MUTCD) R7 Sign Code Series and shall be installed at a spacing of 50' to 100', along the Fire Lane and shall be plainly visible to motorists.

Pavement markings for Fire Lanes shall be installed with beaded paint 15 mils minimum thickness or thermoplastic 90 mils minimum thickness and shall include a yellow curb throughout the limits of the Fire Lane. The pavement marking legend shall be "NO PARKING - FIRE LANE" spaced at a maximum of 100' apart. Pavement marking lettering must be 8' high with 6" strokes in accordance with the MUTCD.

WHAT IS MEANT BY 'HIGHWAY CAPACITY' AND 'LEVEL OF SERVICE'?

Capacity of a highway is defined in the 1985 Highway Capacity Manual (HCM), by the Transportation Research Board, as "the maximum hourly rate at which persons or vehicles can reasonably be expected to traverse a point or uniform section of a lane or roadway during a given time period under prevailing roadway, traffic and control conditions." The HCM defines "Level of Service" (LOS) as "a qualitative measure describing operational conditions within a traffic stream, and their perception by motorists and/or passengers."

Six Levels of Service for each facility type range from "A" (Best) to "F" (Worst).

LOS "A" represents free flow. Individual users are virtually unaffected by the presence of others in the traffic stream. Freedom to select desired speeds and to maneuver within the traffic stream is extremely high. The general level of comfort and convenience provided to the motorist, passenger, or pedestrian is excellent.

LOS "B" in the range of stable flow, but the presence of other users in the traffic stream begins to be noticeable. Freedom to select desired speeds is relatively unaffected, but there is a slight decline in the freedom to maneuver within the traffic stream from LOS "A". The level of comfort and convenience provided is somewhat less than at LOS "A", because the presence of others in the traffic stream begins to affect individual behavior.

LOS "C" is in the range of stable flow, but marks the beginning of the range of flow in which the operation of individual users become significantly affected by interactions with others in the traffic stream. The selection of speed is now affected by the presence of others, and maneuvering within the traffic stream requires substantial vigilance on the part of the user. The general level of comfort and convenience declines noticeably at this level.

LOS "D" represents high density, but stable flow. Speed and freedom to maneuver are severely restricted, and the driver or pedestrian experiences a generally poor level of comfort and convenience. Small increases in traffic flow will generally cause operational problems at this level.

LOS "E" represents operating conditions at or near the capacity level. All speeds are reduced to a low, but relatively uniform value. Freedom to maneuver within the traffic stream is extremely difficult, and it is generally accomplished by forcing a vehicle or pedestrian to "give way" to accommodate such maneuvers. Comfort and convenience levels are extremely poor, and driver or pedestrian frustration is generally high.

LOS "F" is used to define forced or breakdown flow. This condition exists wherever the amount of traffic approaching a point exceeds the amount which can traverse the point. Queues form behind such locations. Operations within the queue are characterized by stop-and-go waves, and they are extremely unstable. Vehicles may progress at reasonable speeds for several hundred feet or more, then be required to stop in cyclic fashion. LOS "F" is used to describe the operating conditions within the queue, as well as the point of the breakdown.

For each type of facility, LOS is based on one or more operational parameters which best describe operating quality for the subject facility type. The parameters selected to define LOS for each facility type are called "Measures Of Effectiveness" (MOE). For a 2 lane highway, the MOEs are "percent time delay (%)" and "average travel speed (mph)". For a multilane highway, the MOE is "Density (passenger cars/mile/lane)". For a signalized intersection, the MOE is "average individual stopped delay (seconds/ vehicle)." For unsignalized intersections, the MOE is "Reserve capacity (passenger cars/hour)."

For planning purposes, some engineers use the following uninterrupted flow capacity (vehicles/day/lane) for the LOS indicated: "A" (2,500); "B" (4,000); "C" (6,000); "D" (7,500); "E" (12,000).

To determine the operational capacity of a highway, engineers must obtain detailed data based on the characteristics of a roadway. For a 2 lane highway, the data needed for an operational capacity analysis is: terrain, lane width, shoulder width, "No Passing" zone, % Trucks, % RVs, % Buses and directional distribution. For a multilane highway, the data needed for an operational capacity analysis is: terrain, number of lanes, lane width, lateral clearance, obstruction on 1 or 2 sides, highway type (divided or undivided), suburban or rural, design speed, % Trucks, % RVs, % Buses and driver population factor (based on regular users or non- regular users). Signalized intersection analysis must consider the following prevailing conditions: the amount and distribution of traffic movements, traffic composition, geometric characteristics and the details of intersection signalization. Unsignalized intersection analysis must consider the number and use of lanes, channelization, % grade, curb radii and approach angle, sight distance and average running speed on major roadway.

WHAT CAN A PEDESTRIAN DO TO REDUCE PEDESTRIAN CRASHES?

Each year for the last five years, there were more than 600 pedestrian fatalities and over 7000 pedestrian injuries in Florida. 1985 Statistics indicate a pedestrian fatality rate of 5.71 per 1000 population. Florida ranked second in the nation for pedestrian fatalities with 655. California with 843 pedestrian fatalities was highest for that year. The major crash types most often associated with pedestrian crashes are: Mid-block dartouts; Intersection dash; Vehicle Turn/Merge; Multiple lanes crossing; Bus stop related; Vendor--Ice Cream Truck and Backing Up .

Walk Defensively - Be prepared for the unexpected--don't let cars surprise you even if a motorist does something wrong like running a stop sign or making a sudden turn.

Walk Facing Oncoming Traffic - When there are no sidewalks, walk near the curb, or off the road, if necessary.

Cross Streets at Intersections Whenever Possible - Look in all directions before entering the street. Be especially alert to vehicles that may be turning right on a red signal. If there are crosswalks, use them but don't assume you are completely safe in a crosswalk. Don't cross at mid-block because "jaywalking" is dangerous and against the law.

At Intersections, Look for the Signs or Signals - They will help to cross safely. Use the push-buttons for crossing protection at signalized intersections that have pedestrian indications. The lighted "Walk" and "Don't Walk" signals are meant for the pedestrian. If the "Don't Walk" light is blinking while you are in the street, continue quickly and carefully. If there are no walk signals, watch the traffic signals. When there are only STOP or YIELD signs, look in all directions and cross when traffic has cleared.

Be Careful in Parking Lots - Pedestrians are supposed to have the right of way but many drivers don't wait for pedestrians. Parking lots can be as dangerous as streets. On streets, the direction of cars is usually known but in parking lots, cars might be moving in all directions, including backwards.

Avoid Dangerous Moves - Any movement a pedestrian makes that drivers aren't expecting, could be dangerous. When leaving a school bus, wait a second before crossing. Drivers don't always stop for unloading school buses; so stop, look both ways and then cross. Don't step into traffic from between parked cars since this is a sure way of surprising drivers.

Keep Your View of Traffic Clear at All Times - A pedestrian needs to be able to see cars around him. Don't block your view with packages, umbrellas or other objects.

After Dark, Wear Light Colored or White Clothes - Drivers can see you better if you wear light colored or white clothes. Carry a lighted flashlight and swing it back and forth to improve your chances of being seen by drivers. In spite of the relatively small percentage of pedestrian travel during darkness, more than one-third of pedestrian crashes occur during dark conditions.

Following all these tips while you are a pedestrian will greatly improve your chances of safely walking your estimated lifetime average of 75,000 miles.

WHAT IS 'TRAFFIC ENGINEERING'?

The Institute of Transportation Engineers, an international professional organization, defines traffic engineering as "that phase of engineering which deals with the planning, geometric design and traffic operations of roads, streets and highways--their networks, terminals, abutting lands and relationships with other modes of transportation--for the achievement of safe, efficient and convenient movement of persons and goods."

When roads and streets were built many years ago, the biggest task facing the road builder was to keep them passable in all types of weather. The problem of moving large numbers of cars and parking them was not significant.

As the number of cars increases, taxing the capacity of our streets and highways, the field of traffic engineering has become increasingly prominent. Each year more people own and operate cars. Urban growth has increased the need for public transportation, for improved movement of goods, for new shopping and industrial centers, and for transportation terminals. Funding for new roads has decreased, due partly to environmental concerns. This has resulted in an increased emphasis on improving the existing road system as much as possible. Traffic Engineering is helping to meet these challenges.

Traffic Engineering extends beyond the local level. It plays a vital role in the functional design and traffic operations of the Interstate Highway System. The Traffic Engineer must formulate recommendations for the integration of freeways, shopping centers, and industrial complexes into communities which will serve the population and benefit future development. Traffic Engineers design and operate highway control and communication systems and devise ways to expand capacity and improve safety of existing roads and streets.

Traffic Engineering involves two major areas of activity:

(1) team decision making about new streets, highways and other transportation matters;

(2) responsibility for the efficient, convenient, and safe use of existing transportation facilities.

The Traffic Engineer is concerned with groups and individuals and their needs, desires, actions, characteristics, capabilities and limitations as related to the roadway system. His decisions affect drivers, passengers, and pedestrians.

One of the tasks of traffic engineering is long-range transportation planning. Working with sophisticated, computer-aided techniques, engineers and planners determine future transportation needs.

HOW ARE "SPEED LIMITS" ESTABLISHED?

In Florida, Florida Statutes set speed limits. Chapter 316, is the "State Uniform Traffic Control" portion of State law. Florida Statutes Chapter 316.187, authorizes the Florida Department of Trans-portation (FDOT) to set maximum and minimum speed limits it deems safe and advisable, for travel on the roadways under its authority, not to exceed 70 mph on limited-access highways, 65 mph on certain designated segments of highways outside an urban area, and 60 mph for all other roads.

Florida Statutes, Chapter 316.189, presents the authority for establishment of Municipal and County speed zones maintained by these agencies. This section indicates that the maximum speed on any Municipal or County maintained road is 30 mph. However, the Municipality or County may set speed zones altering such speeds, both as to maximum and minimum after investigation determines such a change is reasonable and in conformity with the criteria established by the FDOT. Section 316.183 is also referenced with respect to Unlawful Speed. Traffic engineers throughout the country use normal driving speed as a guide in setting speed limits since most drivers tend to regulate their own speed according to traffic, road and weather conditions. These engineers consider speed differential the overriding safety concern and inappropriate speed limits create greater speed differentials.

For a speed limit to be effective, at least 85 percent of the drivers must voluntarily comply with the law. It is important to remember that the speed regulation informs the driver of the limits within which one can safely operate a vehicle under normal circumstances and within which the driver can be expected to react safely. Setting speed limits at appropriate levels will create a reasonably uniform flow of traffic, discourage violation of the law and help keep streets and highways safe.

The FDOT criteria for setting speed zones are presented in the publication entitled Speed Zoning for Highways, Roads and Streets in Florida for Compliance with the Florida Statutes, Chapter 316. This publication states: "The 85th percentile speed is the speed at or below which 85 percent of the observed free-flowing vehicles are traveling." It also states that a speed limit should not differ from the 85th percentile speed by more than 3 mi/h and it shall not be less than 8 mi/h.

The following excerpts are also from the speed zoning publication mentioned above:

"It is common traffic engineering knowledge that about 85 percent of drivers travel at reasonably safe speeds for the various roadway conditions encountered, regardless of speed limit signs. It is for those drivers who don't, that the practice of speed zoning does take place, to provide realistic speed restrictions to which meaningful enforcement can be applied."

"The vehicle speed chosen by a driver may be influenced by, the presence of other vehicles, weather, road conditions, road geometrics, adjacent land use and other factors shown in this manual. A driver's choice of speed is a balance between expedience and safety, and is often a subconscious reaction to the environment."

"Motorists tend to pay little attention to speed limit signs, which they consider unreasonable, unless there is an inordinate degree of enforcement."

"Unreasonably low speed limits are commonly violated by a majority of motorists, making enforcement difficult, with resultant operating speeds sometimes higher than would exist with proper, realistic speed limits."

HOW MUCH TRAFFIC WILL THAT NEW DEVELOPMENT GENERATE?

Many variables affecting traffic generation make it difficult to predict the precise amount of traffic to be generated by a project. However, transportation studies have quantified, in general terms, the volume generated for different types of land use. The Institute of Transportation Engineers (ITE) has compiled a listing of trip generation rates for various land uses. These rates were developed from studies conducted throughout the country. Trip Generation Rates for residential land uses are usually expressed as average weekday vehicle Trip Ends per Dwelling Unit (TE/DU) while those for commercial developments are typically expressed as average weekday vehicle Trip Ends per 1,000 Gross Square Feet of Leasable Area (KGSFLA), Trip Ends per 1,000 Square Feet of Gross Floor Area (KSFGFA), Trip Ends per 1,000 Square Feet of Building Area (KSFBA) or Trip Ends per 1,000 Gross Square Feet (KGSF). A "Trip End" is defined as a single or one-direction vehicle movement, into or out of the site. The table below is a summary of trip generation rates presented in the 1997 ITE publication entitled Trip Generation - 6th Edition.

SUMMARY OF ITE TRIP GENERATION RATES BY LAND USE AND DEVELOPMENT TYPE

LAND USE/BUILDING TYPE (ITE CODE)	AVERAGE WEEKDAY VEHICLE TRIP ENDS		
	AVERAGE	RANGE	NO. OF STUDIES
RESIDENTIAL			
Single Family Detached (210)	9.57 TE/DU	4.31-21.85	348
Apartment - General (220)	6.63 TE/DU	2.00-11.81	80
Low Rise Apartment (221)	6.59 TE/DU	5.10-9.24	22
High Rise Apartment (222)	4.20 TE/DU	3.00-6.45	9
Residential Condominium (230)	5.86 TE/DU	1.83-11.79	53
Mobile Home Park (240)	4.81 TE/DU	2.29-10.42	37
Recreational Home (260)	3.16 TE/DU	3.00-3.24	2
Residential Planned Unit Development (270)	7.50 TE/DU	5.79-14.38	13
RETAIL			
Shopping Center (820):	42.92 TE/KGSFLA	12.50-270.89	299
Specialty Retail Center (814)	40.67 TE/KGSFLA	21.30-50.94	3
Discount Store (815)	56.63 TE/KGSFLA	25.53-106.88	20

Restaurant-Quality (831)	2.86 TE/SEAT	1.77-5.50	11
Restaurant-Quality (831)	89.95 TE/KSFGFA	33.41-139.80	15
Restaurant-High Turnover Sit Down (832)	130.34 TE/KSFGFA	73.51-246.00	12
Restaurant-Fast Food w/Drive Thru (834)	496.12 TE/KSFGFA	195.98-1132.92	21
Convenience Market - 24 Hr Open (851)	737.99 TE/KGSF	330.00-1,438.00	8
OFFICE			
General Office (710)	11.01 TE/KGSF	3.58-28.80	78
Medical-Dental Office Building (720)	36.13 TE/KGSF	23.16-50.51	10
Government Office Building (730)	68.93 TE/KGSF		1
U.S. Post Office (732)	108.19 TE/KSFGFA	35.57-352.42	8
Office Park (750)	11.42 TE/KSFGFA	7.56-30.30	12
SERVICE			
Bank (Walk-In) (911)	156.48 TE/KGSF		1
Bank (Drive-In) (912)	265.21 TE/KGSF	150.86-817.00	14
LODGING			
Hotel (310)	8.23 TE/Room	3.47-9.58	9
Motel (320)	9.11 TE/Occ. Rm	4.13-14.64	15
MEDICAL			
Hospital (610)	11.77 TE/Bed	3.00-32.83	20
Hospital (610)	16.78 TE/KGSFA	11.40-45.14	14
Nursing Home (620)	2.61 TE/Bed	1.88-3.97	20
Clinic (630)	31.45 TE/KGSFA	23.79-50.74	2
INDUSTRIAL			
General Light Industrial (110)	6.97 TE/KGSF	1.58-16.88	18

General Heavy Industrial (120)	1.50 TE/KGSF	0.58-1.84	3
Industrial Park (130)	6.96 TE/KGSFBA	0.91-36.97	49
Manufacturing (140)	3.82 TE/KGSF	0.50-52.05	62
Warehousing (150)	4.96 TE/KGSF	1.51-17.00	16

WHY CAN'T WE HAVE A 4-WAY STOP TO REDUCE CRASHES?

Many people believe that installing STOP signs on all approaches to an intersection will result in fewer crashes. This is not always the case, however. Although the crash severity may be lessened, drivers are penalized by the additional delay and higher vehicle operating costs (fuel, brakes, etc.). There is no real evidence to indicate that STOP signs decrease the speed of traffic. Impatient drivers view the additional delay caused by unwarranted STOP signs as "lost time" to be made up by driving at higher speeds between STOP signs. Unwarranted STOP signs breed disrespect by motorists who tend to ignore them or slow down without stopping. This can sometimes lead to tragic consequences.

State Law requires the installation of all traffic control devices, including STOP signs to meet State standards adopted by the Florida Department of Transportation (FDOT). Florida Statutes, Section 316.0745(1), states: "The Department of Transportation shall adopt a uniform system of traffic control devices for use on the streets and highways of the State." Section 316.0745(3) states: "All official traffic control signals or official traffic control devices purchased and installed in this State by any public body or official shall conform with the manual and specifications published by the Department of Transportation ...." The Manual on Uniform Traffic Control Devices (MUTCD) published by the U.S. Department of Transportation is the national standard for traffic control devices and has been adopted by the FDOT as the State standard.

The installation of a multi-way stop condition must first meet the warrants as set forth in the MUTCD. The MUTCD states the following Support statements for the use of multi-way stops: "Multi-way stop control can be useful as a safety measure at intersections if certain traffic conditions exist. Safety concerns associated with multi-way stops include pedestrians, bicyclists, and all road users expecting other road users to stop. Multi-way stop control is used where the volume of traffic on the intersecting roads is approximately equal."

The MUTCD provides the follow Guidance statements:

The decision to install multi-way stop control should be based on an engineering study. The following criteria should be considered in the engineering study for a multi-way STOP sign installation:

A. Where traffic control signals are justified, the multi-way stop is an interim measure that can be installed quickly to control traffic while arrangements are being made for the installation of the traffic control signal.

B. A crash problem, as indicated by five or more reported crashes in a 12-month period that are susceptible to correction by a multi-way stop installation. Such crashes include right- and left-turn collisions as well as right-angle collisions.

C. Minimum volumes:

1. The vehicular volume entering the intersection from the major street approaches (total of both approaches) averages at least 300 vehicles per hour for any 8 hours of an average day, and

2. The combined vehicular, pedestrian, and bicycle volume entering the intersection from the minor street approaches (total of both approaches) averages at least 200 units per hour for the same 8 hours, with an average delay to minor-street vehicular traffic of at least 30 seconds per vehicle during the highest hour, but 3. If the 85th-percentile approach speed of the major-street traffic exceeds 40 mph, the minimum vehicular volume warrants are 70 percent of the above values.

D. Where no single criterion is satisfied, but where Criteria B, C.1, and C.2 are all satisfied to 80 percent of the minimum values. Criterion C.3 is excluded from this condition.

WHAT IS A DRI?

In 1972, the Florida Legislature enacted Chapter 380.06 of the Florida Statutes. This law identified large developments for extensive review. These Developments are called Developments of Regional Impact (DRI). Chapter 380.06 states that a project is considered to have a regional impact and designated a DRI if because of its character, magnitude or location, it would have a substantial effect on the health, safety or welfare of citizens of more than one county. The law further specifies thresholds for different land use types that will vary with the size of the county. The following list is a summary of thresholds for various facilities:

AIRPORTS - Any new airport with paved runways, new passenger terminal or existing runway or terminal expansion by 25% or more.

ATTRACTIONS & RECREATION FACILITIES - Any of the following facilities:

1. Sports, entertainment, amusement or recreation facility which provides for:

(a) a single performance with over 2,500 parking spaces or more than 10,000 permanent seats;

(b) a serial performance with over 1,000 parking spaces or more than 4,000 permanent seats.

2. Construction of a new pari-mutuel facility or an existing facility that has a 10% increase in parking spaces.

HOSPITALS

1. A proposed hospital which has a design capacity of more than 600 beds, or

2. A new facility that serves two or more counties.

INDUSTRIAL PLANTS & INDUSTRIAL PARKS

1. Any new facility with over 2,500 parking spaces, or

2. A new facility that occupies a site greater than 320 acres.

MINING OPERATIONS

1. A facility with removal or disturbance of over 100 acres per year of solid minerals or overburden, or

2. A facility with a water consumption of over 3,000,000 gallons per day.

OFFICE DEVELOPMENTS

1. A new facility that occupies over 30 acres of land, or

2. A facility with over 300,000 square feet of gross floor area.

3. A facility with over 600,000 square feet of gross floor area in counties over 500,000 population.

PETROLEUM STORAGE FACILITIES

1. A new facility within 1,000 feet of navigable water and storing over 50,000 barrels, or

2. A new facility with a storage capacity of over 200,000 barrels.

PORT FACILITIES

1. Wet storage or mooring of over 100 watercraft used exclusively for sport, pleasure or commercial fishing.

2. Dry storage of more than 150 watercraft used for sport, pleasure or commercial fishing.

3. Wet or dry storage or mooring of more the 300 watercraft used exclusively for sport, pleasure or commercial fishing in an area in the state marina siting plan as suitable for a marina.

4. Dry storage of over 300 watercraft used exclusively for sport, pleasure or commercial fishing at a marina constructed prior to 7-1-85.

RESIDENTIAL DEVELOPMENTS - Any proposed residential development to be over the following dwelling units:

a) Counties with a population of less than 25,000, threshold = 250 welling Units (DU's).

b) Counties with 25,000 to 50,000 population, threshold = 500 DU's.

c) Counties with population of 50,001 to 100,000, threshold = 750 DU's.

d) Counties with population of 100,001 to 250,000, threshold = 1,000 DU's.

e) Counties with population of 250,001 to 500,000, threshold = 2,000 DU's.

f) Counties with population of over 500,000, threshold = 3,000 DU's.

SCHOOLS

1. A new school with over 3,000 full-time equivalent students, or

2. The expansion of a facility by at least 20% of the design population.

SHOPPING CENTERS - Any proposed retail or wholesale business that

1. Occupies more than 40 acres of land, or

2. Encompasses more than 400,000 square feet of gross floor area, or

3. Provides parking spaces for more than 2,500 cars.

HOTEL OR MOTELS -

1. Any proposed hotel or motel development that is planned to create or accommodate 350 or more units, or

2. Any proposed hotel or motel development over 750 units in counties with over 500,000 population.

RECREATIONAL VEHICLE DEVELOPMENTS - Proposed recreational vehicle development with 500 or more spaces.

MIXED USE DEVELOPMENTS

Any proposed development with two or more land uses if the sum of the threshold percentages is more than 130%.

The developer of any project exceeding 120% of these thresholds must file an application for Development Approval with the State Department of Community Affairs, the Regional Planning Council and the unit of local government having jurisdiction. This application must include:

- Maps and a project description.

- Environmental information that covers air, land, water, wetlands, flood plains, vegetation and wildlife.

- Historical and Archaeological sites.

- Employment and Economic Characteristics.

- Public Facilities including wastewater management, drainage, water supply, solid waste, energy, education, recreation and open space, health care, police and fire protection and public transportation.

- Housing.

If a development is between 80% and 120% of the above thresholds, the developer may need to prove that it is not a DRI by preparing a "Binding Letter Application" (BLA). The BLA, much simpler than a DRI, is a short form impact assessment which is intended to show whether the developer's project has any significant regional impact.

WHAT IS A LOCAL GOVERNMENT COMPREHENSIVE PLAN?

State and local governments have become aware of the costs of uncontrolled growth. Inadequately managed development imposes costs in terms of additional public facility and service needs, adverse environmental impacts, and a lot of the qualities which make a community special. Florida's citizens and local officials are beginning to recognize that properly managed growth can benefit their communities in several ways. Potential benefits include a broader range of job opportunities, protection of natural resources, affordable housing, the elimination of sprawl and a more compact development pattern which is capable of being served by existing and planned public facilities.

In response to this awareness, the Florida Legislature, during the past fifteen years, has enacted a series of laws requiring state, regional and local government agencies to prepare plans to manage Florida's rapid growth. A 1972 Act directed the Governor's Office to prepare a State Comprehensive Plan for adoption by the Legislature and directed the eleven regional planning councils to prepare and adopt comprehensive regional policy plans, all within specified deadlines.

Local governments, which were required by a 1975 act to prepare and adopt comprehensive plans, were directed by the 1985 and 1986 revisions of that act (the Local Government Comprehensive Planning and Land Development Regulation Act) to ensure that their plans were consistent with the State Comprehensive Plan and appropriate regional plans. The result of this legislation is a statewide framework for coordinated planning.

Because both the State Comprehensive Plan, adopted by state statute, and local plans, which must be adopted by ordinance, have the force of law, this framework does more than require the production of government documents. To ensure that local plans are implemented, the local planning act directed the state land planning agency (the Florida Department of Community Affairs) to adopt by rule minimum criteria for determining plan compliance with the act and required local plans to contain measurable objectives and specific policies to ensure implementation. It also required local governments to adopt, within one year after submitting their plan for state compliance review, specific land development regulations consistent with their plan and to only allow development where sufficient services are available or are committed to be available at the same time as the development's impacts.

Regardless of where a local government chooses to begin planning, an initial vision, subject to refinement later, can help guide other important planning activities. These activities include the collection and analysis of data related to locally perceived needs, the development of goals, objectives and policies to achieve the desired future growth pattern and way of life, and the ongoing evaluation of the plan's effectiveness in meeting local needs and achieving desired results.

The Local Government Comprehensive Plan consists of the following elements:

Future Land Use; Traffic Circulation; Mass Transit; Port, Aviation and Related Facilities; Housing; Sanitary Sewer, Solid Waste, Drainage, Potable Water, and Natural Groundwater Aquifer Recharge; Coastal Management; Conservation; Recreation and Open Space; Intergovernmental Coordination; and Capital Improvements.

WHAT IS THE FUNCTIONALLY CLASSIFIED ROAD SYSTEM?

In 1977, the Florida Legislature enacted Chapter 77-165 which provided for the establishment of the functional classification of public roads in Florida. The law defined the various road classifications, established public road systems based on these classifications and provided a mechanism for a continuing evaluation of each classified road. The law also required that functional evaluations performed after 1982 utilize a quantitative criteria developed by the Florida Department of Transportation (FDOT).

Florida Statutes, Chapter 334.03, defines Functional Classification as "The assignment of roads into systems according to the character of service they provide in relation to the total road network. Basic functional categories include arterial roads, collector roads and local roads which may be subdivided into principal, major, or minor levels. Those levels may be additionally divided into rural and urban categories." Functional classifications designated by the FDOT include:

State Rural Principal Arterial	County Urban Extension Major Collector
State Urban Extension Principal Arterial	County Rural Minor Collector
State Intra Urban Principal Arterial	County Urban Extension Minor Collector
State Rural Minor Arterial	County Intra Urban Collector
State Urban Extension Minor Arterial	County Local Road
State Intra Urban Minor Arterial	Municipal Intra Urban Collector
County Intra Urban Minor Arterial	Municipal Urban Collector
County Rural Major Collector	Municipal Local Road

The quantitative criteria developed by the FDOT, known as System Attribute Score (SAS) is based upon two system classification theories. The first classification theory is based on the concept that a road has certain road attributes which define its functional service. These road attributes are physical and operational characteristics such as:

Average Daily Traffic (ADT); Length of Road (Miles); Trucks (Number of);

Access Factor (ADT/access points per mile); Intersections/Interchanges (Number of);

Mobility (Number of Counties road is in); Speed (MPH); Traffic Signals; Lanes; Divided/Undivided

The second classification theory is based on the concept that the whole road network is comprised of system elements (routes) that interconnect and link together the end points of transportation service. System elements are each defined in terms of their operation within a hierarchal order of service connections. A few typical relationships between road linkage and functional classification are shown below:

LINKAGE	FUNCTIONAL CLASSIFICATION
Urbanized to Urbanized w/Arterial Termini	Principal Arterial
Bypass Around Urban Area w/Minor Arterial Termini	Minor Arterial
Community-to-Other Community, or to Urbanized/Urban	Major Collector
Rural-to-Urbanized/Urban or Community/Not Arterial-to-Arterial	Minor Collector
Within Community	Local

Based on these functional classifications, agencies have the responsibility for the maintenance and improvements along roadways under their jurisdiction. Cities and Counties are allotted funds by the State to carry out these duties on their assigned roads while the FDOT is responsible for State roads, interstates and other limited access roads.

HOW ARE TRANSPORTATION PROJECTS FUNDED?

Due to the rapid growth throughout Florida, many agencies must depend on several funding methods to provide for new road projects. Revenue sources that are being used by various agencies include the following:

A. DISCRETIONARY TAXES

1. Ad Valorem (Property) Tax - While allowing local governments to use the ad valorem tax, the Constitution limits the millage rate to 10 mills for County purposes, 10 mills for Municipal purposes and 10 mills for school districts. Although additional ad valorem millage for debt service and operating purposes for a maximum of two years is allowed, this additional millage is subject to voter approval.

2. Municipal Utility Tax - This tax is available to municipalities up to a maximum of 10%, with other statutory limitations depending upon the type of utility being taxed.

3. Occupational License Taxes - Cities and Counties can use this tax.

B. NON-DISCRETIONARY TAXES

1. Sales Taxes for Mass Transit - At up to 1% rate, these taxes are available to Broward, Dade, Duval, Sarasota and Volusia Counties.

2. Motor Fuel Tax - The 5th, 6th and 7th cent of the State motor fuel tax is paid directly to Florida's 67 counties. Distribution is based on 25% County area, 25% population and 50% motor fuel tax collection to the total State. The 5th and 6th cent must be used for road construction and maintenance and the 7th cent must be used for maintenance of County roads and bridges.

A Local Option Motor Fuel Tax of up to 6 per gallon, earmarked for transportation needs, can be levied without voter approval by all Counties and an additional Voted motor fuel tax of 1 per gallon is allowed with voter approval.

The Optional 6 per gallon Motor Fuel Tax that a County can assess must be used for "transportation expenditures" including (a) Public transportation operations and maintenance; (b) Roadway and right of way maintenance and equipment; (c) Roadway and right of way drainage; (d) Streetlighting; (e) Traffic signs, traffic engineering, signalization and pavement markings; (f) Bridge maintenance and operation; (g) Debt service and current expenditures for transportation capital projections in the foregoing program areas including construction or reconstruction of roads.

The voted 1 per gallon tax pays the costs of land acquisition, construction, reconstruction and maintenance of roads and streets.

3. Municipal/State Revenue Sharing is unit-based (i.e., cigarettes and 8th cent motor fuel tax).

4. County/State Revenue Sharing is largely based on the intangible tax. Intangible tax is based on personal property such as stocks, bonds, mutual funds and other obligations for payment of money.

5. User Fees are direct charges for products or services such as toll roads.

6. Special Assessments may be used by counties, municipalities and special districts for indirect service charges. The service must provide a real and substantial benefit to real property. Special assessments differ in type or degree from the benefits provided to the community as a whole.

7. Impact Fees fall under the category of an indirect charge for services. Impact fees rely on the police power of the jurisdiction, not on any taxing authority. They cannot be used for improvements to, or extensions of, existing facilities unrelated to the needs created by new development, nor can they be used for operation, maintenance or replacement of existing facilities. They can only be used for those capital facility capacity needs necessitated by new growth.

All existing Federal, State and local funds for roads have specific uses or system limitations. Consequently, it becomes necessary to determine which system receives improvements. With the estimate of funds by category, a financial plan can be refined from the needed roadway improvements. By using the functional classification program, certain roads are identified by ownership and are eligible for funding on a priority basis.

Revised: March 23, 1990

WHAT IS A TRANSPORTATION MODEL?

A model is simply a representation of a real object or process. Physical models are used to represent objects or structures; while mathematical models are used to represent established relationships which evolve from some process such as the interactions among speed, flow, and density in a traffic stream. Transportation models are mathematical rather than physical in nature. The use of a transportation model does not necessarily require a computer; however, models that describe complex relationships or multiple operations are usually easier to incorporate into a computer program than to calculate manually.

There are two general approaches to transportation modeling in engineering.

1. The first is the empirical approach, in which answers to engineering questions are developed using actual measurements rather than mathematical simulations. For example, the traffic carrying capacity of a roadway has been addressed empirically to determine the effect of such factors as roadway width, parking, etc. Results similar to this have been incorporated into the "Highway Capacity Manual." The main advantage of the empirical approach is the credibility resulting from making direct measurements of a specific process under specific conditions. There is no need to rely on approximations or other factors that may reduce confidence in the validity of the solution to a given problem.

2. The second is the mathematical simulation approach, which makes use of available information on the process being studied to generate additional information, generally in the form of specific answers to specific questions. Compared to the empirical approach, mathematical simulation offers some important benefits in certain areas, especially when applied to complex problems which do not lend themselves to simple empirical analyses. The specific advantages include:
   (a) Cost: it is usually possible to model a complex situation such as a moon landing at much lower expense;
   (b) Safety: computer specialists are seldom injured in the course of their duties;
   (c) Speed: many processes such as weather patterns can be simulated at many times their actual speed;
   (d) Scope: it is possible using computer modeling to examine hypothetical problems such as a proposed road or to develop future traffic volumes; and
   (e) Controllability: it is usually easier to constrain the parameters of a model; consequently, the effects of each parameter may be independently controlled.

All of these advantages are of some interest to the traffic engineer who is concerned with transportation systems that are costly to install, which may involve safety related problems, and/or which may require data analysis over long periods of time, often under hypothetical conditions.

A few popular transportation models are:

- SOAP (Signal Operations Analysis Package)
- PASSER (Progression Analysis and Signal System Evaluation Routine)
- TRANSYT-7F (TRAffic Network StudY Tool)
- CORSIM (CORidor SIMulation Model)
- FSUTMS (Florida Standard Urban Transportation Model Structure)

WHAT IS 'FSUTMS'?

FSUTMS stands for the Florida Standard Urban Transportation Model Structure. The FSUTMS model structure consists of standardized computer software programs, urban area data formats, and operating procedures. These standards are common to all urban transportation models in Florida, and were developed for the primary purpose of reducing the time and effort required to produce long-range travel demand forecasts for Metropolitan Planning Organizations (MPOs) Long Range Transportation Plans. Under such standardization, the Florida Department of Transportation (FDOT) Central Office is able to efficiently provide software updates, procedural manuals, and technical support to both the FDOT districts and MPOs.

The primary objective of travel demand forecasting is to predict the effects of various policies, programs, and projects on highway and transit facilities. These impacts are commonly quantified by representing the projected travel demand in terms of forecasted traffic volumes and transit ridership. Forecasting travel demand is an integral part of an area's MPO Long Range Transportation Plan.

Each urbanized area in Florida has an MPO, which is comprised of locally elected officials, who serve as the decision-making body for the expenditure of Federal and State transportation funds. The MPOs work cooperatively with the FDOT in developing an area's Long Range Transportation Plan. The Long Range Transportation Planning process sets the major transportation improvement priorities for a 20-25 year planning horizon. These improvements are based on expected future transportation revenues, as well as expected population growth.

Travel demand forecasting consists of four (4) primary steps: trip generation, trip distribution, mode choice, and assignment. However, to create the necessary input files for each of the four primary steps the FDOT has expanded these steps to a total of twelve (12) steps in the FSUTMS software. The twelve main steps in the FSUTMS software are:

- External Travel Model
- Trip Generation Model
- Highway Network Model
- Highway Pathbuilding Model
- Trip Distribution Model
- Transit Network Model
- Transit Pathbuilding Model
- Mode Choice Model
- Highway Assignment Model
- Highway Evaluation Model
- Transit Assignment Model
- Transit Evaluation Model

In Florida, as of 2003, there are currently 25 MPO planning models, 8 non-MPO planning models, 8 regional models, and 1 statewide model. The urban area MPO models and the Regional models are maintained cooperatively by the MPO and FDOT District Planning staffs; the non-MPO models are maintained by the County and FDOT District Planning staffs; and the State model is maintained by the FDOT Central Office Planning staff.

WHAT ARE THE WARRANTS FOR TRAFFIC SIGNALS?

In order to assure that traffic signals are installed only where necessary, a series of 8 warrants has been developed and accepted by traffic engineers throughout the country. Traffic signal warrants are contained in a manual developed by the U.S. Department of Transportation, entitled "Manual on Uniform Traffic Control Devices" (MUTCD). For State approval, a signal must meet at least one of the warrants presented in the MUTCD. A brief summary of the 8 warrants for traffic signals is presented below:

Warrant 1 - Eight Hour Vehicular Volume:
Condition A - Minimum Vehicular Volume and Condition B - Interruption of Continuous Traffic
Condition A or Condition B is satisfied if minimum volumes are met for 8 hours.
Warrant 1 is satisfied if Condition A or Condition B is 100% satisfied. Warrant 1 is also satisfied if both Condition A and Condition B are 80% satisfied.

Warrant 2 - Four Hour Vehicular Volume
This involves plotting 4 volume combinations. If 4 points lie above the appropriate line in a graph, then the warrant is satisfied.

Warrant 3 - Peak Hour
An unusual condition, such as a high volume from a nearby manufacturing plant, is required to justify the use of this warrant.

Warrant 4 - Pedestrian Volume
1. Pedestrian volume crossing the major street is 100 pedestrians/hour or more for each of 4 hours or 190 ped/hour or more for 1 hour.
2. There are fewer than 60 gaps per hour in the major street traffic stream of adequate length for pedestrians to cross during the same period as the pedestrian volume criterion is satisfied.
3. The nearest traffic signal along the major street is located more than 300 feet away. Or the nearest traffic signal is within 300 feet but the proposed traffic signal will not restrict the progressive movement of traffic.

Warrant 5 - School Crossing
1. There is a minimum of 20 students during the highest crossing hour.
2. There are fewer adequate gaps in the major street traffic stream during the period when the children are using the crossing than the number of minutes in the same period.
3. The nearest traffic signal along the major street is located more than 300 feet away. Or, the nearest traffic signal is within 300 feet but the proposed traffic signal will not restrict the progressive movement of traffic.

Warrant 6 - Coordinated Signal System
1. On a one-way street or a street that has traffic predominately in one direction, the adjacent signals are so far apart that they do not provide the necessary degree of vehicle platooning.
2. On a two-way street, adjacent signals do not provide the necessary degree of platooning and the proposed, adjacent signals will collectively provide a progressive operation.

Warrant 7 - Crash Experience

This warrant is satisfied if all three of the criteria are fulfilled.

1. One of the warrants a, b or c below is met:
a. Warrant 4.1 at 80% of volume requirements: 80 ped/hr for 4 hours or 152 ped/hr for 1 hr.
b. Warrant 1, Condition A (80% satisfied)
c. Warrant 1, Condition B (80% satisfied)
2. Adequate trial of other remedies has failed to reduce crash frequency.
3. Five or more reported crashes, of types susceptible to correction by signal, within a 12 month period.

Warrant 8 - Roadway Network

This warrant is satisfied if at least one of the criteria is fulfilled and if all intersecting routes have one or more of the characteristics listed.

WHAT IS THE FDOT GREENBOOK?

The "FDOT Greenbook" was developed by the Florida Department of Transportation (FDOT) and is entitled "Manual of Uniform Minimum Standards for Design, Construction and Maintenance of Streets and Highways."

The purpose of the FDOT Greenbook is "to provide uniform minimum standards and criteria for the design, construction and maintenance of all public streets, roads, highways, bridges, sidewalks, curbs and curb ramps, crosswalks where feasible, bicycle facilities, underpasses and overpasses used by the public for vehicular and pedestrian traffic as directed by Sections 334.044(10)(a) and 336.045, Florida Statutes."

The FDOT standards are intended to provide the basic guidelines for developing and maintaining a highway system with reasonable operating characteristics and a minimum number of hazards.

The standards established by the FDOT Greenbook are intended for use on all new construction projects. It is understood that the FDOT standards cannot be applied completely to all reconstruction projects, however, the standards should be applied to the extent that economic and environmental considerations and existing development will allow.

When the FDOT Greenbook refers to guidelines and design standards given by current American Association of State Highway and Transportation Officials (AASHTO) publications, these guidelines and standards should generally be considered as minimum criteria.

The criteria and standards set forth in other manuals which have been included by reference shall be considered as requirements within the authority of this manual.

Listed below is a brief outline of the chapters in the FDOT Greenbook.

I. Planning
   - A. Introduction
   - B. Conflicting Criteria
   - C. Highway Function and Classification
   - D. Operation

II. Land Development
   - A. Introduction
   - B. Objective
   - C. Principles and Guidelines
   - D. Conflicts and Coordination
   - E. Control Techniques

III. Geometric Design
   - A. Introduction
   - B. Objectives
   - C. Design Elements

IV. Roadside Design
- A. Introduction
- B. Policy
- C. Objectives
- D. Roadside Design
- E. Protective Devices

V. Pavement Design and Construction
- A. Introduction
- B. Pavement Design
- C. Pavement Construction

VI. Roadway Lighting
- A. Introduction
- B. Objectives
- C. Warning Conditions
- D. Level of Illumination
- E. Uniformity of Illumination
- F. Underpasses
- G. Maintenance
- H. Light Poles

VII. Rail-Highway Grade Crossing
- A. Introduction
- B. Objective and Priorities
- C. Rail-Highway Grade Crossings
- D. Maintenance and Reconstruction

VIII. Pedestrian Facilities
- A. Introduction
- B. Minimizing Conflicts
- C. Barrier Separation
- D. Vertical Separation

IX. Bicycle Facilities
- A. Introduction
- B. On-Street Facilities
- C. Shared Use Paths

X. Maintenance
- A. Introduction
- B. Objectives
- C. Policy
- D. ID of Needs
- E. Priorities

XI. Work Zone Safety
- A. Introduction
- B. Objectives
- C. Policy
- D. Planning of Operations
- E. Work Zone Operations
- F. Evaluation of Program

XII. Construction
- A. Introduction
- B. Objectives
- C. Control of Work
- D. Control of Materials

XIII. Public Transit
- A. Introduction
- B. Objective
- C. Transit Components

XIV. Design Exceptions
- A. General
- B. Design Exceptions
- C. Recommendation for and Approval of Design Exceptions
- D. Coordination
- E. Justification
- F. Final Processing

XV. Traffic Calming
- A. Introduction
- B. Planning Criteria
- C. Inappropriate Treatments
- D. Appropriate Treatments
- E. Other Sources

XVI. Residential Street Design
- A. Introduction
- B. Objectives
- C. Design Elements

WHAT IS CONCURRENCY?

Concurrency means that the necessary public facilities and services to maintain the adopted level of service standards are available or will be in place when the impacts of the development occur.

The "Local Government Comprehensive Planning and Land Development Regulation Act", commonly referred to as the 1985 Growth Management Act (GMA), prohibits the issuance of building permits to developments which would reduce the level of public services impacted by the development to below the Level of Service (LOS) required by a Local Government's Comprehensive Plan (LGCP).

Some have referred to the "Concurrency Doctrine" as the "Doomsday Clause" in the Growth Management Act since it could severely limit or stop growth in parts of the State.

Florida Statutes Section 163.3177(10)h(1987) state: "It is the intent of the Legislature that public facilities and services needed to support development shall be available concurrent with the impacts of such development. In meeting this intent, public facility and service availability shall be deemed sufficient if the public facilities and services for a development are phased, or the development is phased, so that the public facilities and those related services which are deemed necessary by the local government to operate the facilities necessitated by that development are available concurrent with the impacts of the development. The public facilities and services, unless already available, are to be consistent with the capital improvement element of the local comprehensive plan..."

The Act requires that each local government prepare a comprehensive plan and submit its plan to Florida's State land planning agency, the Department of Community Affairs (DCA), on designated dates between July 1, 1988 and July 1, 1991.

Florida Statutes, Section 163.3202(1)-(2)g(1987) require that: "(1) Within 1 year after submission of its...comprehensive plan (all local governments) in this state shall adopt or amend and enforce land development regulations that are consistent with and implement their adopted comprehensive plan...(2) Local land development regulations shall contain specific and detailed provisions necessary or desirable to implement the adopted comprehensive plan and shall as a minimum: (g) Provide that public facilities and services meet or exceed the standards established in the capital improvements element required (under this Act) and are available when needed for the development, or that development orders and permits are conditioned on the availability of these public facilities and services necessary to serve the proposed development. Not later than 1 year after its due date established by the state...a local government shall not issue a development order or permit which results in a reduction in the level of services for the affected public facilities below the level of services provided in the comprehensive plan of the local government."

DCA's secretary, Thomas Pelham, has indicated the following will satisfy the concurrency requirement: "(1) The necessary facilities are in place at the time a development permit is issued or development permit is issued subject to the condition that the necessary facilities will be in place when the impacts of the development occur; (2) The necessary facilities are under construction at the time a permit is issued; (3) The necessary facilities are the subject of a

binding contract executed for the construction of those facilities at the time a development permit is issued; or (4) The necessary facilities have been included in the local government's budget at the time a development permit is issued even though the facilities are not yet the subject of a binding contract for their construction."

Florida Statutes, Section 163.3215 (1987) provides that any aggrieved or adversely affected party has the right to maintain action for injunctive or other relief against any local government to prevent the local government from taking any action on a development order that is not consistent with its adopted comprehensive plan.

WHAT ARE 'PASSER-BY' TRIPS?

Land use activities generate traffic to and from a particular site. Many types of commercial activities such as Service Stations, Fast Food Restaurants, Convenience Stores, Supermarkets, Banks and Shopping Centers generate a portion of the traffic that is already on the adjacent street that merely stop at the establishment in passing by (i.e. passer-by traffic).

Passer-by factors are used to recognize and reduce the estimated additional total daily traffic to the street(s) serving a proposed development. They are not applied directly to reduce trip generation and turning movement volume at driveways serving a development.

There are three categories of trips: Primary Shopping Trips, Diverted Linked Trips and Passer-by Trips.

A Primary Shopping Trip to a retail facility is one in which the purpose of the trip is shopping and the trip pattern is generally home-to-shopping-to-home.

A Diverted Linked Trip or a Passer-by Trip is one in which the shopping destination is a secondary part of the primary trip such as work-to-shopping-to-home. The diverted linked trip involves a route diversion from one roadway to another.

The Passer-by Trip comes directly from the traffic stream passing the facility on the adjacent street system and does not require a diversion from another roadway. Two ITE publications, the Trip Generation Manual, 5th Edition (1991), and the Transportation and Land Development Manual (1988), present the following data related to passer-by trip rates:

GENERATOR	% PASSER-BY TRIPS (% OF SITE TRAFFIC)
Service Station	58%
Fast-Food Restaurant	45%
Convenience Store	16-45%
Supermarket	28%
Banks w/Drive Thru Window	14%
Hardware Store	8%

Shopping Center:

$$\text{Ln (Pass-By Trip \%)} = -0.341 \text{ Ln } \frac{\text{GLA}}{1000}$$

(Use with caution - See Manual)

50,000 SFGLA	56.94%
100,000 SFGLA	44.95%
150,000 SFGLA	39.15%
200,000 SFGLA	35.49%
250,000 SFGLA	32.89%

% Passer-by for Shopping Centers = 45.1 - 0.0225 X SFGLA/1000

WHAT IS A DESIGN VEHICLE?

Design Vehicle information is presented in the FDOT Greenbook, the state standard at:

http://www11.myflorida.com/rddesign/Florida%20Greenbook/Florida%20Greenbook%202002.htm

A "design vehicle" is a selected motor vehicle whose weight, dimensions, and operating characteristics are used to establish highway design controls to accommodate vehicles of a designated type. For the purpose of geometric design, the design vehicle should be one with dimensions and minimum turning radii larger than those of almost all vehicles in its class. Design vehicles are listed in Table 3 - 2.

One or more of these vehicles should be used as a control in the selection of geometric design elements. In certain industrial (or other) areas, special service vehicles may have to be considered in the design. Fire equipment and emergency vehicles should have reasonable access to all areas.

If a significant number or percentage (5 % of all the total traffic) of vehicles of those classes larger than passenger vehicles are likely to use a particular street or highway, that class should be used as a design control. The design of major arterial streets and highways should normally be adequate to accommodate all design vehicles. The decision as to which of the design vehicles (or other special vehicles) should be used as a control is complex and requires careful study. Each situation must be evaluated individually to arrive at a reasonable estimate of the type and volume of expected traffic.

Design criteria significantly affected by the type of vehicle include: horizontal and vertical clearances, alignment, lane widening on curves, shoulder width requirements, turning roadway and intersection radii, intersection sight distance and acceleration criteria.

Particular care should be taken in establishing the radii at intersections, so vehicles may enter the street or highway without encroaching on adjacent travel lanes or leaving the pavement. It is acceptable for occasional trucks or buses to make use of both receiving lanes, especially on minor side streets.

WHAT CAN BE DONE TO DEVELOP A SAFE AND EFFICIENT TRANSPORTATION SYSTEM?

Traffic Engineers are striving to provide roadway conditions that contribute to smooth and efficient traffic flow. Experience has shown that safety is enhanced by smooth traffic flow. Disrupting the smooth flow of traffic increases the probability of crashes.

Erratic traffic operation may be caused by vehicles stopping or slowing in the roadway, passing and weaving maneuvers, unwarranted traffic signals, the lack of street name signs and unreasonably low speed limits. In addition, too many commercial signs may cause driver confusion and indecision. Slower speed does not insure safer traffic operation. The chances of a driver becoming involved in a crash are least when he is traveling at the average speed of traffic. The population growth in many areas poses great challenges for Traffic Engineers. These engineers are utilizing many traffic management techniques to control traffic within the development review process. These management techniques should:

Limit the number of driveways from new developments.

Increase spacing between driveways.

Limit indiscriminate access to major roads by requiring connecting drives between adjacent shopping centers.

Require developers to direct traffic into signalized access points.

Require developers to provide a good turning radius at driveways to allow drivers to enter and exit roads easily.

Require developers to provide tapers or turn lanes when needed.

Require developers to provide traffic control devices such as signs, pavement markings and signals.

In addition, Traffic Engineers can improve traffic safety and congestion by the following techniques:

Install computerized signal systems to improve traffic flow.

Install turn lanes at existing or proposed intersections and along sections of roadways where there are frequent turning movements.

Install bikeways and sidewalks where needed.

Promote mass transit where feasible.

Promote ride share programs.

Direct benefits to the public can be improved safety and air quality and reduced travel cost and travel time. Safety can be enhanced by improving the uniformity of traffic flow and reducing the vehicles on the roadway. Air Quality can be improved by reducing the number of stops and motorized vehicles on the road. Delay in Travel Time can be reduced especially at signalized intersections. Travel Cost can be reduced by minimizing delays at traffic signals and in heavy traffic congestion.

HOW CAN I OBTAIN THE PUBLICATIONS USED BY TRAFFIC ENGINEERS?

Many of the publications used by Traffic Engineers can be downloaded from the "Florida Section of the Institute of Transportation Engineers" web site:
http://www.floridasectionite.org/links.html

"Manual of Uniform Minimum Standards for Design, Construction, and Maintenance for Streets and Highways" (FDOT Greenbook) by the Florida Department of Transportation
Florida Department of Transportation - Maps and Publications Section
605 Suwannee Street, MS-12
Tallahassee, Florida 32399-0450 Phone: (850) 414-4050 Fax (850) 414-4915
http://www11.myflorida.com/rddesign/Florida%20Greenbook/Florida%20Greenbook%202002.htm

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"Manual on Uniform Traffic Control Devices for Streets and Highways" (MUTCD) by the U.S. Department of Transportation
Superintendent of Documents
U.S. Government Printing Office
Washington, D.C. 20402 Phone: (866) 512-1800 Fax (202) 512-2168
http://bookstore.gpo.gov/

"Trip Generation Manual" by the Institute of Transportation Engineers (ITE).
"Highway Capacity Manual" by the Transportation Research Board (TRB).
"A Policy on Geometric Desiqn of Hiqhways and Streets" (AASHTO Green Book)
The above three publications are available from:
Institute of Transportation Engineers
1099 14th St. NW, Suite 300 West
Washington, D.C. 20005-3438 Phone: (202) 289-0222 Fax: (202) 289-7722
http://www.ite.org/cgi-bin/searcht.cgi

"Florida Traffic Laws - Florida Statutes - Chapter 316 - State Uniform Traffic Code"
Chapter 316 - Traffic Laws and Other Florida Statutes:
http://www.flsenate.gov/statutes/

WHAT IS A CLOSED LOOP SYSTEM?

A "closed loop system" is a system of communication between individual signalized intersections within an arterial or a network of arterial roadways, and the Traffic Engineer.

A closed loop system basically consists of sampling detectors at intersections, local controllers, one or more on-street master controllers and a central microcomputer.

The system is called "closed loop" because two-way communication can be maintained between the street controllers and the user. "Open loop" systems maintain only one-way communication "up" from the sampling detectors to the on-street master to the local controllers, but no feedback is received from the local controller or the master. The addition of the central microcomputer "closed the loop" in the system's communications. Data is transferred from the sampling detectors to the master via the local controllers; the sampling detectors report to the central microcomputer via the master; and the central microcomputer transmits information to the master and to the local controllers via the master.

ta Loading

The following data is entered by the microcomputer user via a keyboard:

Controller settings such as minimum and maximum GREEN, YELLOW, and RED times

System timing parameters such as cycle lengths, offsets, splits and permissive periods

Traffic responsive computation information such as sampling detector ththreshold values, detector assignments and weighting factors

Time clock information (at the master and local controllers) and Time Of Day (TOD) and Day Of Week (DOW) schedule entries

The microcomputer "downloads" the above data to the master controller and to each local controller via the master.

System Monitoring and Reports

The central microcomputer can receive from the master the following information:

Mode of operation (TOD/DOW, traffic responsive, free, etc.) for the current time and/or previous 24 hour period.

Timing plan in effect for the current time and the previous 24 hour period.

Status of local controllers (flash, preemption, failures, etc.) for the previous 24 hours.

Status of sampling detectors (in/out service, failures) including all volume and occupancy data for the previous 24 hours.

WHAT GIVES THE COUNTY THE RIGHT TO DIG UP MY FRONT YARD?

Increasing urbanization has led to many roadway reconstruction projects in built-up areas. Some residents do not understand that the public right of way extends into what they consider to be their private property.

The Florida Department of Transportation (FDOT) publication entitled "Manual of Uniform Minimum Standards For Design, Construction and Maintenance For Streets and Highways" (Greenbook) includes the following definition of the term right of way:

> "A general term denoting land, property or interest therein, usually in a strip, acquired for or devoted for transportation purposes. More specifically, land in which the State, the Department, a county, a transit authority or a municipality owns the fee, or has an easement devoted to or required for use as a public road."

During roadway construction projects, many public agency officials or contractors are mistakenly blamed for trespassing onto private property. Even if the public agency does not own actual fee simple title to property, it may acquire the right to the property when the public agency has maintained a roadway for a period of at least four (4) years. This type of right of way is known as prescriptive right of way.

Florida Statutes, Section 95.361, presents information on when roads are presumed to be dedicated through the prescriptive right concept. This section states: "When a road, constructed by a county, a municipality, or the Department of Transportation, has been maintained or repaired continuously and uninterruptedly for 4 years by the county, municipality, or the Department of Transportation, jointly or severally, the road shall be deemed to be dedicated to the public to the extent in width that has been actually maintained for the prescribed period, whether or not the road has been formally established as a public highway. The dedication shall vest all right, title, easement, and appurtenances in and to the road in …"

Most public agencies such as counties and cities require a permit for any work within the county right of way. This includes driveway connections and culvert/utility installations. The reason for controlling work within the public right of way is to insure that hazardous objects are not installed too close to the roadway. Also, the maintaining agency officials must insure that installations in the right of way do not obstruct the view of road users.

The area of the public right of way for a road usually varies from 50 feet for a local road with curb and gutter to 300 feet for an interstate highway. To determine the right of way width for a road, a citizen may contact the Engineering Department (Right of Way Section) of the maintaining agency of the roadway.

WHAT IS GIS?

The term "GIS" is used to refer to Geographic Information System. The computerized GIS is used to automate everything from simple mapping functions to complex land use analysis, site selection and network modeling.

GIS has created a new dimension in map making which allows an enhanced ability to manage our cities, natural resources, parcels of land and utility systems.

Using GIS, public officials can quickly evaluate the impact of proposed facilities. For example, public works engineers can assess the impact of a pollution spill on all areas along a water distribution path and fire and police departments can dispatch vehicles based on a detailed analysis of the quickest path between two points. Tasks that once took months can now be accomplished in a few minutes, using GIS.

Through GIS, geographic information from maps, aerial photographs and batches of descriptive records are fed into computers as overlays representing property parcels, political and man-made boundaries, utility distribution networks, natural land base features, land use patterns, demographic data, etc. This information is tied to these graphic pictures by the numerous records that describe them. For example, the dimensions and ownership data associated with each land parcel, or the height, diameter, material, number and other information associated with a utility pole. An urban planner could quickly find all industrially zoned land that meets minimum acreage criteria and is within 100 yards of a major transportation feeder. GIS provides the means to point to a parcel on a display screen and have instant access to all publicly available information about that address.

A technology similar to GIS, is called AM/FM which is an acronym for Automated Mapping/Facilities Management. GIS is used within a planning, natural resources and land records management environment AM/FM is used more often by the utility environment. The AM/FM stems from an evolution of computer-aided drafting technology.

The basic hardware components of a GIS include:

Central Processing Unit (CPU) is where the information processing tasks are performed and software commands executed.

Disk Drives are the storage medium for the GIS database. Tape drives are the medium for loading data from other systems, backing up and storing GIS data.

Output Devices include printers, plotters and copiers.

Digitizing Device is the mechanism for electronically tracing manually produced maps to produce a digital version of the information.

Workstation includes a graphics display screen and a keyboard used for data input, editing and manipulation.

WHERE SHOULD A "STOP SIGN" AND "STOP LINE" BE LOCATED?

In Florida, as in most states, the standard for signs, signals and pavement markings is the "Manual On Uniform Traffic Control Devices" (MUTCD). This publication by the U.S. Department of Transportation serves as the standard for the installation of all traffic control devices. The MUTCD states:

STOP Sign Installation:

Standard:
STOP signs shall not be installed at intersections where traffic control signals are installed and operating because the potential for conflicting commands could create driver confusion. Portable or part-time STOP signs shall not be used except for emergency and temporary traffic control zone purposes.

Guidance:
STOP signs should not be used for speed control. STOP signs should be installed in a manner that minimizes the numbers of vehicles having to stop. At intersections where a full stop is not necessary at all times, consideration should be given to using less restrictive measures such as YIELD signs (see Section 2B.08). Once the decision has been made to install two-way stop control, the decision regarding the appropriate street to stop should be based on engineering judgment. In most cases, the street carrying the lowest volume of traffic should be stopped. A STOP sign should not be installed on the major street unless justified by a traffic engineering study.

STOP Sign Placement:

Standard:
The STOP sign shall be installed on the right side of the traffic lane to which it applies. When the STOP sign is installed at this required location and the sign visibility is restricted, a Stop Ahead sign (see Section 2C.26) shall be installed in advance of the STOP sign. The STOP sign shall be located as close as practical to the intersection it regulates, while optimizing its visibility to the road user it is intended to regulate. STOP signs and YIELD signs shall not be mounted on the same post.

Guidance:
Stop lines, when used to supplement a STOP sign, should be located at the point where the road user should stop (see Section 3B.16). If only one STOP sign is installed on an approach, the STOP sign should not be placed on the far side of the intersection. Where two roads intersect at an acute angle, the STOP sign should be positioned at an angle, or shielded, so that the legend is out of view of traffic to which it does not apply.
Where there is a marked crosswalk at the intersection, the STOP sign should be installed in advance of the crosswalk line nearest to the approaching traffic.

Stop Line (pavement marking):

Standard:
If used, stop lines shall consist of solid white lines extending across approach lanes to indicate the point at which the stop is intended or required to be made.

Guidance:
Stop lines should be 12 to 24 inches wide.
Stop lines should be used to indicate the point behind which vehicles are required to stop, in compliance with a STOP sign, traffic control signal, or some other traffic control device.
If used, stop and yield lines should be placed 4 feet in advance of and parallel to the nearest crosswalk line, except at roundabouts as provided for in Section 3B.24. In the absence of a marked crosswalk, the stop line or yield line should be placed at the desired stopping or yielding point, but should be placed no more than 30 feet nor less than 4 feet from the nearest edge of the intersecting traveled way. Stop lines should be placed to allow sufficient sight distance for all approaches to an intersection. Stop lines at mid-block signalized locations should be placed at least 40 feet in advance of the nearest signal indication (see Section 4D.15).

HOW D0 YOU KNOW HOW MUCH TRAFFIC IS GOING TO BE ON A ROAD IN 10 YEARS?

The following factors must be considered by Traffic Engineers and Planners in order to develop traffic projections.

- Historic traffic volumes
- Historic and projected population growth rates
- Future land uses, to include average expected development as well as high impact developments (DRIs)

To determine future traffic projections, Engineers and Planners must:

- Use data from an area transportation model, or
- Use historic traffic counts and land use information to develop a growth curve, or
- Use historic traffic counts and a compound linear rate table to determine a growth factor that is adjusted by changes in land development.

Projection of future traffic volumes expected on the area roadways can be accomplished using several methodologies, depending upon what data is available.

The use of an area transportation model, such as FSUTMS, is the most desirable method. It assigns traffic to the roadway links based on a comprehensive and complex series of vehicle trip assignments derived from information on future population, economic conditions, land use and system operations information.

An alternative analysis involves the use of growth trends developed from historic traffic count information and land uses, both existing and planned, for the area. This information, plotted over time, will form a curve which is then extended to project future traffic volumes. Typically, the curves will show a linear or non-linear relationship that should correlate with the area's growth trends, i.e. high growth, slow but steady, increment, etc., each of which should exhibit a different curve. Extension of the curve, consistent with the expected growth trend, will provide future traffic volumes expected on the roadways. This may be done by physically graphing the data or through the use of computerized curve-fitting analysis programs. Knowledge of the area, professional judgment, and economic conditions form important elements in determining the rational basis for traffic projections.

Another methodology involves the use of growth factors referenced through compound linear rate tables. This involves the determination of a rate of growth from the ratio of the most recent and earliest count volumes, which is then located on compound linear rate tables according to the number of years between the counts. From this table, a growth factor is determined for the desired number of years into the future, which is then applied to existing traffic volumes to produce the expected traffic volume for the desired year. Any anticipated major changes in land use could be used to alter the projection.

WHAT ARE THE WARRANTS FOR MULTI-WAY STOP SIGNS?

In order to insure multi-way Stop signs are installed only where necessary, warrants have been developed by the U.S. Department of Transportation and accepted by traffic engineers throughout the country.

The Manual on Uniform Traffic Control Devices (MUTCD) published by the U.S. Department of Transportation is the national standard for traffic control devices. The Florida Department of Transportation has adopted the MUTCD as the State standard. The installation of a multi-way stop condition must first meet the warrants as set forth in the MUTCD.

The MUTCD states the following support statements for the use of multi-way Stops:

"Multi-way stop control can be useful as a safety measure at intersections if certain traffic conditions exist. Safety concerns associated with multi-way stops include pedestrians, bicyclists, and all road users expecting other road users to stop. Multi-way stop control is used where the volume of traffic on the intersecting roads is approximately equal."

The MUTCD provides the follow guidance statements:

The decision to install multi-way stop control should be based on an engineering study.

The following criteria should be considered in the engineering study for a multi-way

Stop sign installation:

A. Where traffic control signals are justified, the multi-way stop is an interim measure that can be installed quickly to control traffic while arrangements are being made for the installation of the traffic control signal.

B. A crash problem, as indicated by 5 or more reported crashes in a 12-month period that are susceptible to correction by a multi-way stop installation. Such crashes include right- and left-turn collisions as well as right-angle collisions.

C. Minimum volumes:

1. The vehicular volume entering the intersection from the major street approaches (total of both approaches) averages at least 300 vehicles per hour for any 8 hours of an average day, and

2. The combined vehicular, pedestrian, and bicycle volume entering the intersection from the minor street approaches (total of both approaches) averages at least 200 units per hour for the same 8 hours, with an average delay to minor-street vehicular traffic of at least 30 seconds per vehicle during the highest hour, but

3. If the 85th-percentile approach speed of the major-street traffic exceeds 40 mph, the minimum vehicular volume warrants are 70 % of the above values

D. Where no single criterion is satisfied, but where Criteria B, C.1, and C.2 are all satisfied to 80% of the minimum values. Criterion C.3 is excluded from this condition.

WHAT IS THE "ACCESSIBILITY REQUIREMENTS MANUAL?"

The "Accessibility Requirements Manual" is a public document that was published in January 1990 by the Department of Community Affairs (DCA), Florida Board of Building Codes and Standards.

The 1989 Florida Legislature passed a bill which mandated many changes to the requirements for accessibility for the physically handicapped. The bill also stipulated that the Department of Community Affairs (DCA) be required to prepare a manual which fully explains the relationship and requirements of the American National Standards Institute standard and Part V of Chapter 553, Florida Statutes relating to handicapped accessibility.

This manual was published by the Department of Community Affairs in association with the Florida Agricultural and Mechanical University's Institute for Building Sciences, School of Architecture, who illustrated the drawings and cover.

Many different groups throughout the state including building departments, design professionals, builders and handicapped advocates will use this publication to determine the minimum requirements for providing accessibility. Included in the manual are the requirements of Part V, Chapter 553, Florida Statutes; the mandatory portions of A117.1, 1986; definitions; interpretive illustrations; special notes; and an appendix of legislation relating to issues that affect the disabled. The text is laid out in concert with the interpretive illustrations so that a verbal and graphic representation of the subject matter is presented together. It should be noted that the interpretive illustrations are often construed as the code itself.

The code and manual address accessibility features designed for the physically handicapped adult. It does not address the special needs of the physically handicapped child; however, the Florida Department of Education is currently developing a standard that identifies the special design requirements needed to provide accessibility for physically handicapped children.

Accessibility features of buildings and facilities provide the opportunity for handicapped persons in the community to become more self reliant and independent. Barrier free design can help to enable a person with disabilities to achieve his or her potential for contributions to our society.

The new DCA "Accessibility Requirements Manual" includes the following topics:

- Basic Components, Windows Lavatories, Sinks, & Mirrors Signage
- Space Allowances & Reach Ranges, Doors, Bathtubs, Telephones
- Accessible Route Entrances, Shower Stalls, Food, & Liquor Service
- Walkways, Drinking Fountains, Toilet Rooms, Bathrooms, Bathing Establishments
- Protruding Objects & Water Coolers Facilities & Shower Rooms Seating, Tables & Ground & Floor Surfaces, Restroom, Vestibules, Changing Rooms, Work Surfaces
- Parking Spaces & Passenger Restroom & Toilet Storage Areas Auditorium & Assembly
- Curb Ramps, Grab Bars, & Tub & Loading Zones, Room, Clear Passage
- Ramps, Shower Seats, Controls & Operating Mechanisms, Residential Stairs, Water Closets, Alarms, Occupancies
- Elevators, Toilet Stalls, Detectable Warnings, Modifications & Exceptions From Accessibility, Urinals, Enforcement & Date Waivers, Requirements

A copy of the DCA "Accessibility Requirements Manual" may be obtained from the:

Department of Community Affairs, Florida Board of Building Codes & Standards
2740 Centerview Drive
Tallahassee, Florida 32399-2100 Phone: (904) 487-1824 SUNCOM 277-1824

WHAT IS THE RADIUS FOR A TRAFFIC IMPACT STUDY?

When doing a traffic impact study, there is always the question as to how far the study area should reasonably go from the site. The purpose of this TIPS is to provide a general guidance for the study area radii for a particular type of development.

These suggested study area radii require the consideration of two variables. One of these is the type of land use, and the second is the magnitude of that land use. The table below for suggested impact study area radii is based upon the average trip length for various types of land uses. Generally, one quarter of this average trip length is utilized as the significant impact area for the largest developments for each type of land use and the study area decreases in size with smaller projects. In rural areas the study area radii may be extended to cover the nearest major intersections.

SUGGESTED IMPACT STUDY AREA RADII (MILES)

	Average Trip Length (Miles)	Over 1000 Units	500-1000 Units	250-499 Units	0-249 Units
Residential	6-8	2.0	1.5	1.0	0.5
Hotel/Motel	2-3	1.5	1.0	0.5	0.25

		Over 200,000 GBA	100,000-199,000	0-99,000
Office	5-6	1.5	1.0	0.5

		Over 400,000 GBA	200,000-399,000	100,000-199,000	50,000-99,000	0-49,000
Shopping Center	1-5	1.5	1.0	0.75	0.5	0.25

		All Sizes
Quality/Sit Down Restaurant	1-1.5	0.25
Fast Food	0.5-1.0	0.25
Convenience Store	0.5-1.0	0.25
Drive-In Bank	1.5-2.0	0.25
Day Care Center	1.5-2.0	0.25
Building Materials	3.4	0.75

		Over 1,000,000 GBA	500,000-1,000,000	250,000-499,000	0-250,000
Industrial/ Manufacturing	6-8	2	1.5	1	0.5

WHAT IS THE HARM OF INSTALLING AN UNWARRANTED TRAFFIC CONTROL DEVICE?

Traffic Control Devices (TCD's) such as Traffic Signals, Stop Signs and Speed Limit Signs are installed to regulate traffic flow and improve safety. The installation of these TCD's should be based on the professional judgement of Traffic Engineers after careful study of the location to be controlled. The study should consider such factors as crash frequency and type, vehicle speeds and traffic volumes.

On occasion, an elected official, with a true "politician's" zeal to please everyone, influences the installation of a traffic control device against the advice of the Traffic Engineer. The elected official's motivation is often an angry or persistent citizen rather than the objective professional judgement of the Traffic Engineer.

Many elected officials do not realize that there are National guidelines for the installation of Traffic Control Devices. The Manual On Uniform Traffic Control Devices (MUTCD) gives Transportation Engineers the uniform standards to safely assist motorists as they travel. It defines a series of uniform Traffic Control Devices (Signals, Signs and Pavement Markings) which are clear in their messages as applied on the nation's roadway system.

The March 1990 issue of "Public Roads" magazine, published by the U.S. Department of Transportation, contained an article on "Motorist Compliance With Standard Traffic Control Devices." The article examined the following forms of motorist noncompliance:

- Speeding
- Not coming to a full stop at STOP signs
- Failing to yield right of way to pedestrians
- Ignoring active railroad crossing devices
- Making illegal turns
- Using lanes improperly
- Violating traffic signal indications
- Driving too fast through work zones
- Encroaching on centerlines
- Violating passing zone restrictions

The behavioral studies collected compliance and other data at a large number of typical sites over extended periods of time. In the process, hundreds of thousands of motorists were observed. The clear conclusion was that motorist noncompliance does take place.

One of the recommendations in the US DOT article was: "To ensure that the motoring public maintains a healthy respect for TCD's, traffic professionals must use them prudently. Through concerted efforts of the nature outlined above (Engineering, Enforcement and Education), the safety and efficiency of our streets and highways can be maximized."

Another recommendation was to "Apply TCD's consistently to ensure they command respect."

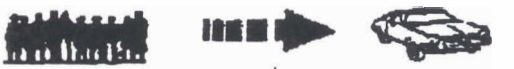
Institute of Transportation Engineers
FLORIDA SECTION
DISTRICT 10

WHAT TRANSPORTATION ACTIVITIES CAN BE IMPLEMENTED TO IMPROVE THE ENVIRONMENT ?

RECYCLE ENGINE OIL , BATTERIES , TIRES & SCRAP VEHICLES

COMBINE TRIPS

PARTICIPATE IN CAR POOLING

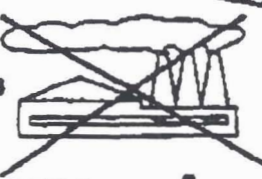


KEEP VEHICLES PROPERLY TUNED

DRIVE FUEL EFFICIENT VEHICLES

USE PUBLIC TRANSPORTATION

SUPPORT ANTI- POLLUTION LAWS



WALK OR BICYCLE WHENEVER POSSIBLE

DON'T LITTER

WHY IS LANDSCAPE DESIGN & MAINTENANCE IMPORTANT IN PRIVATE PARKING LOTS?

Landscape design is important because it can contribute greatly to safe ingress and egress of any busy parking lot.

The problem begins long before the sight obstruction becomes noticeable to the motorist. It starts when the architect and site planners are preparing building plans and parking lot layouts. Many times the architect or site plan designer will try to take advantage of the end island treatment of parking aisles to meet landscaping requirements of the municipalities. Unfortunately, the type of planting selected is not always functional from a traffic or pedestrian safety perspective. When plants are allowed to grow to a height that makes it difficult for a motorist to see oncoming vehicles or pedestrians, it creates a traffic safety hazard.

Property owners, site managers and ground maintenance personnel should be trained to identify poorly maintained plantings and correct hazardous conditions. Property owners who invite the public onto their property should come under the same scrutiny as the public sector.

Traffic crashes caused by sight distance problems in parking lots of shopping center, office complexes or other private commercial sites are just as harmful as traffic crashes on public residential streets. There could be more pedestrians crossing in a neighborhood shopping center than on a typical residential street.

Many traffic crashes on private sites go unreported because they are minor in nature and many police departments do not respond to private property crashes unless there is an injury. Pedestrian crashes from either public or private sites are usually reported. Police agencies have very little enforcement authority within private parking areas.

Because there is little documented traffic data on private property, traffic analysts rely on judgment and experience when reviewing site plans from a traffic safety perspective.

Municipalities have corner clearance ordinances regulating the height of fences and hedges at the intersection of public roads. These restrictions are generally enforced when the obstruction becomes a traffic safety problem. However, there are few municipalities which have regulations or inspect sight triangle or corner clearance obstructions in parking areas.

Good landscaping treatment that would improve safety and reduce crashes should use the following guidelines:

1. Trees, at maturity, should not have a trunk diameter larger than 4 inches.
2. Trees should require very little trimming or other maintenance and should not have branches lower than 6 feet.
3. Hedges should be avoided. Plants and vegetation should be no higher than 18 inches.
4. A clear zone between 18 inches and 6 feet above the ground should be left open.

These few guidelines could go a long way toward reducing crashes within private property parking areas. People bruise, bleed and break bones the same way on public or private property - the ownership of the property does not lessen the pain of the injured.

WHAT IS THE ROADSIDE CLEAR ZONE?

The "Manual of Uniform Standards for Design, Construction and Maintenance for Streets and Highways" is published by the Florida Department of Transportation (FDOT). This manual, often called the FDOT Greenbook, defines the term "roadside clear zone." Chapter 3 of this manual states:

"The roadside clear zone is that area outside the traveled way available for use by errant vehicles. Vehicles frequently leave the traveled way during avoidance maneuvers, due to loss of control by the driver (e.g., falling asleep) or due to collisions with other vehicles. The primary function of the clear zone is to allow space and time for the driver to retain control of his vehicle and avoid or reduce the consequences of collision with roadside objects. This area also serves as an emergency refuge location for disabled vehicles."

"The design of the roadway must also provide for adequate drainage of the roadway. Drainage swales within the clear zone should be gently rounded and free of discontinuities. Where large volumes of water must be carried, the approach should be to provide wide, rather than deep drainage channels. Side slopes and drainage swales that lie within the clear zone should be free of protruding drainage structures (CHAPTER 4 - ROADSIDE DESIGN, D.6.c. Culverts)."

"In the design of the roadside, the designer should consider the consequences of a vehicle leaving the traveled way at any location. It should always be the policy that protection of vehicles and occupants shall take priority over the protection of roadside objects. Further criteria and requirements for safe roadside design are given in Chapter 4 - Roadside Design."

Clear zones can be enhanced by some innovative techniques. Using selected plant species, landscaping can provide a natural crash cushion of thick shrubbery or bushes. Placing electric and telephone lines underground will eliminate concrete poles along the side of the road. Billboards and other large signs can be built using supports that angle away from the roadway. Smaller signs can use special breakaway supports. Street lights can bolt to low-profile concrete foundations. Stormwater drains and culverts can be designed for vehicles to drive over them rather than crash into them.

Trees, business signs, or local landmarks are sometimes identified for relocation during a road widening project in order to provide an adequate clear zone. It is often difficult for residents to accept the need for relocating such objects to accommodate a larger road, but highway designers are responsible to the public for developing the safest practical roadway design.

When you see damaged light poles, heavily scarred tree trunks, or guardrail installed around a chipped concrete foundation and think about the events that caused the damage, you will understand why engineers insist on adequate roadside clear zones.

For more detailed information on "Roadside Clear Zones" see the FDOT Greenbook:

http://www11.myflorida.com/rddesign/Florida%20Greenbook/Florida%20Greenbook%202002.htm

WHAT ARE THE TYPICAL DESIGN STANDARDS FOR BIKE PATHS?

Bikeway facility standards are presented in a publication entitled "Bicycle Facilities Planning and Design Manual" published by the Florida Department of Transportation (FDOT). This Manual contains the information necessary to plan, locate, select, and design bicycle facilities.
A copy of the FDOT Bicycle Facilities Planning & Design Manual may be obtained from:
http://www11.myflorida.com/safety/ped_bike/ped_bike_standards.htm#Florida%20Bike%20Handbook

Multi-use Trails (paths) are facilities on exclusive rights-of-way and with minimal cross flow by motor vehicles. Since bicycle paths are almost always used by pedestrians, joggers, in-line skaters, equestrians and bicyclists, they are referred to as multi-use trails. The FDOT design elements for multi-use trails are:

Width of a Multi-use Trail:
Under most conditions the minimum recommended paved width for a two-directional trail is 12 feet. The minimum width for a one-directional multi-use trail is 5 feet. One-way multi-use trails, will be used as two-way facilities unless effective measures are used to assure one-way operation. Without such design and enforcement, it should be assumed that shared use paths will be used as two-way facilities. They should be designed accordingly.

Horizontal Clearances of a Multi-use Trail:
A minimum, 4 feet of clearance is desirable to provide distance from trees, poles, walls, fences, guardrails, or other lateral obstructions. A 2 feet width graded area should be maintained adjacent to both sides of the pavement. A wider graded area on either side of the shared use path can serve as a separate jogging path. Any edge drop-off should be eliminated.

Vertical Clearances of a Multi-use Trail:
The vertical clearance to obstructions should be a minimum of 8 feet. However, vertical clearance may need to be greater to permit passage of maintenance vehicles and, in undercrossings and tunnels, a clearance of 10 feet is desirable for adequate physical and psychological vertical shy distance. Equestrian trails should be designed with a 10 foot vertical clearance.

Bike Lane Width:
Bicycle lanes are to be used on urban roadway sections, whenever right-of-way and existing curb/drainage sections permit. Occasionally it is possible to convert wide curb lanes on multi-lane highways to bike lanes by reducing the travel lane widths to 11 feet, and turn lanes to 10 feet. The width of the bike lane is included within the motorist clear zone and horizontal clear distance. Additional clearance is not required.

Bike Lane on Curb and Gutter Sections:
Bicyclists do not generally ride near a gutter because of the possibility of debris, of hitting a pedal on the curb, of an uneven longitudinal joint, or of a steeper cross slope. However, many novice bike riders will ride in a gutter if the roadway is too narrow, and thus bike lanes help reduce this problem. Bicycle lanes in this location should have a minimum width of 4 feet from the edge of pavement to the motor vehicle travel lane. Since Florida measures most dimensions from the edge of pavement, it can be assumed an additional 1.5 feet lateral separation exists from the curb face.

WHAT IS 'TRANSPORTATION DEMAND MANAGEMENT'?

Transportation Demand Management (TDM) focuses on ways of influencing the amount and the time of the demand on transportation. It encourages alternatives to the single-occupant automobile and more efficient use of the transportation system by altering the demand characteristics. When properly used, TDM actions can promote the use of public transportation, increase the people moving capacity of the transportation system and allow the transportation system to support a higher development density.

TDM TECHNIQUES are divided into the following three categories:

1. Promote alternatives to the automobile by encouraging persons to switch to other modes of travel such as transit, bicycles, or walking. The following techniques can be used:

a) Park-and-Ride service
b) Shuttle Systems
c) Pedestrian Systems
d) Employer Transit Subsidies
e) Bicycling

2. Encourage more efficient use of automobiles and roads by use of Ride Sharing and Alternative Work Hours. The following techniques can be used:

a) High-Occupancy Vehicle (HOV) Lanes
b) Ride Sharing
c) Alternative Work Hours
d) Truck Traffic Restrictions

3. Discourage the use of automobiles by making their use more costly or more difficult. The following techniques can be used:

a) Limiting on-Street Parking.
b) Limiting off-Street Public Parking
c) Allowing developers to provide fewer than the standard number of parking spaces in exchange for promoting other TDM activities, such as ride sharing and variable work hours.
d) Requiring Parking Permits for Residential Areas adjacent to business districts.
e) Increasing Long-Term (commuter) Parking Rates.

The above three TDM techniques can be used together to reduce peak-hour traffic by five (5) to fifteen (15) percent (%).

TDM is a part of the activities of Transportation System Management (TSM). In addition to the types of actions included in TDM, TSM includes:

- Traffic Signal Timing Improvement
- Turn Lane Additions
- Transit Scheduling Improvement
- Other Improvements related to Increased Operating Efficiency of the Existing Transportation System.

WHAT ARE THE FACTS ABOUT FLORIDA'S DUI LAW?

In 1989, there were 36,312 alcohol related crashes and Florida's new DUI Law is a serious effort to reduce the number of alcohol related vehicular deaths which totaled 1,492 in 1989.

The new law requires police to immediately suspend the license of any driver who has a Blood-Alcohol Content (BAC) of .10% or higher or who refuses to take a breathalyzer test or provide a urine sample upon request of the arresting officer. In cases of crashes with injuries or fatalities, blood tests may not be refused without loss of license for up to 18 months. Four DUI convictions require a lifetime revocation of a Florida driver's license. The table below summarizes the penalties for the convicted drunk driver:

Penalty	1st Conviction	2nd Conviction	3rd Conviction
License Revocation	Mandatory 180 days, up to 1 year.	Minimum 5 yrs., if within 5 yrs. of 1st conviction.	Minimum 10 yrs., if within 10 yrs. of 1st conviction.
Fine (See note below)	Mandatory $250. up to $500.	Mandatory $500. Up to $1,000.	Mandatory $1,000. Up to $2,500.
Imprisonment	Up to 6 Mos. optional.	10 days mandatory, if within 3 yrs. of 1st conviction. Up to 9 mos.	30 days mandatory, if within 5 yrs. of prior conviction. Up to 1 yr. optional.
Probation	Mandatory - Up to 1 Year with fee paid by offender.		
Community Service	At least 50 hours with costs paid by offender.		
Education	Required substance abuse course with fee paid by offender. Further treatment of the defendant may be required by the school.		

Note: Minimum fine will be doubled if convicted with blood alcohol of .20 (double legal limit) or above.

SOURCE: AAA World Magazine, January/February 1991, American Automobile Association

WHAT ARE THE MITIGATION TECHNIQUES FOR TRAFFIC CONGESTION?

TECHNIQUE	POTENTIAL ROAD CAPACITY IMPROVEMENT	
	SEGMENTS	INTERSECTIONS
Alternate Work Hours	-	-
Bikeways	-	-
Car Pool	7 - 30%	-
Development with Lower Trip Rate	-	-
Intersection Improvements	LOW - MEDIUM	HIGH
Lane Width Widening (10' to 12')	13 - 18%	LOW
Mixed Use Development (Use)	-	-
New Highways	HIGH	HIGH
One-Way Streets	10 - 20%	-
Park & Ride Facilities	-	-
Parking Management	-	-
Project Size Reduction	-	-
Rideshare Program	-	-
Sidewalks & Walkways	-	-
Through Lanes (ADD)	HIGH	HIGH
Traffic Control Device Improvement(s)	LOW	LOW
Traffic Signal Improvements (Coordination)	8 - 25% Travel Time Improvement	HIGH
Traffic Signals (New)	Reduced Capacity	HIGH
Transit Use (Increase Use)	2 - 11%	-
Turn Lanes (ADD)	5% for Multilane; 15% for 2 Lane	HIGH
Van Pool Program	1 - 5%	-

Sources:

Transportation and Traffic Engineering Handbook (1982) by I.T.E.
A Toolbox for Alleviating Traffic Congestion (1989) by 1.T.E.
Automobile Travel Reduction Options for Urban Areas (1988) by I.T.E.
Level of Service Standards and Guidelines Manual (1988) by FDOT
Volusia County DPW Traffic Engineering Division
D. Scot Leftwich, Ph.D.

"WHAT ARE FLORIDA'S NEW ACCESS MANAGEMENT AND DRIVEWAY CONNECTION STANDARDS?"

On February 13, 1991, the Florida Department of Transportation passed one of the nation's most far reaching access management regulations. The regulation is called Administrative Rule Chapter 14-97 Access Management Classification System and Standards. This rule institutes minimum spacing standards for driveway connections, median openings, and traffic signals on the State Highway System.

By July 1992, the entire State Highway System should be categorized into seven Access Management Classifications, each with its own minimum standard for access management. See Exhibit 1 for the classification system for arterials.

INTERIM STANDARDS

Until highways are classified, minimum spacing standards for driveway connections, median openings, and signals will be handled by Interim Standards found in Rule Chapter 14-97. These Interim Standards will be based primarily on the posted speed limit of the highway. See Exhibit 2 for the Interim Standards.

THE MEASUREMENTS

With the institution of this new Administrative Rule, the Department of Transportation will also be measuring distances between connections and corner clearance in a new fashion. Previously, this distance was measured from the point of tangency to the point of curvature, but now it will be measured from the edge of the pavement to the edge of the pavement of the other connection or nearest intersecting road (Please see Exhibit 4). Corner clearance standards and the connections spacing standards will be the same. This means that if the connection spacing standard is 330 feet, the corner clearance standard will also be 330 feet except where exempted specifically within this Rule.

THE IMPORTANT EXEMPTIONS

There are exemptions to this Rule such as small single family residential and where "reasonable access" would be denied, such as a small landlocked parcel with no alternate access. In this case, a single driveway would be allowed.

THE TREATMENT OF MULTIPLE PROPERTIES UNDER SINGLE OWNERSHIP

Multiple neighboring properties under single ownership will be treated as if they were one parcel. Exemptions to this are leasehold interests in existence before February 13, 1991, and bonafide contracts for sale anytime. Minimum corner clearance measurements may be used where there are small corner properties that are landlocked from having reasonable access either through a side street or their neighbor. Where such properties exist, they may be allowed to have driveways closer to the intersections than are called for within the standards. Under these portions of the regulations, they will usually be required to have restrictive driveway connections such as right-in/right-out. Exhibit 4 is the table of the minimum corner clearance distances.

This summary is not intended to be a substitute for complete knowledge of Rule Chapter 14-97, but is intended as an overview. We highly recommend that you get a copy of Rule Chapter 14-97, available at Florida Department of Transportation Media Center, Maps and Publications Sale at 605 Suwannee Street, M.S. 12, Tallahassee, Florida 32399-0450, telephone (904)488-9220. The cost of this document is $7.00.

WHAT IS AN INTELLIGENT TRANSPORTATION SYSTEM?

Since 1956, road travel has more than tripled to nearly 1.9 trillion vehicle-miles. At the same time, road and street mileage has seen only modest growth: from 1970 to 1985, vehicle population grew 63 percent while road mileage increased 5 percent. In 1987, drivers experienced 2 billion vehicle-hours of delay on urban freeways, a 60% increase from 1984. Studies of the top U.S. cities estimate total economic losses due to congestion at approximately $42 billion per year. Two-thirds of all urban interstate traffic is experiencing severe congestion (defined as travel under 35 mph).

Studies estimate that travel will double to 3.8 trillion vehicle-miles by 2020. If no major improvements are made, there will be about 10 billion vehicle-hours of delay by 2005. The driving population is aging. Today, 1 in 8 drivers is older than 65. By 2020, 1 in 5 drivers (20% of the driving population) will be over 65.

Engineers need to look for ways to increase driver mobility while increasing safety. The National Transportation Policy recognizes these issues by including four strategies to address future surface transportation needs: Build New Capacity; Manage Travel Demand; Increase Operational Efficiency; and Advance New Technologies. One strategy with the potential to effectively provide for increased mobility and safety is advancing new technologies. Collectively, these technologies are known as Intelligent Transportation Systems (ITS), or smart cars and smart highways.

IVHS represents the marriage of the vehicle, the driver and the highway to improve system efficiency and driver safety. There are four elements of ITS:

- Advanced Traffic Management System (ATMS) - Commercial Vehicle Operations (CVO)
- Advanced Traveler Information System (ATIS) - Advanced Vehicle Control System (AVCS)

IVHS shows promise for increased safety: by 2010, they could save an estimated 11,500 lives and prevent 442,000 injuries annually.

Advanced Traffic Management Systems

Much like air traffic controllers at an airport, these systems are intended to monitor, control and manage traffic. ATMS will:

- Work in real-time
- Use algorithms to predict congestion and implement countermeasures
- Use area-wide surveillance and detection to develop optimal solutions
- Coordinate control of freeways and arterials
- Provide rapid response to incidents
- Provide information to individual vehicles
- Be able to cover multiple jurisdictions

ATMS should substantially reduce congestion by reducing delays an estimated 10 to 35 percent. The greatest potential for reduced delay is through improved incident management strategies - one minute saved in clearing an incident reduces the duration of congestion by at least 4 to 5 minutes. ATMS also helps reduce crashes by improving traffic conditions. (Source: Public Roads, U.S. DOT - FHWA, December 1990)

"WHAT ARE THE TECHNIQUES TO IMPROVE TRAFFIC FLOW IN URBAN AREAS?"

Improve Land Use Planning

- Reduce trip generation rate per acre
- Increase number and width of corridors set aside for roads
- Require increased investment by investors

Add or Improve Mass Transit (Extremely expensive)

Build New Roads (Extremely expensive)

Increase Capacity of Existing Roads

- Widen roads (Very expensive)
- Widen intersections only (Expensive)
- Set up ONE-WAY street pairs or networks (Operational complications)
- Upgrade roads by:
    a. new striping
    b. curb and gutter
    c. reduce access points
    d. reduce other side friction
- Upgrade traffic signals by:
    a. re-phasing signals (Comparatively inexpensive)
    b. re-timing signals (Very high benefit/cost ratio)
- Add new signals - carefully or capacity may be reduced
- Remove unwarranted signals (Inexpensive)
- Re-evaluate use of ALL-STOP, STOP, and YIELD signs
- Implement a reversible lane control system (Operational complications)

Improve Incident Management

- Repair signals and signs more expeditiously (Comparatively inexpensive)
- Set up detours if needed more expeditiously
- Advise drivers to avoid individual incidents by:
    a. public radio broadcasts
    b. variable message signs
    c. CCTV monitoring of major intersections and corridors
- Remove/tow debris more expeditiously
- Prevent incidents from being visible by:
    a. creating visual barriers in freeway medians
    b. curtaining off individual incidents
- Move violators away from other traffic for ticketing

Modify Drive Behavior

- Educate drivers:
    a. driving school
    b. license test
        . public service broadcasts
        . newspaper articles

- Ticket violators
- Encourage car-pooling
- Stagger working hours
- Encourage use of mass transit
- Encourage use of alternate private transport:
    a. walking
    b. bicycling
    c. motorbiking
- Encourage living closer to work
- Encourage businesses to locate near residences

"HOW DO 'PEDESTRIAN' SIGNALS WORK?"

A pedestrian signal allows a safe way for pedestrians to cross the street at signalized intersections. The pedestrian signal, when activated, provides time for the pedestrian to enter the street on the steady "WALK" signal and finish crossing the street on the flashing "DONT WALK" SIGNAL. The pedestrian signal is activated by a pedestrian detector push-button, which causes the controller to operate a pre-programmed timed sequence of steady "WALK" and flashing "DONT WALK" indications.

Pedestrian signal indications consist of "WALK" and "DONT WALK" signals or international symbols displaying a person walking for the "WALK" indication and a hand for the "DONT WALK" indication. The "WALK" or person walking symbol is displayed in white and the "DONT WALK" or hand symbol is displayed in Portland orange.

The pedestrian signal sequence begins when the "WALK" indication is illuminated. This sequence should be at least 4 to 7 seconds long and allow enough time to leave the curb and begin crossing the street before the clearance interval begins. At locations where large numbers of pedestrians are crossing, a longer "WALK" interval may be warranted.

The pedestrian clearance interval consists of a flashing "DONT WALK" indication. During this interval the pedestrian should complete his crossing, however; he should not begin crossing on the flashing "DONT WALK" signal. The clearance interval timing is based on the street width divided by 4 feet per second walking time. If elderly pedestrians are using the crossing it is recommended that the walk speed be reduced to 3.5 feet per second. The distance is measured across the street: from the curb on the near side to the center of the last lane on the far side of the street.

The "DONT WALK" indication, steadily illuminated, means that a pedestrian should not enter the street in the direction of the pedestrian signal.

The design requirements for a pedestrian signal require that a pedestrian signal be mounted at least 8 feet, but no higher than 10 feet, above the sidewalk. The pedestrian signal shall be so positioned and adjusted as to provide maximum visibility to the pedestrian. The pedestrian detector push-button is usually found on the pole under the pedestrian signal head that faces the crossing direction. A sign shall be mounted above the detector unit explaining its purpose and the positioning of the push-button should clearly indicate which crosswalk signal is activated by each push-button.

WARNING-Both pedestrians and drivers must be particularly alert while pedestrians are crossing, especially when "Right turn on Red" movements are allowed.

WHAT ARE TRAFFIC ENGINEERS DOING TO HELP OLDER DRIVERS?

BACKGROUND

The increasing needs of older road users are becoming more apparent as a greater proportion of our nation's motorists fall into the 65 or older age group. The natural aging process results in a steady decrease in the abilities needed to perform the driving task. The effect of aging upon vision, hearing, coordination, range of movement, strength, attentiveness and response time have been well documented through research.

Concern over how these limitations affect motorists ultimately resulted in the preparation of the Transportation Research Board's Special Report 218, "Transportation in an Aging Society," in 1988. This report summarizes mobility concerns, the problems older drivers have with vehicle operation, and current highway design deficiencies related to older driver abilities. The report presents recommendations for corrective improvements in the following areas:

1. Roadway design and operation.
2. Traffic control devices (signs, signals and markings).
3. Vehicle safety.
4. Driver screening and licensing.
5. Vision screening.
6. Alternative means of transportation.

Implementation of these recommendations would improve the mobility and safety of older persons, and most of the improvements would benefit all age groups.

FHWA FOLLOW-UP

The Federal Highway Administration supported the TRB's recommendations and developed an action plan to implement the highway-related recommendations of the report. Their "Action Plan for Older Persons," dated February 1989, presented strategies for the following:

1. Highway safety data needs.
2. Traffic control device improvements.
3. Roadway design improvements.
4. Pedestrian improvements.
5. Older person awareness training.

RECOMMENDATIONS

The Florida Department of Transportation (FDOT) will prepare recommendations on specific engineering enhancements to meet the requirements of the older road-user. Concurrent with this effort, the FDOT will be identifying locations and facility types on which to use these enhancements.

Specific design improvements to benefit the older road-user may include:

Improved signing - Increased letter size, retroreflectivity, better placement, multiple and mid-block signing, trailblazing and use of symbols.

Improved pavement marking and delineation - Size of markings, use of edge and centerlines on low volume roads, improved maintenance and inspection, more pavement arrows and words.

Improvements to traffic signals - Larger signal faces, better located within field of view, longer walk phase for pedestrian signals, improved maintenance.

Improved sight distance - For stopping, decision making, intersections, and clear sight line.

Improved intersection configurations - Simplify designs, provide protected left turns, grade separations for very high volumes with confusing movements.

Improved roadway designs - For better channelization, increase use of medians, minimize hazards and unexpected obstacles, eliminate grade crossings.

Improved pedestrian crossings - Provide refuge islands, utilize high visibility crossing pavement markings, re-evaluate pedestrian walk speeds.

Improved roadway lighting - Reduce headlight glare with glare screens and open graded asphalt at pedestrian crossings, interchanges, intersections and mainlines.

These representative design improvements have been proven to benefit the older road-user. The FDOT also recommends that the Department of Highway Safety and Motor Vehicles periodically test all road users on traffic control devices since technology and regulations can and do change.

WHAT ARE THE DISTINCTIONS AMONG ARTERIAL, COLLECTOR AND LOCAL ROADS?

Travellers have two basic needs for roadways: (1) to travel efficiently from origin to destination and (2) for access to the roadway system. Accordingly, roadways have two primary functions: (1) to carry heavy volumes of traffic at high rates of speed, and (2) to provide access to land. The corresponding facilities are known as arterial roads, and local roads, respectively. Since traffic volumes on arterial roads are normally heavy, the main function of an arterial road is to serve an efficient network supporting high-speed travel and provide capacity to maintain adequate travel speeds.

These two functions, traffic service and land access, are incompatible. A roadway that serves one function cannot serve the other function effectively. Heavy volumes and high-speed traffic on local roads disrupt residential settings, subject pedestrians and pedalcyclists to hazards, and conflict with the safety and ease of land access. These effects counteract the purpose of local roads. Similarly, slow traffic operations caused by points of land access disrupt the traffic flow, reduce arterial speeds, increase crash potential, and reduce traffic-carrying capabilities. These effects degrade traffic service, increase congestion, and counteract the purpose of arterial roads. Also, degradation of arterial function can cause traffic to seek short-cuts on local streets by speeding through neighborhoods; defeating the purpose of local roads.

Since the two primary functions of roadways are incompatible, a third class of roadway is needed to serve as an interface between the local and arterial. These are collector roads, which collect traffic from the local roads and intercept the arterial roads at locations spaced to minimize disruptions.

A leading consideration associated with functionally classified roadways is to overcome the popular misconception that any roadway can serve multiple functions. Multiple functions result in wasteful consumption of energy, transport time, and in allowing concessions that are irreversible. Because of these functional incompatibilities, it is essential to recognize and preserve the functional integrity of arterial, collector and local roads, not just for now, but also for future generations.

WHAT IS ISTEA?

The term ISTEA (pronounced Ice Tea) refers to the "Intermodal Surface Transportation Efficiency Act of 1991. This law was signed by President Bush on December 18, 1991. This important bill provides for the renewal of our surface transportation programs to address the changing needs for America's future. It will create jobs, reduce congestion and rebuild our infrastructure.

ISTEA will provide $155 billion for highways, highway safety and mass transportation for the next 6 years (FY 1992-1997). The purpose of the Act is given in its statement of policy: "To develop a National Intermodal Transportation System that is economically efficient, environmentally sound, provides the foundation for the Nation to compete in the global economy and will move people and goods in an energy efficient manner."

Some of the major features include:

- A National Highway System (NHS), consisting primarily of existing Interstate routes. A portion of the Primary System is established to focus Federal resources on roads that are the most important to interstate travel and national defense, roads that connect with other modes of transportation, and are essential for international commerce.

- State and local governments are given more flexibility in determining transportation solutions, whether transit or highways. This will provide the tools for enhanced planning and management systems to guide them in making the best choices.

- New technologies, such as Intelligent Transportation System (ITS) and prototype magnetic levitation systems (MAGLEV) are funded to push the Nation forward into thinking of new approaches in providing 21st Century transportation.

- The private sector is tapped as a source for funding transportation improvements. Restrictions on the use of Federal funds for toll roads have been relaxed and private entities may even own such facilities.

- The Act continues discretionary and formula funds for mass transit.

- Highway funds are available for activities that enhance the environment, such as wetland banking, mitigation of damage to wildlife habitat, historic sites, activities that contribute to meeting air quality standards, a wide range of bicycle and pedestrian projects, and highway beautification.

- Highway safety is further enhanced by a new program to encourage the use of safety belts and motorcycle helmets.

- State uniformity in vehicle registration and fuel tax reporting is required. This will ease the record keeping and reporting burden on businesses and contribute substantially to increased productivity of the truck and bus industry.

WHAT BENEFITS DO TRANSPORTATION ENGINEERS RECEIVE FROM WORKSHOPS AND PROFESSIONAL MEETINGS?

The transportation profession has been in a state of change, especially since the introduction of microcomputers. Transportation analysis techniques are continuously being refined and improved as more studies and data become available. The following manuals, handbooks and related software, used by transportation professionals, undergo frequent updating:

- Highway Capacity Manual (HCM) and Software by the Transportation Research Board

- Manual On Uniform Traffic Control Devices (MUTCD) by the U.S. Department of Transportation

- Trip Generation Manual and Related Software by the Institute of Transportation Engineers

- Parking Generation Manual by the Institute of Transportation Engineers

- Manual Of Uniform Minimum Standards for Design, Construction and Maintenance of Streets and Highways (Green Book) by the Florida Department of Transportation

- A Policy On Geometric Design of Highways and Streets by the American Association of State Highway and Transportation Officials (AASHTO)

- Level Of Service Manual by the Florida Department of Transportation

- Bikeway Facilities Planning and Design Manual by the Florida Department of Transportation

Workshops provide transportation professionals with updates of analysis techniques. Meetings such as those held by the Institute of Transportation Engineers provide a forum for engineers and planners to exchange information. The Institute of Transportation Engineers (ITE) is made up of more than 11,000 transportation engineers and planners in over 70 countries. These transportation professionals are responsible for the safe and efficient movement of people and goods on streets, highways and transit systems. Since 1930 the Institute has been providing transportation professionals with programs and resources to help them meet those responsibilities. Institute programs and resources include professional development seminars; technical reports; a monthly journal; local, regional and international meetings; and other forums for the exchange of opinion, ideas, techniques, and research.

Members of the Florida Section of ITE meet three times each year to share and discuss information on various transportation topics. Technical committees include:

- Access Management
- Growth Management
- Residential Traffic Control
- Traffic Information Program Series (TIPS)

WHAT IS THE JUSTIFICATION FOR A LEFT TURN ARROW?

LEFT TURN SIGNAL PHASING

Left turn signal phases facilitate left turning traffic and usually improve the safety of the intersection for left turning vehicles. However, this is done at the expense of the amount of green time available for through traffic and will usually reduce the capacity of the intersection. Left turn arrows also result in longer cycle lengths which will in turn have a detrimental effect by increasing stops and delays. Pedestrian delays may be increased and due to the increased delay, pedestrians may elect to ignore the pedestrian signal.

While phases for protected left turning vehicles are the most popular and most often added phases, other methods of handling left turn conflicts should be considered first. Potential solutions include prohibited left turns and geometric improvements.

LEFT TURN PHASE CRITERIA

The left turn phase criteria suggested below are a combination of left turning phasing used in several States in the United States and the result of considerable research and study. These warrants are not mandated by the Manual on Uniform Traffic Control Devices (MUTCD) and are provided for information purposes only. Suggested warrants are as follows:

Volumes - Consider left turn phasing when the product of left turning and opposing volumes during peak hours exceed 100,000 on a four lane street, or 50,000 on a two lane street (1 approach lane). Also, the left turn volume for 2 or more approach lanes should be greater than 2 vehicles per cycle during the peak hour period. Volumes meeting these levels indicate that a left turn phase may be justified and further study of the intersection is recommended.

Delay - Consider installing left turn phasing if a left turn total delay of 2 vehicle hours or more occur in a peak hour on a critical approach. Also, there should be a minimum left turn volume of greater than 2 vehicles per cycle during peak hour, and the average delay for left turning vehicle should be at least 35 seconds.

Crash Experience - Install left turn phasing if the critical number of left turn crashes has occurred. For one approach, the critical number is 4 left turn crashes in one year, or 6 in two years. For both approaches, the critical number is 6 left turn crashes in one year, or 10 in 2 years.

PROTECTED/PERMITTED LEFT TURN PHASING

Protected/permitted left turn phasing is a left turn movement of traffic at a signalized intersection having a separate left turn phase in the signal cycle to provide a protected green arrow interval, as well as nonprotected circular green interval. Use of the protected/permitted left turn phasing technique is based on the assumption that the need for a protected left turn interval has been established. One of the basic precepts of the protected/permitted left turn phasing, is that the protected green arrow is displayed only when needed in a traffic demand condition. It is therefore emphasized that the protected/permitted left turn phasing technique is an efficient concept as opposed to a crash reduction concept although it will probably offer safer operation than permissive only operation.

PROTECTED ONLY LEFT TURN PHASING

When a separate interval is provided to accommodate a left turn without conflicting traffic, and left turns are prohibited during the rest of the cycle, protected only left turn phasing occurs. Although the MUTCD provides no left turn phasing warrants, the traffic control device handbook offers suggested guidelines for separate left turn phasing.

UNPROTECTED LEFT TURN PHASING

Unprotected left turn phasing occurs when an exclusive phase is not provided for left turn vehicles. Left turns are permitted to occur through gaps in the opposing traffic flow. Separate left turn lanes may or may not be provided.

WHAT DOES A DRIVER DO WHEN APPROACHING A MALFUNCTING TRAFFIC SIGNAL?

Florida Statutes, Section 316.1235, states: “The driver of a vehicle approaching an intersection in which the traffic lights are inoperative shall stop in the manner indicated in s. 316.123(2) for approaching a stop intersection.” This condition of inoperative traffic lights causes the intersection to be treated as an “all-way” stop.

Florida Statutes, Section 316.123(2)(a) states:

(2)(a) “Except when directed to proceed by a police officer or traffic control signal, every driver of a vehicle approaching a stop intersection indicated by a STOP sign shall stop at a clearly marked stop line, but if none, before entering the crosswalk on the near side of the intersection or, if none, then at the point nearest the intersecting roadway where the driver has a view of approaching traffic on the intersecting roadway before entering the intersection. After having stopped, the driver shall yield the right-of-way to any vehicle which has entered the intersection from another highway or which is approaching so closely on said highway as to constitute an immediate hazard during the time when the driver is moving across or within the intersection.”

Florida Statutes, Section 316.123(2)(b) states:

(b) “At a four-way stop intersection, the driver of the first vehicle to stop at the intersection shall be the first to proceed. If two or more vehicles reach the four-way stop intersection at the same time, the driver of the vehicle on the left shall yield the right-of-way to the vehicle on the right.” Report the traffic signal malfunction to police as soon as possible.

WHAT IS THE DIFFERENCE BETWEEN THE WHITE AND YELLOW SPEED SIGNS?

Regulatory Speed Limit signs are made with a black message on a white background and Speed Advisory signs are made with a black message on a yellow background.

Regulatory signs such as Speed Limit signs are used to impose legal restrictions that apply to certain locations and restrictions are not enforceable without these signs.

Warning signs are used to call attention to hazardous conditions, actual or potential, which otherwise would not be readily apparent such as a Speed Advisory sign around a curve. The established advisory speed at a curve is based on the safe and comfortable speed for the driver.

For more information on Traffic Control Signs visit the sites below:

"Manual on Uniform Traffic Control Devices" (MUTCD) by the U.S. Department of Transportation web site:
http://mutcd.fhwa.dot.gov/

The "Manual of Traffic Signs" web site:
http://members.aol.com/rcmoeur/signman.html

WHAT IS METRICATION?

Metrication is the process of conversion to the metric system. This process has begun in the U.S. and will be totally established by 1996. The conversion applies to all FHWA manuals, documents, publications, reporting and construction contracts. All programs authorized under titles 23 and 49, U.S.Code, and related highway acts shall be converted to metric. The conversion will be mandatory, not voluntary as in the past, for all procurements, grants and other business-related activities, except to the extent that such conversion is impractical or is likely to cause significant inefficiencies or loss of markets to U.S. firms.

Measurement	Multiply By	To Obtain
Acres (Area)	0.4047	Hectares
Acres (Area)	4047.0000	Square Meters
Centigrade (Temperature)	(oCx9/5)+32	Fahrenheit
Centimeters (Length)	10.0000	Millimeters
Centimeters (Length)	0.3937	Inches
Cubic Feet (Volume)	0.02832	Cubic Meters
Cubic Meters (Volume)	35.314	Cubic Feet
Cubic Yards (Volume)	0.7646	Cubic Meters
Cubic Meters (Volume)	1.3079	Cubic Yards
Fahrenheit (Temperature)	(oF-32)x1.8	Centigrade
Feet (Length)	0.3048	Meters
Feet (Length)	30.4800	Centimeters
Gallons (U.S.) (Volume)	3.785	Liters
Grams (Weight)	0.03527	Ounces
Grams (Weight)	453.5900	Pounds
Hectares (Area)	2.571	Acres
Inches (Length)	25.40	Millimeters
Inches (Length)	2.540	Centimeters
Inches (Length)	0.2540	Meters
Kilograms (Weight)	2.2046	Pounds
Kilograms (Weight)	35.2736	Ounces
Kilometers (Length)	0.6214	Miles
Kilometers Per Hour (Speed)	0.6214	Miles Per Hour
Kilometers Per Hour (Speed)	0.9113	Feet Per Second
Liters (Volume)	1.0567	Quarts
Liters (Volume)	0.2642	Gallons (U.S)
Meters (Length)	100.0000	Centimeters
Meters (Length)	1000.0000	Millimeters
Meters (Length)	3.2808	Feet
Meters (Length)	1.0936	Yards
Metric Tons (Weight)	0.98421	English Tons
Miles (Length)	1.6094	Kilometers
Miles Per Hour (Speed)	1.6093	Kilometers p/Hour
Milligrams (Weight)	0.0010	Grams
Millimeters (Length)	0.1000	Centimeters
Millimeters (Length)	0.0010	Meters
Ounces (Weight)	28.35	Grams
Pounds (Weight)	0.4536	Kilograms
Square Meters (Area)	10.764	Square Feet
Square Miles (Area)	2.590	Square Kilometers
Yards (Length)	91.44	Centimeters
Yards (Length)	0.9144	Meters

WHAT ACRONYMS ARE USED FOR INTELLIGENT TRANSPORTATION SYSTEM (ITS)?

ADIS	Advanced Driver Information Systems, renamed as Advanced Traveler Information Systems.
AHAR	Automatic Highway Advisory Radio.
AI	Artificial Intelligence.
AMTICS	Advanced Mobile Traffic Information and Communication System.
API	Automatic Personal Identification.
APTS	Advanced Public Transportation Systems.
ATIS	Advanced Traveler Information Systems.
ATMS	Advanced Traffic Management Systems.
ATSAC	Automated Traffic Surveillance And Control System (Los Angeles).
AVC	Automatic Vehicle Classification.
AVCS	Advanced Vehicle Control Systems.
AVI	Automatic Vehicle Identification.
AVL	Automatic Vehicle Location.
AVM	Automatic Vehicle Monitoring.
CARIN	Car Information and Navigation System.
CB	Citizen Band.
CCTV	Closed Circuit Television.
CMS	Changeable Message Signs (Also Variable Message Signs, VMS).
COM-TV	Commuter-TV System.
CVI	Commercial Vehicle Identification.
CVO	Commercial Vehicle Operations.
EMS	Emergency Management System.
ETTM	Electronic Toll and Traffic Management.
FLAMINGO	Florida Motorists Information Network for Guidance and Operations (Miami).
FSS	Fixed Satellite Service

.

HAR Highway Advisory Radio.

HELP Heavy Vehicle Electronic License Plate Program.

HOV(S) High Occupancy Vehicle(S).

HUD Head-Up Display.

HVCO Heavy Vehicle & Commercial Operations.

ICS Intelligent Corridor System.

ILD Inductive Loop Detectors.

IMS Incident Management System.

INFORM Information For Motorists.

IRTE Integrated Road Transport Environment.

ITS Intelligent Transportation Systems.

IVSAWS In-Vehicle Safety Advisory and Warning Systems.

LCD Liquid Crystal In-Vehicle Safety Advisory and Warning Systems.

LCD Liquid Crystal Display.

LED Light Emitting Diode.

OBC On-Board Computers.

PATH Program on Advanced Technology for The Highway (California).

PGI Parking Guidance and Information.

PIN Personal Identification Number.

PROMETHEUS Program for European Traffic With Highest Efficiency and Unprecedented Safety.

RACS Road Automobile Communication System (Japan).

RDS Radio Determination Satellite Services.

RTI Road Transport Informatics (European term for IVHS).

TARDIS Traffic And Roads - Drive Integrated System.

TMC Traffic Management Center.

VMS Variable Message Signs (Also Changeable Message Signs).

WHAT DO THOSE TRANSPORTATION AGENCY AND ORGANIZATION ACRONYMS MEAN?

AAA	American Automobile Association
AASHTO	American Association of State Highway & Transportation Officials
APA	American Planning Association
APTA	American Public Transit Association
APWA	American Public Works Association
ASCE	American Society of Civil Engineers
CAC	Citizens Advisory Committee
CALTRANS	California Department of Transportation
CEC	Commission of the European Community
CUTR	Center for Urban Transportation Research (University of S. Florida)
DCA	Department of Community Affairs (Florida)
DHS&MV	Department of Highway Safety & Motor Vehicles (Florida)
DOT	Department of Transportation (U.S. Or Florida)
ECFRPC	East Central Florida Regional Planning Council
FAA	Federal Aviation Administration (U.S. D.O.T.)
FAPA	Florida Chapter - American Planning Association
FBT	Floridians for Better Transportaiton
FDOT	Florida Department Of Transportation
FES	Florida Engineering Society
FHP	Florida Highway Patrol (DHS&MV)
FHWA	Federal Highway Administration (U.S. D.O.T.)
FPZA	Florida Planning & Zoning Association
FRA	Federal Railroad Administration (U.S. D.O.T.)
FSITE	Florida Section - Institute Of Transportation Engineers
FSU	Florida State University
FTA	Federal Transit Administration (Formally UMTA) U.S. D.O.T.

IIHS	Insurance Institute for Highway Safety
ITE	Institute of Transportation Engineers
McTRANS	Microcomputers in Transportation (University of Florida)
MPO	Metropolitan Planning Organization (Local)
NHTSA	National Highway Traffic Safety Administration (U.S. D.O.T.)
NRC	National Research Council
NSC	National Safety Council
SWFRPC	Southwest Florida Regional Planning Council
TAC	Technical Advisory Committee
T2	Technology Transfer (Each State)
TRB	Transportation Research Board (National Research Council)
TRC	Transportation Research Center (U. OF F.)
TTI	Texas Transportation Institute
UCF	University of Central Florida
UF	University of Florida
UMTA	Urban Mass Transit Association (Changed to FTA)
U.S. D.O.T.	United States Department Of Transportation
USF	University of South Florida
UTEC	Urban Traffic Engineers Council (ITE)

WHY ARE TRAFFIC ENGINEERS RELUCTANT TO INSTALL "DEAF CHILD" OR "BLIND CHILD" WARNING SIGNS?

Traffic Engineers are reluctant to install "Deaf Child" or "Blind Child" Warning Signs for individuals for the following reasons:

- A "Deaf Child" or "Blind Child" Sign does not describe to the motorists where the child might be. Most streets within a residential area have children who react in the same way, and each driver must be aware of all children in a neighborhood environment.

- Special signs such as "Deaf Child" or "Blind Child" signs provide parents and children with a false sense of security that their children are safe when playing on or near the street, when playing in the street is actually an unsafe practice.

Many attempts to attract the driver's attention through the use of unique and unusual signs have been made. Some examples include messages warning of children at play, of domestic animals crossing, of special speed limit enforcement, and odd-value advisory safe speed signs. Usually, these unique signs are installed as a result of emotional and political pressure.

Unfortunately, the novelty effect wears off quickly and the signs no longer attract the attention of regular passers-by. They are a target for vandals and souvenir hunters and have a high replacement cost. Unique message signs have no legal meaning or established precedent for use in basic traffic engineering references; their use is discouraged because of both the lack of proven effectiveness and undesirable liability exposure.

Many Traffic Engineers feel that special warning signs are warranted at a location adjacent to a school for the deaf or for the blind and have considerably more merit than those at a location where a deaf or blind person may only cross occasionally.

DO BICYCLE RIDERS HAVE TO FOLLOW THE SAME RULES AS VEHICLE DRIVERS?

Florida Law treats bicycle riders of all ages the same as motor vehicle drivers, except for licensing requirements and laws which by their nature can have no application to bicycles. The law imposes additional requirements on bicyclists, most of which are contained in Section 316.2065, Florida Statutes. The major requirements are summarized below.

When operated on a street, a bicycle is subject to the same rules which apply to all vehicles. A bicyclist must travel in the same direction as other traffic and obey all traffic control signs and signals (stop signs, traffic lights, etc.). Bicyclists also are required to use hand signals when turning or stopping. Except when turning left or passing, bicycles must be kept as close as practicable to the right side of the road (or left if on a one-way street).

Unless signs are posted prohibiting access, Florida law permits bicycles to be ridden on all streets and highways other than interstates, Florida's Turnpike, and similar limited-access roads. Bicycles also are permitted on sidewalks except where prohibited by local ordinance.

Bicycles may not be ridden more than two abreast. When ridden two abreast, bicycles may not impede the normal flow of traffic and must occupy only a single lane.

When on a sidewalk or crosswalk, a bicyclist has the same rights and responsibilities as a pedestrian. However, a bicyclist must yield the right-of-way to a pedestrian and must give an audible signal before overtaking and passing a pedestrian.

When operated between dusk and dawn, a bicycle must be equipped with a headlamp exhibiting a white light visible from at least 500 feet and both a lamp and a reflector on the rear, each exhibiting a red light visible from at least 600 feet. Additional lights and reflectors, both on the bicycle and on the rider, are permitted and encouraged when riding at night in order to increase the visibility of the bicycle for drivers of other vehicles.

All bicycles must be equipped with brakes. The brakes must be capable of stopping a bicycle going 10 miles per hour within 25 feet on dry, level, clear pavement.

The driver of a bicycle must be on a permanent seat and keep at least one hand on the handlebars at all times. Bicyclist may not attach themselves or their bicycles to other vehicles.

The number of people allowed to ride on a bicycle is limited to the number for which the bicycle is designed or equipped. Passengers may not be carried on the handlebars or frame of the bicycle. However, an adult may carry a child in a sling or a backpack while riding a bicycle (this is not recommended for very young infants). Trailers may be attached to bicycles for carrying cargo.

For children under 15 years old, the fine for a violation of a traffic law when operating a bicycle is $17. Bicyclists 15 and older receive the same fines as motor vehicle drivers, but are not assessed points against their driver licenses. Parents or legal guardians may be cited for a non-moving traffic violation for knowingly allowing their minor children to operate a bicycle in violation of the special bicycle regulations contained in Section 316.2065, Florida Statutes.

Source:Traffic Crash Facts

Special Report: Bicycle Crashes In Florida by the Florida Department of Highway Safety and Motor Vehicles, June 1993

WHAT IS PARTNERING?

DEFINITION

Partnering is a structured process through which companies identify the barriers which prevent them from working together most effectively and then develop specific action plans to address those barriers. It is designed to reduce conflict, eliminate claims, improve communication and provide timely resolution of problems.

BACKGROUND

The partnering concept began in the late 1980s with the Army Corps of Engineers in Washington State. Adversarial relationships and increased litigation were key factors which revealed the need for a change in contractor owner relationships. The partnering process was developed to improve this deteriorating relationship. Partnering usually begins with a one or two day workshop for a particular project.

CONCEPT

The basic intent is to bring key managers of the project together to open channels of communication, set common goals and foster a climate in which issues can be openly raised, discussed and jointly settled at the lowest practical level of responsibility. Team members or stakeholders are encouraged to candidly discuss their respective interests in the project and to explore areas of potential conflict and possible ways to resolve them. Workshops are held to create a cooperative team spirit, trust between team members, and a step-by-step joint issue identification and resolution process to minimize the number and extent of disputes.

Partnering is a way of doing business with both the contracting agency and the contractor recognizing that they have common goals which can be achieved through cooperation and open communication. Partnering benefits the construction industry in four areas: quality, cost, time and profit. Past partnering efforts in both the public and private sectors have produced significant accomplishments including cost underruns, crash reduction, reduction of rework, reduction of construction errors, and a high level of personal satisfaction which the contracting parties receive from working together. The partnering concept places an emphasis on cooperation rather than confrontation. The foundation of partnering is teamwork. Both the owner and the contractor's organizations share a common vision and responsibility to build the highest quality product on schedule, safely and within budget.

TEAM COMPOSITION

The composition of the team should include people from each company/entity involved with the project. This should include: (1) the contractor and his major sub-contractors and suppliers, (2) the owner or contracting agency's management, project level inspectors, designers, maintenance, etc., (3) utility company representatives: management and field level, (4) city or county engineers, and (5) any other group or person who has a stake in the outcome of the project.

PARTNERING IN FLORIDA'S DEPARTMENT OF TRANSPORTATION

The Florida Department of Transportation adopted the partnering process in March, 1992. Since then, more than 60 workshops have been held on construction projects. It is at these workshops that the planning, communicating and coordinating begin to happen. This is where project level relationships are established and key concerns and issues first get addressed. At these workshops, names and faces come together. Ideas, and the people proposing them, become real and tangible. The spirit of teamwork and trust begins to develop.

Source: Greg Xanders, P.E., Partnering Coordinator, Florida Department of Transportation, Tallahassee, Florida

WHAT ARE THE VERTICAL CLEARANCE STANDARDS FOR ROADWAYS?

The "Manual of Uniform Minimum Standards for Design, Construction and Maintenance for Streets and Highways" (the Greenbook) by the Florida Department of Transportation (FDOT) provides minimum standards for vertical clearances over roadways. The FDOT manual states:

"Vertical clearances should be adequate for the type of expected traffic. Freeways and major arterials shall have a vertical clearance of at least 16 feet. Other streets and highways should have a clearance of 16 feet unless the provision of a reduced clearance is fully justified by a specific analysis of the situation. Provision for additional clearance (3 to 6 inches) is recommended to allow for future resurfacing."

The FDOT Greenbook, Table 3-2 presents the height of various types of design vehicles as shown:

Design Vehicle Height
Passenger Car 4.25 feet
Single Unit Truck 13.5 feet
Single Unit Bus 13.5 feet
Articulated Bus 10.5 feet
Semi-Trailer 13.5 feet

The FDOT "Design Standards for Design, Construction, Maintenance and Utility Operations on the State Highway System" (Standard Indexes) No. 17727, 2 of 2, provides standards for traffic signal head clearance. The document states that "The vertical clearance to the bottom of a vertical or horizontal vehicular signal head shall not be less than 17 feet 6 inches and the maximum height shall be in accordance with the 2000 Manual on Uniform Traffic Control Devices" (MUTCD).

The MUTCD by the U.S. Department of Transportation provides information related to the placement of "Low Clearance Signs" (W12-2 and W12-2P). The MUTCD states:

Standard:
The Low Clearance (W12-2) sign shall be used to warn road users of clearances less than 12 inches above the statutory maximum vehicle height or minimum structure height.

Guidance:
The actual clearance should be shown on the Low Clearance sign to the nearest 1 inch not exceeding the actual clearance. However, in areas that experience changes in temperature causing frost action, a reduction, not exceeding 3 inches, should be used for this condition. Where the clearance is less than the legal limit, a sign to that effect should be placed at the nearest intersecting road or wide point in the road at which a vehicle can detour or turn around. In the case of an arch or other structure under which the clearance varies greatly, two or more signs should be used as necessary on the structure itself to give information as to the clearances over the entire roadway. Clearances should be evaluated periodically, particularly when resurfacing operations have occurred.

Option:
The Low Clearance sign may be installed on or in advance of the structure. If a sign is placed on the structure, it may be a rectangular shape (W12-2P) with the appropriate legend.

WHAT ARE THE PEDESTRIAN RIGHTS AND RESPONSIBILITIES WHEN WALKING ON OR CROSSING A STREET?

Florida Traffic Laws in the Florida Statutes, Chapter 316.130, indicates that pedestrians must follow traffic control devices and traffic regulations as follows:

1. A pedestrian shall obey the instructions of any official traffic control device specifically applicable to him unless otherwise directed by a police officer.

2. Pedestrians shall be subject to traffic control signals at intersections as provided in section 316.075, but at all other places pedestrians shall be accorded the privileges and be subject to the restrictions stated in this chapter.

3. Where sidewalks are provided, no pedestrian shall, unless required by other circumstances, walk along and upon the portion of a roadway paved for vehicular traffic.

4. Where sidewalks are not provided, any pedestrian walking along and upon a highway shall, when practicable, walk only on the shoulder on the left side of the roadway in relation to the pedestrian's direction of travel, facing traffic which may approach from the opposite direction.

5. No person shall stand in the portion of a roadway paved for vehicular traffic for the purpose of soliciting a ride, employment, or business from the occupant of any vehicle.

6. No person shall stand on or in proximity to a street or highway for the purpose of soliciting the watching or guarding of any vehicle while parked or about to be parked on a street or highway.

7. When traffic control signals are not in place or in operation, the driver of a vehicle shall yield the right of way, slowing down or stopping if need be to so yield, to a pedestrian crossing the roadway within a crosswalk when the pedestrian is upon the half of the roadway upon which the vehicle is traveling or when the pedestrian is approaching so closely from the opposite half of the roadway as to be in danger. Any pedestrian crossing a roadway at a point where a pedestrian tunnel or overhead pedestrian crossing has been provided shall yield the right of way to all vehicles upon the roadway.

8. No pedestrian shall suddenly leave a curb or other place of safety and walk or run into the path of a vehicle which is so close that it is impossible for the driver to yield.

9. Whenever any vehicle is stopped at a marked crosswalk or at any unmarked crosswalk at an intersection to permit a pedestrian to cross the roadway, the driver of any other vehicle approaching from the rear shall not overtake and pass such stopped vehicle.

10. Every pedestrian crossing a roadway at any point other than within a marked crosswalk or within an unmarked crosswalk at an intersection shall yield the right-of-way to all vehicles upon the roadway.

11. Between adjacent intersections at which traffic control signals are in operation, pedestrians shall not cross at any place except in a marked crosswalk.

12. No pedestrian shall, except in a marked crosswalk, cross a roadway at any other place than by a route at right angles to the curb, or by the shortest route to the opposite curb.

13. Pedestrians shall move, whenever practicable, upon the right half of crosswalks.

14. No pedestrian shall cross a roadway intersection diagonally; unless authorized by official traffic control devices, and when authorized to cross diagonally, pedestrians shall cross only in accordance with the official traffic control devices pertaining to such crossing movements.

15. Notwithstanding, other provisions of this chapter, every driver of a vehicle shall exercise due care to avoid colliding with any pedestrian or any person propelling a human-powered vehicle and give warning when necessary and exercise proper precaution upon observing any child or any obviously confused or incapacitated person.
For more Pedestrian regulations see Florida Statutes, 316.130 at the link below:
http://www.flsenate.gov/Statutes/

WHAT IS THE STRATEGIC HIGHWAY RESEARCH PROGRAM (SHRP)?

Background:
The Strategic Highway Research Program (SHRP) is a $150,000,000 product-driven research program financed under the Federal-aid highway program. SHRP was developed in a partnership with the States, American Association of State Highway and Transportation Officials (AASHTO), Transportation Research Board (TRB), industry, and the Federal Highway Administration (FHWA). SHRP includes research in asphalt, concrete and structures, highway operations, and long-term pavement performance.

Congress, fully recognizing that this important program would require resources to implement the findings, authorized $108,000,000 over 6 years for both implementation efforts and for continuation of the Long-Term Pavement Performance Program (LTPP).

Purpose:
The purpose of FHWA's SHRP Products Implementation Program is to encourage and facilitate the application of those research findings that will improve the quality, efficiency, safety, performance, and productivity of our Nation's highway system.

Goals:

- To fully, professionally, and aggressively communicate the SHRP products to the U.S. highway community.
- To develop and implement both short- and long-range marketing strategies for SHRP products by taking full advantage of a variety of existing and innovative technology transfer delivery systems.
- To bring into practice those SHRP products and techniques that are essentially complete and are implementable with minimal training and/or evaluation.
- To promote customer evaluation of those SHRP products that require use of local materials and adaptation to regional, State, or specific industry practices.
- To advance those promising but only partially completed SHRP products/processes through further research, development, test and evaluation, standard setting, and institutional awareness.
- To provide technical and financial assistance to public and private agencies for the purpose of evaluating and ultimately adopting SHRP research products.
- To provide training on the use of SHRP products and initiate activities that will enhance long-range educational efforts.
- To promote activities by standard setting organizations such as AASHTO, American Concrete Institute, American Society for Testing and Materials, etc. that enhance the acceptability and credibility of the SHRP products.

Successful Implementation Operating Principles:

- Established public and private sector partnerships.
- Effective communication among all partners.
- Top executive awareness, understanding, and support of the program - State, Federal, and industry-continued promotion of a highway program that is progressive and technology centered.
- Full and continuous congressional financial support.
- Effective use of Federal-aid highway funds by the States to test and evaluate SHRP products.
- Continues State and industry participation on technical working and expert task groups.
- Proper identification of the scope and integration of post-SHRP findings from national R&D programs sponsored by FHWA, National Cooperative Highway Research Program (NCHRP), U.S. Army Corps of Engineers, Federal Aviation Administration, private sector, etc.
- Commitment of private sector to development, marketing, and support of hardware.

Source: "Implementation Plan-Strategic Highway Research Program Products", June 1993, U.S. Department of Transportation, Federal Highway Administration.

WHAT TYPES OF LAMPS ARE USED FOR ROADWAY LIGHTING?

Background:
The general purpose of roadway lighting is to provide improved visibility for the various users of roadways and associated facilities. The "users" may include vehicle operators (automobiles, trucks, buses, motorcycles, bicycles), pedestrians and other citizens such as merchants and shoppers.

Purpose:
Lighting increases the comfort and safety of the motorist. It has been noted that lighting can be expected to reduce night crashes by about 30 percent.

The objectives of roadway lighting are:

- To supplement vehicle headlights, extending the visibility range beyond their limits both laterally and longitudinally.
- To improve the visibility of roadway features and objects on or near the roadway.
- To delineate the roadway ahead.
- To provide visibility of the environment.
- To reduce the apprehension of those using the roadway.

LIGHT SOURCES:
There are two general types of light sources -- filament lamps and arc-discharge lamps. The main filament lamp is the incandescent lamp. Discharge lamps include fluorescent and high intensity discharge (HID) lamps.

1. Incandescent Lamp
* Filament wire encased in a bulb filled with an inert gas, usually hydrogen or krypton
* Light produced by current passing through filament heating filament to incandescence

2. Fluorescent
* Light produced by fluorescent coating on the inside of the tube. Coating activated by ultraviolet energy which is generated by the arc.

3. Mercury Vapor
* Arc tube inside the outer bulb contains gaseous material and electrodes.
* Light produced from mercury vapor
* Lamps may be clear or coated with phosphors to improve color rendition.

4. Metal Halide
* Light produced by combination of metallic vapors
* Excellent color rendition - Sports & TV broadcast; Short lamp life (16,000 - 18,000 hours life)

5. High Pressure Sodium (Efficient lighting/power)
* Light produced from sodium vapor
* Arc tube filled with sodium mercury and xenon. Xenon used for starting and mercury for color.
* No starting electrode - high voltage pulse used to start arc -- 2500 to 4000 volts (24,000 hours life).

6. Low Pressure Sodium (Causes everything to look like a dirty shade of brown)
* Very efficient
* Monochromatic -- single color only
* Large physical size - light hard to control; Lower lamp life (18,000 hours life)
Source: "Basic Lighting Design", Participants Notebook, Developed by the Office of Design, Florida Department of Transportation.

WHAT IS MAGLEV?

"High-speed magnetically levitated ground transportation (maglev) is a new surface mode of transportation in which vehicles glide above their guideways, suspended, guided, and propelled by magnetic forces. Capable of traveling at speeds of 250 to 300 miles-per-hour or higher, maglev would offer an attractive and convenient alternative for travelers between large urban areas for trips of up to 600 miles. It would also help relieve current and projected air and highway congestion by substituting, for short-haul air trips, thus releasing capacity for more efficient long-haul service at crowded airports, and by diverting a portion of highway trips." The guideway is the physical structure along which MAGLEV vehicles are levitated. Guideway configurations proposed are: T-shaped, U-shaped, Y-shaped, and box-beam. The guideway can be constructed of steel, concrete or aluminum.

The three primary functions basic to MAGLEV technology are:
1. Levitation
2. Propulsion
3. Guidance

In most common designs, magnetic forces are used to perform all three functions, although a nonmagnetic source propulsion could be used.

Levitation Systems
The two principal means of levitation are:

1. Electro Magnetic Suspension (EMS) is an attractive force levitation system whereby electromagnets on the vehicle interact with ferromagnetic rails on the guideway.
2. Electro Dynamic Suspension (EDS) employs magnets on the moving vehicle to induce currents in the guideway. Resulting repulsive force produces stable vehicle support and guidance because the magnetic repulsion increases as the vehicle/guideway gap decreases. However, the vehicle must be equipped with wheels or other forms of support for "takeoff" and "landing" because the EDS will not levitate at speeds below 25 PMH.

Propulsion Systems
The three types of propulsion systems that have been proposed are:

1. "Long-stator" propulsion using an electrically powered linear motor winding in the guideway appears to be the favored option for high-speed MAGLEV systems. It is also the most expensive because of higher guideway construction costs.
2. "Short-stator" propulsion uses a Linear Induction Motor (LIM) winding on board and a passive guideway. While short-stator propulsion reduces guideway costs, the LIM is heavy and reduces vehicle payload capacity, resulting in higher operating costs and lower revenue potential compared to the long-stator propulsion.
3. A nonmagnetic energy source (gas, turbine or turboprop) can be used for propulsion, but this results in a heavy vehicle and reduces operating efficiency.

Guidance Systems
Guidance or steering refers to the sideward forces that are required to make the vehicle follow the guideway. The necessary forces are supplied in a uniform fashion to the suspension forces, either attractive or repulsive. The same magnets on board the vehicle which supply lift, can be used concurrently for guidance; or separate guidance magnets can be used.
Source: "Final Report on the National MAGLEV Initiative" by the U.S. Department of Transportation, September 1993.

DO MARKED CROSSWALKS PROVIDE BETTER PEDESTRIAN SAFETY?

The proper placement and use of marked crosswalks is often discussed by traffic engineers and the public. This information sheet will present facts regarding the use of crosswalks as set forth in Florida Statutes Chapter 316, the Federal Highway Administration (FHWA) "Manual on Uniform Traffic Control Devices" and the Florida Department of Transportation (FDOT) "Florida Design Standards …" (FDS)."

What are the regulations and standards?

Florida Statutes, Chapter 316 - State Uniform Traffic Control, is the statute that applies to all jurisdictions in the state. The basic reference in the statute is the "Manual on Uniform Traffic Control Devices (MUTCD)." The MUTCD is used as the basis for much of the case law that has been made in the United States over the past several decades. Traffic control devices include traffic signals, traffic signs, and painted roadway lines and markings. The MUTCD covers all aspects of the placement, construction and maintenance of every form of approved traffic control device. There are five basic requirements for all traffic control devices.

They must:

1. Fulfill a need.
2. Command attention.
3. Convey a clear and simple meaning.
4. Command respect of road users.
5. Give adequate time for proper response.

The MUTCD emphasizes "uniformity" of traffic control devices. A uniform traffic control device conforms to the regulations for dimensions, color, wording and graphics. The standard device should convey the same meaning at all times. Consistent use of traffic control devices protects the clarity of their messages. The MUTCD also requires that similar situations be treated in the same way.

What is a crosswalk?

Florida Statutes, Chapter 316.003 defines a "crosswalk" as follows:

"(a) That part of a roadway at an intersection included within connections of the lateral lines of the sidewalks on opposite sides of the highway, measured from the curbs or, in the absence of curbs, from the edges of the traversable roadway."

"(b) Any portion of a roadway at an intersection or elsewhere distinctly indicated for pedestrian crossing by lines or other markings on the surface."
Definition (b) above refers to "marked" crosswalks. All other crosswalks are, therefore, "unmarked."

Crosswalks may be either "marked" or "unmarked." Marked crosswalks must be painted white and must be installed in accordance with the MUTCD and the "Florida Design Standards."

How are crosswalks used?

Normally, pedestrians must yield the right-of way to motorists. Florida Statutes require that pedestrians not leave a curb or other safe place such that it is impossible for a motorist to yield. In addition, pedestrians are required to yield to motorists whenever crossing a roadway at any point other than a crosswalk (marked or unmarked). These requirements place the burden of crossing at the appropriate place, and crossing in concert with the traffic signals, upon the pedestrian. Crosswalks are marked mainly to encourage pedestrians to use a particular crossing. Studies conducted on the relative safety of crosswalks support minimal installation of marked crosswalks. Studies conducted in several California locations gave surprising results. Although 2½ times as many people used the marked crosswalks, 6 to 8 times as many crashes occurred in the marked crosswalks.

What causes crashes at marked crosswalks?

Research suggests that marked crosswalks give pedestrians a false sense of security. Pedestrians often step off the curb expecting drivers of vehicles approaching the crosswalk to stop. However, drivers frequently fail to stop and cause a vehicle/pedestrian crash. At all crosswalks, both marked and unmarked, it is the pedestrian's responsibility to be cautious and alert before starting to cross the street.

At crosswalks on multi-lane roadways, another frequent factor in causing crashes involves the driver of a vehicle in the lane nearest the curb stopping for a pedestrian who is waiting to cross or who is already in the crosswalk. The driver of a second vehicle traveling in the lane next to the stopped vehicle tries to pass the stopped vehicle and hits the pedestrian, even though it is illegal for drivers to pass a stopped vehicle at a crosswalk (Chapter 316.130(9)). Pedestrians should be very cautious when walking in a crosswalk, especially when their visibility is limited by vehicles already stopped at the crosswalk.

Where are crosswalks normally marked?

Crosswalks are marked at intersections where there is substantial conflict between vehicle and pedestrian movements, where significant pedestrian concentrations occur, where pedestrians could not otherwise recognize the proper place to cross, and where traffic movements are controlled. For example: approved school crossings and signalized and stop sign controlled intersections where there is significant pedestrian traffic or where one or more crossing locations are prohibited. The foregoing examples follow the philosophy of using marked crosswalks to encourage proper pedestrian crossing behavior. In the first case, school children are encouraged to use a crossing which is normally being monitored. In the second case, pedestrians are encouraged to avoid a prohibited crossing movement. In general, it is not good policy to paint crosswalk markings at mid-block locations where traffic is not controlled by stop signs or traffic signals. Marked crosswalks should only be used where necessary to direct pedestrians along the safest route.

What are special school crosswalks?

Crosswalks should be marked at all intersections on any "suggested route to school", usually available through your local school district. They should also be marked where there is high conflict between vehicles and crossing students, where students are permitted to cross between intersections, or where students could not otherwise cross. The best safety measure for school age children is to educate them on how and where to safely cross the street.
(Adapted from Marked Crosswalks, City of Buenaventura, CA, traffic information brochure series 1994.)

WHAT ARE TRAFFIC CONTROL ISLANDS?

A Traffic-Control Island is a defined area between traffic lanes for control of vehicle movements or for pedestrian refuge. Within an intersection area, a median or an outer separation is considered to be an island. An island may be designated by paint, raised bars, mushroom buttons, curbs, guideposts, pavement edge or other devices and combinations.

CLASSIFICATION AND FUNCTION

Islands frequently serve more than one purpose but may be generally classified according to their main function as follows:

1. Pedestrian Refuge Islands.
2. Traffic Divisional Islands.
3. Traffic Channelizing Islands.

1. PEDESTRIAN REFUGE ISLANDS

The specific function of a refuge island is to provide a place of safety for pedestrians who cannot safely cross the entire roadway width at one time because of changing traffic signals or oncoming traffic.

Refuge Islands are particularly useful at intersections in urban areas where there is a considerable amount of pedestrian traffic and where heavy volumes of vehicular traffic make it difficult and dangerous for pedestrians to cross, such as:

- On multi-lane roadways.
- In large or irregularly shaped intersections.
- At complex signalized intersections to provide a place of safety between different traffic streams to reduce pedestrian conflicts.

2. TRAFFIC DIVISIONAL ISLANDS

The function of divisional islands is to separate opposing traffic; also, they may be used to separate traffic in the same direction, e.g., to divide left-turn traffic in a median lane from the through traffic. Divisional Islands are used to guide traffic around an obstruction within the roadway (such as a bridge pier) or in advance of an intersection to separate opposing traffic. Divisional islands may also be located to prevent overtaking and passing at hazardous points, such as sharp curves or narrow underpasses.

Where Divisional Islands are continuous, they are called medians; the more important functions are as follows:

- Medians provide an insulating area between opposing streams of moving traffic.
- Medians provide protection and control of cross and turning traffic.
- Medians provide a refuge for pedestrians.

3. TRAFFIC CHANNELIZING ISLANDS

The primary function of a Channelizing Island is to control and direct a vehicle operator into the proper channel for his intended route. Channelizing Islands may be installed to bring about an orderly flow of traffic in areas that otherwise would be broad expanses of pavement.

Channelization is particularly helpful at streets intersecting at slanting angles, at 3-leg junctions, and at multileg intersections.

Traffic Channelizing Islands may be provided for separation (and special control) of turning movements.

Florida Statues Chapter 316 - State Uniform Traffic Control provides regulations governing driving on divided highways. Section 316.090(2) states "no vehicle shall be driven over, across, or within any such dividing space, barrier, or section, except through an opening in such physical barrier or dividing section or space or at a crossover or intersection as established, unless specifically authorized by public authority."

SOURCES: 1. Manual on Uniform Traffic Control Devices (MUTCD) by the U.S. D.O.T.
2. Florida Traffic Laws, Chapter 316 - State Uniform Traffic Control

ROUNDABOUTS

A roundabout is a circular intersection similar to the "traffic circle" with which most motorists in this country are familiar. Roundabouts have been used throughout Europe, Australia, Great Britain and several other countries of the world for many years. They have only recently been introduced to America as a means of traffic control, although there are some isolated uses of roundabouts in this country that have been in place for a number of years.

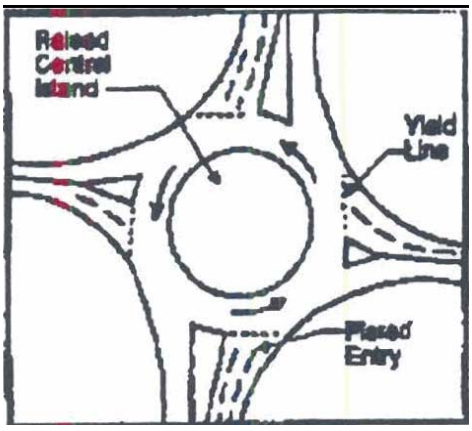
Roundabouts, when installed according to accepted design principles, offer reductions in injury crashes, traffic delays, fuel consumption and air pollution while increasing intersection capacity and enhancing intersection aesthetics. They have also successfully been used to control traffic speeds in residential neighborhoods and are accepted as one of the safest types of intersection design.

The major differences between traffic circles and roundabouts are:

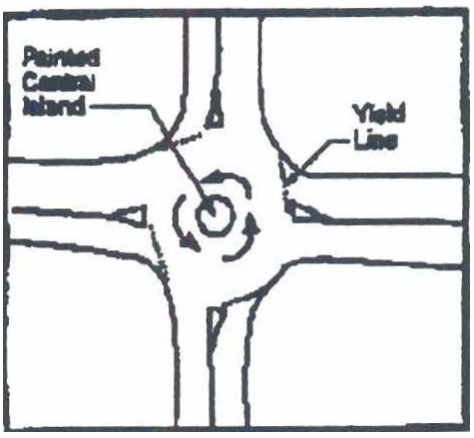
- **Yield at Entry** At roundabouts the entering traffic yields the right-of-way to the circulating traffic. This yield-at-entry rule keeps traffic from locking up and allows free flow movement through the intersection.
- **Deflection** The entry geometry and center island of a roundabout deflect entering traffic to slow the traffic stream and to reinforce the yielding process.
- **Flare** The entry to a roundabout often flares out from one or two lanes to two or three lanes at the yield line to provide increased capacity through the intersection.

There are two basic types of roundabouts (Figure 1):

- **Conventional roundabout** A one-way circular roadway around a curbed central island for circulating traffic, usually with flared approaches to allow multiple vehicle entry.
- **Mini-roundabout** A one-way circular roadway around a flush or slightly raised central island of up to 15 feet in diameter, usually without flared entries.



Conventional Roundabout

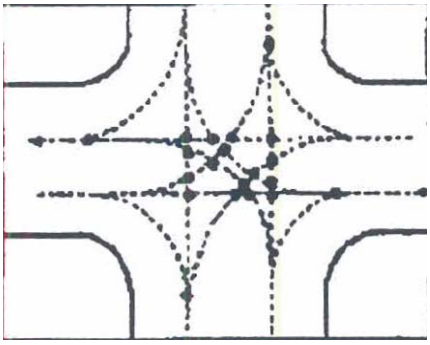


Mini-Roundabout

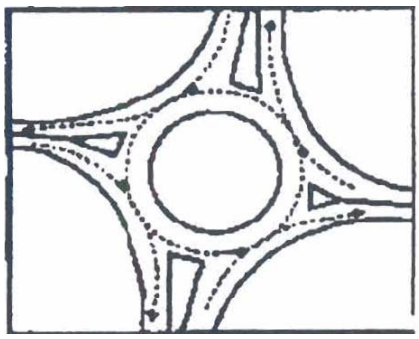
Figure 1

Traffic engineers have several reasons why roundabouts are viable traffic control devices to be considered during the investigation of situations which may require some form of traffic control.

Among the most often considered reasons are:
1. *Safety* - Roundabouts have been shown to reduce fatal and injury crashes by as much as 75% in Australia and 86% in Great Britain. The reduction in crashes is attributed to slower speeds through the intersection and to a reduced number of conflict points (Figure 2).



Standard Intersection



Roundabout Intersection

• = Conflict Point

Figure 2

2. *Low Maintenance* - Roundabouts eliminate maintenance costs associated with traffic signals which amount to $3,000-$5,000 per year per intersection. In addition, the cost of electricity is reduced for a savings of about $1500-$2000 per year per intersection.
3. *Reduced Delay* - By yielding at the entry rather than stopping and waiting for a green light, delay is significantly reduced.
4. *Increased Intersection Capacity* - Intersections with a high volume of left turns are handled by a roundabout rather than by a multi-phased traffic signal.
5. *Reduction of Pollutants* - Reduced delay corresponds to a decrease in fuel consumption and a reduction in air and water pollution.
6. *Aesthetics* - The central island provides an opportunity to provide landscaping. Although landscaping requires maintenance, it also provides a secondary benefit in helping to support adjacent property values.

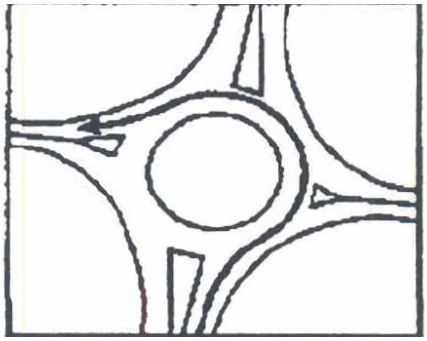
The correct way to drive a roundabout is simple:

- As you approach a roundabout there will be a YIELD sign and a dashed yield limit line. Slow down, watch for pedestrians and bicyclists, and be prepared to stop if necessary. When you enter, yield to circulating traffic on the left, but do not stop if it is clear.

- A conventional roundabout will have ONE WAY signs mounted in the center island. The signs help guide traffic and indicate that you must drive to the right of the center island. Mini-roundabouts may not have one-way signs if the center island is not raised. You must still drive to the right of the domed painted island.

Upon passing the street prior to your exit, turn on your right-turn signal and watch for pedestrians and bicyclists as you exit.

- Left turns are completed by traveling around the central island (Figure 3).



Left Turn

Figure 2

(Adapted from Roundabouts, City of Buenaventura, CA, Traffic Information Brochure Series, 1995)

WHAT ARE TRAFFIC VOLUME COUNTS AND WHAT ARE THEY USED FOR?

Traffic volume counts are basic to all phases of highway development and operation. No other single reference tells an engineer as much about a road as the number of vehicles which use it.

Traffic volumes are needed for street and highway project development, financing considerations, project cost-benefit comparisons, project priority determinations, analyzing, monitoring and controlling traffic movement on roadways, traffic accident statistics, research purposes, street and highway maintenance, public information, highway legislation and other public and private purposes.

Traffic volumes vary from place to place, even along the same highway or roadway segment. Traffic volumes also vary from hour to hour, day to day, month to month and year to year. Both location and time elements must be properly identified and related to one another to develop accurate traffic volume data.

Traffic counts are the major source of traffic data. Traffic counts are very specific in that they only apply to one location and to the time period for which they have been obtained. Some of the major types of traffic counts in general use by engineers are annual counts, peak hour counts, turning movement counts and classification counts.

Annual counts refer to traffic volume counts that are taken over a period of days throughout the year and converted to a single number known to engineers as Average Annual Daily Traffic (AADT). This number is reasonably close to the traffic volume that one could expect to see on any given day of the year. These volume counts are used for a number of engineering, economic and public purposes:

- As a yardstick for evaluating present highway problems
- As a criterion for safety evaluation
- As a basis for planning and design estimates
- As a basis for establishing need and priorities
- As a reference for public information purposes
- As a reference for other traffic volume computations

Peak hour counts are traffic volume counts taken during the time period of the day most likely to produce the highest volumes during any particular 24-hour period. For instance, the most common peak hour counts of interest to engineers are those that occur in the morning and afternoon. These usually occur around the times that most people are traveling to and from work; however, there are times when the peaks occur at less obvious times. These peaks may be due to a large employer having a staggered starting or quitting time, a school or college, or some other out-of-the-ordinary occurrence. The traffic engineer needs to have this information to properly evaluate the impact of this traffic pattern on the roadway network. Among the uses for this type of volume count are:

- As a capacity consideration
- For traffic signal system operations
- As an aid to determining appropriate use of traffic control devices

Turning movement counts are taken at intersections to determine the actual movement of traffic through the intersection. Traffic engineers and others have a number of uses for these counts:

- For roadway planning and alignment studies
- For intersection design
- For traffic signal system design
- For evaluating traffic volume impacts

Classification counts are just a little different from simple traffic volume counts. In addition to determining the numbers of vehicles passing a given point on the roadway, classification counts also separate the traffic stream into its vehicle-type components and/or speed components; that is, how many passenger cars, how many trucks, how many vehicles with trailers, etc., and the variations in speed of the traffic stream. This data is very important to engineers for a variety of reasons:

- As a means of determining percentages of trucks, buses, etc. with respect to the overall traffic stream
- For neighborhood traffic calming studies with respect to "cut-through" traffic
- As an aid in speed studies
- For determining the appropriate use of traffic control devices

The foregoing discussion of traffic volume counts is an introduction to what this data is and why it is important to engineers, planners and the public. Traffic volume count data is one of the basic resources in determining the most efficient use of our limited tax revenues for streets and highways and supporting project selection decisions.

WHAT CAN TRAFFIC ENGINEERS DO TO REDUCE THE NUMBER OF REAR-END CRASHES?

A rear-end crash occurs when the front of a vehicle strikes the rear of a leading vehicle. In the US, each year there are approximately 1.9 million reported rear-end crashes with 1,900 fatal crashes and 600,000 injury crashes. In Florida, each year there are approximately 70,000 rear-end crashes with about 210 fatal crashes and 47,000 injury crashes. The number of rear-end crashes represents about 30% of the total crashes. Rear-end crashes are the most frequent type of crash.

Rear-end crashes are typically caused by driver error when following too closely in congested areas, bad weather, last minute lane changes and unexpected stops by motorists traveling at high speed. Each situation is unique; however, the following are some countermeasures by intersection type:

In order to reduce rear-end crashes at an unsignalized intersection or driveway the Traffic Engineer should consider the need for the following countermeasures:

- Install/improve advanced warning devices (i.e. signs, flashers) and pavement markings.
- Improve pavement condition with friction course overlay, improved drainage, or provide "Slippery When Wet" signs.
- Reduce speed limit on approaches (when appropriate).
- Relocate crosswalk, driveway or entrance road to reduce conflict and/or improve sight distance.
- Install and/or extend left and/or right turn lanes where needed. (Note: too often turn lanes are designed for the minimum requirements. Turn lane length can be a significant factor in rear-end crash frequency).
- Increase curb radii (the curved part of a roadway such as at street corners).
- Make sure that there are appropriate warning devices and/or transitions for lanes.
- Prohibit turns at critical locations.
- Remove median cuts that are in the influence area of the intersection.
- Apply Access Management principals to driveways and median openings. For more details see the FDOT web site: http://www11.myflorida.com/planning/systems/sm/accman/
- Increase enforcement of existing traffic laws.

In order to reduce rear-end crashes at a signalized intersection or driveway the Traffic Engineer should consider the need for the above mentioned countermeasures plus the following where justified:

- Add additional signal heads including near side signals.
- Fine tune signal timings to minimize driver indecisiveness through the dilemma zone (advanced loops) and adjust amber phase or fix short initial interval.
- Provide progression through a set of signalized intersections.
- Install/improve signing and/or marking of pedestrian crosswalks.
- Remove unwarranted signals.
- Consider channelized U-turns through the medians for special case turn problems.
- Provide bus pickup areas that do not interfere with intersection operation.
- Provide advanced street name signs.

A traffic signal can reduce the number of angle crashes at an intersection but may increase the number of rear-end crashes. Good engineering judgment should be used when considering the use of any traffic control device or engineering technique.

New technologies can assist drivers and improve traffic safety. One of the most promising advanced new Intelligent Transportation Systems (ITS) technologies being tested to prevent or decrease the severity of rear-end crashes is called Adaptive Cruise Control (Intelligent Cruise Control). When perfected, this device could slow or stop a vehicle, reducing or eliminating rear-end crashes.

For more details on ITS see the ITS America web site at: http://www.itsa.org/