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A REGIONAL TRANSPORTATION PARTNERSHIP

Balancing Speed Management and Emergency Response Times

A Guide for Transportation Professionals, Policymakers, and First Responders

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Final

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LIST OF ACRONYMS

ADT – Average Daily Traffic
AED – Automated External Defibrillator
AFD – Austin Fire Department
AHJ - Authority Having Jurisdiction
ALS – Advanced Life Support
APCO – Association of Public-Safety Communications Officials
ATSP – Accelerated Transportation Safety Program
ATV – All-Terrain Vehicle
AWWA – American Water Works Association
BLS – Basic Life Support
CAD – Computer-Aided Dispatch
CAAS – Commission on Accreditation of Ambulance Services
Caltrans – California Department of Transportation
CNU – Congress for New Urbanism
CPSE – Center for Public Safety Excellence
DRC – Development Review Committee
EMS – Emergency Medical Services
EPA – United States Environmental Protection Agency
FDM – FDOT Design Manual
FDOT – Florida Department of Transportation
FFPC - Florida Fire Prevention Code
FHWA – Federal Highway Administration
FSRS – Fire Suppression Rating Schedule
GIS – Geographic Information System
GPS – Global Positioning System
ITE – Institute of Transportation Engineers
ISO – Insurance Services Office
LPI – Leading Pedestrian Interval
MSBU – Municipal Services Benefit Unit
NACTO – National Association of City Transportation Officials
NFPA – National Fire Protection Association
OCFRD – Orange County Fire Rescue Department
OCFR – Osceola County Fire Rescue
PPC – Public Protection Classification
RRFB – Rectangular Rapid Flashing Beacon
SCFD – Seminole County Fire Department
SHOT – Special Hazards & Operations Team
VDOT – Virginia Department of Transportation

1 Introduction

Modern speed management techniques were born in the 1960s in the Netherlands as part of a grassroots movement to promote *woonerven* ("living yards"). Since then, these techniques have spread across the world and are increasingly mainstream on roadways in Europe and the U.S. The United States completed its first national traffic calming study around 1980. Two decades later, the Institute of Transportation Engineers (ITE)'s *Traffic Calming: State of the Practice* report presented a toolbox of calming measures along with policy, procedural, and political challenges.[1]

In a similar instance of cultural safety exchange, the success of Sweden's Vision Zero policy in the late 1990s has encouraged Florida municipalities to adopt their own Vision Zero programs in recent years, including MetroPlan Orlando's Vision Zero Central Florida initiative.[2] Speed management plays an essential role in Vision Zero's goal for safer systems with greatly reduced traffic-related injuries and fatalities, as demonstrated by its inclusion in the program's *Engineering Countermeasures Toolkit.*[3]

Since coming to the United States, modern speed management measures have been a point of tension for fire-rescue services. Fire departments have raised concerns that traffic-calming devices—particularly vertical deflection measures such as speed humps—can significantly delay emergency response times. Emergency response times have already been on the rise in the region, particularly in highly urbanized areas, and officials have expressed concerns about the risk further increases would pose to the public.

In response to these concerns, this white paper does the following:

- Examines the Insurance Services Office (ISO) Public Protection Classification (PPC) program, which rates fire protection services and allows property insurers to assess risk.
- Studies how emergency response times factor into the PPC rating, as well as response time requirements per the National Fire Protection Association (NFPA) Standard 1710.
- Assesses guidelines and benchmarks for emergency response used by fire departments in Central Florida, along with how these departments plan for future growth.
- Identifies speed management design guidelines used for different types of speed management techniques and for emergency vehicles at the local, state, and national levels.
- Examines the effects of certain speed management techniques on emergency services, local policies on approved speed management techniques, and thresholds for implementation.
- Reviews case studies from peer agencies and local projects to determine techniques being used and their effects on speeds.
- Investigates different studies on how each type of speed management treatment affects emergency response times and evaluates how different agencies have sought to balance emergency vehicle mobility with traffic-calming needs.
- Gathers input from transportation, government, and emergency response leaders in Central Florida and synthesizes this feedback with input from state and local planners and engineers to offer final recommendations.

The goal of this white paper is to make recommendations regarding the policy framework for and implementation of speed management techniques on emergency response routes. This paper seeks to balance emergency response times with the need to continue implementing speed management countermeasures that meet Vision

Zero goals. This white paper demonstrates that *speed management strategies can be designed and implemented such that they do not inherently conflict with achieving or maintaining an ISO Class 1 rating,* and that *response time concerns can be mitigated through coordinated policy, design standards, and routing practices*. This white paper is an advisory resource; it does not establish new regulatory requirements or design standards. By utilizing the recommendations presented in this white paper, the Central Florida region can prepare for expected growth by preserving its legacy of exemplary emergency response and accreditation while furthering the Vision Zero goals.

2 Emergency Response Considerations

The following section outlines key findings from fire department annual reports, guidelines for emergency response used by local agencies, and an overview of the ISO PPC Rating. Also, this section summarizes the Fire Suppression Rating Schedule (FSRS) along with how response times factor into the rating and the scoring breakdown for Seminole County. Furthermore, response time thresholds from the NFPA Standard 1710 and implications of these findings on speed management implementation are also included in the discussion.

2.1 COUNTY FIRE DEPARTMENT ANNUAL REPORTS

2.1.1 SEMINOLE COUNTY REPORTS

The 2022 Annual Report for the Seminole County Fire Department (SCFD)[4] noted that at the time, it was one of only three County Fire Departments in Florida with an ISO Class 1 rating. In addition to this accreditation, the department has accreditation through the Commission on Accreditation of Ambulance Services (CAAS). The department has four battalions and 20 stations, with one pending, along with 16 engines (with 10 in reserve), 21 rescues (with 10 in reserve), one Special Hazards & Operations Team (SHOT) Unit (with one in reserve), six aerials (with two in reserve), five tankers (with one in reserve), eight woods trucks, five ATVs, and eight marine units. The department has a training center in Longwood, where there was a 55% increase in training hours in 2022 compared to 2021.

Calls received to 9-1-1 increased by 9% from the previous year. An average of 154 9-1-1 calls were answered in a day, and 97% of those were answered within 10 seconds. Of calls to SCFD, 72% are to emergency medical services (EMS) and total EMS responses increased steadily from 2018 to 2022. During that time period there was also an increase in new inspections, existing inspections, fire investigations, and plans review. In 2022, SCFD began utilizing an internal trails response app to find lost or injured hikers and bikers on the trail. This technology has significantly cut search and rescue times on trails from an average of two-three hours to 25-35 minutes.

2.1.2 ORANGE COUNTY REPORTS

The Orange County Fire Rescue Department (OCFRD) is an ISO Class 1 rated department and is accredited by the Center for Public Safety Excellence (CPSE), one of only 5 departments nationwide serving a population of 900,000 or greater who have both. OCFRD's Annual Summary for fiscal year 2024/2025 shows that the department has 45 fire stations, with five planned in the future, along with 37 engine companies, 7 quints (75' aerial apparatus that can also be used as an engine company), 5 truck companies (95' aerial apparatus), 48 advanced life support transport rescue companies, 9 peak activity medic units, 7 tankers, 3 hazmat/technical rescue squads, 2 air/light units, 1 technical rescue support vehicle, 1 rehabilitation unit, and 2 mobile command units. Specialty units include 13 brush/woods trucks, 25 marine rescue boats, and 1 high water rescue vehicle, which are staffed as needed.

Of the 141,781 calls received to 9-1-1, over 80% (115,004) were for EMS. The turnout time for crews responding to EMS calls averages sixty-two seconds and sixty-six seconds for fire incidents. OCFRD average first unit arrival time at the scene of the emergency is five minutes, forty-seven seconds in urban areas and seven minutes, sixteen seconds in rural areas.

The Osceola County Fire Rescue (OCFR) and EMS Department did not have an annual report available at the time this paper was published.

2.2 EMERGENCY RESPONSE GUIDELINES

2.2.1 SEMINOLE COUNTY GUIDELINES

The Incident Management System for Seminole County[6] is a publicly available "living document" intended for command staff and fire service professionals detailing Seminole County incident management capabilities and emergency scene operations. This resource details that when responding to an incident, the first arriving unit is usually the one to relay best routes to other units once arriving at the scene. When the first unit arrives on the scene, the officer shall direct as expeditiously as feasible, whether or not the balance or specific units included within the balance of the assignment continue response as non-emergency, upgrade to emergency, or are canceled. Units departing fire stations on non-emergency response assignments may use traffic control preemption devices which are provided to safely expedite their entry onto roadways. According to this document, emergency vehicles shall not exceed the posted speed limit of a roadway by more than ten miles per hour (mph), and only when weather and road conditions safely permit. Emergency vehicles are required to come to a complete stop at all red lights, stop signs, and uncontrolled railroad crossings.

2.2.2 ORANGE COUNTY GUIDELINES

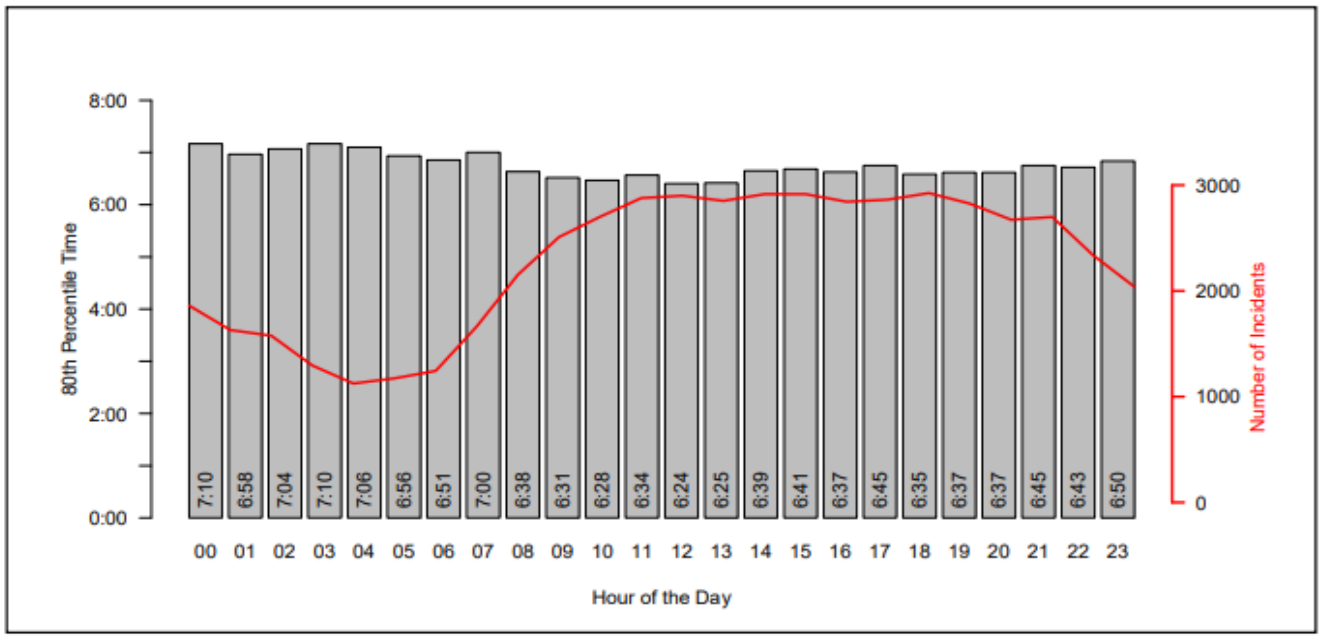
In 2015, a Fire Station Location Study[7] was completed for Orange County, analyzing the current deployment of fire stations in Orange County and potential need for additional ones to meet future growth and development, as a projected 400,000 new residents are expected to move just to unincorporated areas of Orange County in the next 25 years. From 2010 to 2013, the annual incident demand increased by 16%. Seven out of every ten calls were for EMS, and they increased by 40% during that time. Travel times in Orange County were found to be long, but travel times in metropolitan areas of the County are also high: the 90th percentile travel time for first-arriving unit was almost eight minutes, double the NFPA Standard 1710 recommended travel time of four minutes. Travel times in densely populated areas were most problematic, especially in northeast Orange County. **Table 1** demonstrates average, 80th percentile, and 90th percentile travel times for each type of area within the County, along with their corresponding performance standards.

Table 1: Orange County First Arriving Unit Travel Time and Performance Standards, 2013 (minutes)

	Average	80th Percentile	90th Percentile	Travel Time Performance Standard	Total Response Time Performance Standard
Metropolitan	5:05	6:32	7:38	5:20	7:40
Urban	4:50	6:27	7:34	6:00	8:20
Suburban	5:22	6:49	7:56	7:00	9:20
Rural	5:43	7:36	8:55	9:00	11:20
(all)	5:10	6:43	7:53	-	-

In addition, as shown by **Figure 1**, the 80th percentile travel time of first-arriving units does not change by more than 46 seconds for each hour throughout the day despite a large decrease in number of incidents during the late night and early morning hours, as well as an overall decrease in traffic on roadways during those times.

Figure 1: Orange County Travel Time (First Arriving Unit) by Hour of the Day, 2013



Source: Orange County Fire Station Location Study

The findings determined that 15 additional stations are needed over the next 20 years to match growth (four between 2020 and 2025 and the rest after 2025). In the next 10 years, six of the seven station changes are new additions to the current 41 stations; one recommended change is relocating Station 30. Beyond 2025, five of the eight station changes are relocations and three are additional. If the entire set of stations were to be constructed, Orange County would have 55 stations after 2025.

The City of Orlando Fire Design Guidelines[18] mandates (per NFPA 1 criteria) a minimum clear width of 20 feet for fire department vehicle operational access, with a 20-foot by 60-foot operational bay.

2.2.3 OSCEOLA COUNTY GUIDELINES

The Osceola County Comprehensive Plan Fire Rescue Element Data & Analysis[8] acknowledges the current level of service being provided by the OCFR and establishes a terminal level of service goal with buildout of the proposed

2040 roadway network. The current fire districts in the county are almost identical to the fire districts established in 1989. Additionally, the OCFR department currently operates from a 20-year-old building that is community centered. In 2012, 97% of calls were from within the urban growth boundary, with the rest in rural areas, and 79% of calls were for EMS. **Table 2** shows the current level of service and 2040 level of service goals for the county.

Table 2: Osceola County Current and Future Level of Service

Performance Measure	Performance Benchmark	2012 Level of Service %	2040 Level of Service Goal %
Call Handling Time	1:00	22%	90%
First Unit Turn Out Time	1:00	33%	90%
First Unit Travel Time	6:30	58%	70%
Total First Unit Response Time	8:30	40%	70%

To meet 2040 level of service goals, the document estimates that eight of the 15 existing fire stations in the county are either in need of replacement/refurbishment or of possible relocation.

2.3 ISO PPC RATING / FSRS

The ISO created the PPC program to help establish appropriate fire insurance premiums for residential and commercial properties by compiling reliable and up-to-date information about a community's fire-protection services to evaluate risk. This information is collected from municipal fire-protection efforts, then analyzed using the FSRS, and assigned a PPC from 1 to 10, Class 1 is superior and Class 10 doesn't meet minimum criteria.[9]

The FSRS, which is used to determine the PPC, is a manual containing the criteria used in reviewing the fire prevention and fire suppression capabilities of individual communities or fire protection areas. Using nationally accepted standards from the National Fire Protection Association (NFPA), the American Water Works Association (AWWA), and the Association of Public-Safety Communications Officials (APCO) International, as well as other criteria, it measures the major elements of a community's fire protection system and develops the numerical grading for the PPC.[10]

Table 3 shows the items that are evaluated as part of the FSRS and how many points they are worth[11], and **Table 4** shows the point ranges for each PPC.

Figure 2 shows the distribution of PPC grades for fire departments around the U.S. The fire departments for Orange County and Seminole County are among the 517 ISO Class 1 departments in the country.

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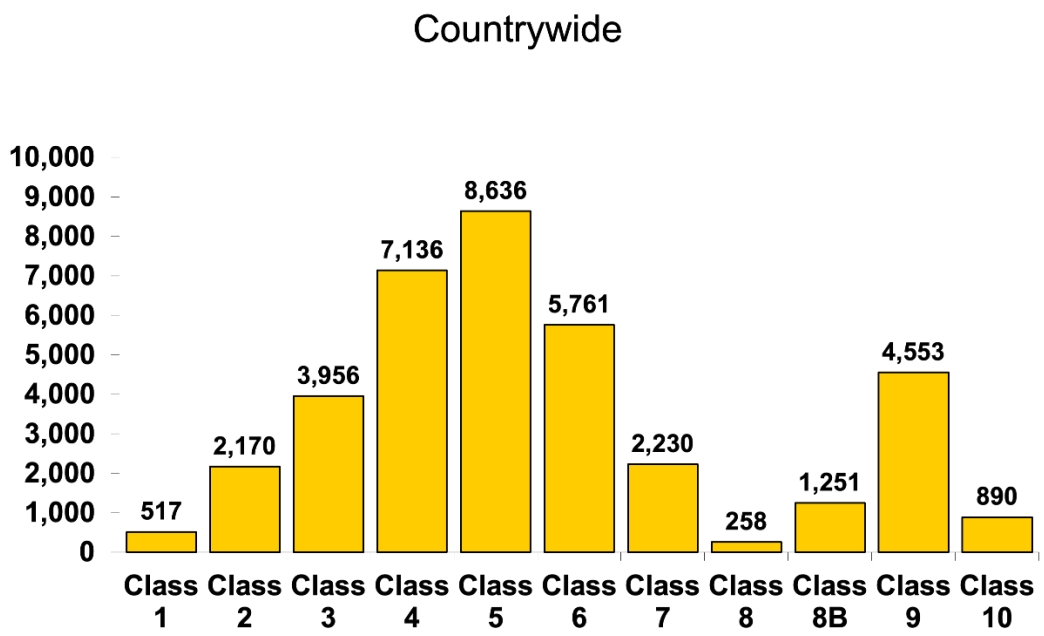
Table 3: Fire Suppression Rating Schedule (FSRS) Point Breakdown

Item	Subitem	Subitem Possible Points	Total Possible Points
Emergency Communications	Emergency Reporting	3	10
	Telecommunicators	4	
	Dispatch Circuits	3	
Fire Department	Engine Companies	6	50
	Reserve Pumpers	0.5	
	Pump Capacity	3	
	Ladder / Service Companies	4	
	Reserve Ladder / Service Trucks	0.5	
	Deployment Analysis	10	
	Personnel	15	
	Training	9	
	Operational Considerations	2	
Water Supply	Supply System	30	40
	Hydrant Size, Type, and Installation	3	
	Hydrant Inspection and Fire Flow Testing	7	
Community Risk Reduction[12]	Fire Prevention Code Adoption and Enforcement	2.2	5.5
	Public Fire Safety Education	2.2	
	Fire Investigation	1.1	
Total			***105.5***

Table 4: PPC Grades and Point Ranges

PPC Grade	Points
1	90.00 or more
2	80.00 to 89.99
3	70.00 to 79.99
4	60.00 to 69.99
5	50.00 to 59.99
6	40.00 to 49.99
7	30.00 to 39.99
8	20.00 to 29.99
9	10.00 to 19.99
10	0.00 to 9.99

Figure 2: Nationwide Distribution of PPC Grades



Source: ISO Mitigation Facts and Figures about PPC Codes around the Country

Out of the 105.5 possible points received for the FSRS, only the 10 points from the deployment analysis may be impacted by emergency response times. The deployment analysis is determined by the percentage of the community within the specified response distances of pumpers (1.5 miles) and ladder/service apparatus (2.5 miles). Thus, as shown by the main methodology and equation used for the deployment analysis, any changes in response time would not directly affect the scoring for this item. As an alternative to this analysis, a fire protection area may use the results of a systemic performance evaluation, which analyzes computer-aided dispatch (CAD) history to demonstrate that the fire department meets the time constraints for initial arriving engineer and initial full-alarm assignment, in accordance with the general criteria in NFPA Standard 1710.

The PPC Summary Report for SCFD in 2021[13] outlines the department's scoring for each item from the FSRS. Out of the possible 10 points for deployment analysis, the department achieved a 7.55-point credit, receiving a 42.05-point credit out of the 50 possible points for the fire department item. SCFD utilized the secondary methodology and their CAD data to determine the score for the deployment analysis. The final score for SCFD was 91.67 points, which was enough to achieve an ISO Class 1 rating as it is above the PPC-1 threshold of 90.0 points.

An article from ISO[14] interviewing different fire chiefs on how their communities were able to achieve an ISO Class 1 rating offers insight on strategies to help communities successfully navigate this process.

- Montgomery, Alabama assembled an ISO committee, developed a relationship with the Community Dispatch Center and Water Works, and purchased records management software.
- Rogers, Arkansas undertook a formal risk assessment, developed a standard of cover, implemented changes in deployment processes, and sought CPSE accreditation.

- Largo, Florida reviewed their past performance, as well as met with other local fire departments (from other cities), and the County 9-1-1 call center and GIS department to find areas where information and collaboration are possible.
- St. Charles, Illinois uncovered areas in need of improvement and created opportunities to improve relationships with key stakeholders while preparing for the FSRS review.

Benefits: Achieving a Class 1 rating gives fire department good leverage during budget time, enhances community support for the fire department in a practical, dollar-and-cents way, and can be used as a community development marketing tool. In communities recently achieving Class 1 status, it has also led to economic benefits by encouraging more development due to lower property insurance rates.

2.4 NATIONAL FIRE PROTECTION AGENCY (NFPA) THRESHOLDS

The NFPA Standard 1710[15] was originally released in 2001. After that release, there have been four revisions, with the most recent in 2020. The Standard provides the minimum requirements for resource deployment for fire suppression, EMS and Special Operations while also addressing firefighter occupational health and safety. It addresses structure fires in three hazard levels: low hazard (residential single-family dwellings), medium hazard (three story garden-style apartments or open-air strip malls), and high hazard (high-rise buildings). **Table 5** shows benchmarks and response objectives per NFPA standards.

As per the standard, the initial full alarm assignment to a low hazard structure fire must be provided for a minimum of 16 members, or 17 if an aerial device is used. For a medium hazard structure fire, deployment must consist of a minimum of 27 members or 28 if an aerial device is used. For a high hazard structure fire, a minimum of 42 members must be deployed, or 43 if an aerial device is used.[16] [17]

Table 5: NFPA Standard 1710 Response Objectives

Benchmarks	Response Objectives
Alarm Answer	15 sec 95% of the time, or 40 sec 99% of the time
Alarm Processing	64 sec 95% of the time, or 106 sec 99% of the time
Turnout – Fire	80 sec
Turnout – EMS	60 sec
First-due Engine (Fire)	240 sec (4 min) 90% of the time
Second-due Engine (Fire)	360 sec (6 min) 90% of the time
Initial Full Alarm – Low / Medium Hazard (Fire)	480 sec (8 min) 90% of the time
Initial Full Alarm – High Hazard (Fire)	610 sec (10 min 10 sec) 90% of the time
First Responder with AED or Higher Capability (EMS)	240 sec (4 min)
ALS Unit Arrival (EMS)	480 sec (8 min)

2.5 TRAVEL TIME IMPLICATION TO ISO PPC RATING AND EMERGENCY RESPONSE

From examination of the PPC rating system, less than 10% of the scoring is potentially impacted by response time. Additionally, the primary method of determining this portion of the scoring does not involve response time, and it is only the alternative method. The alternative method using CAD deployment data also incorporates additional benchmarks and response objectives that are not affected by speed management-related delays along response routes, such as alarm answering and dispatch processing times.

Even though response time does not usually factor into the ISO PPC evaluation, it is essential to meet NFPA Standard 1710 response objectives. Fire departments in the Central Florida region have expressed challenges in meeting these response time objectives, particularly in densely populated urbanized areas. For instance, Orange County in their Fire Station Location Study cited that "travel times in densely populated areas were the most problematic, especially in northeast Orange County". Response times have also increased over time with more population growth. Apart from increased traffic and congestion in these areas, causes listed for inability to meet these goals also include needs to upgrade, add, or relocate fire stations and other fire department infrastructure to support recent growth in the region. Agencies that attended the roundtable articulated specific challenges, which are summarized in the **Stakeholder Outreach Summary** section.

Because emergency response units are generally limited to no more than 10 mph over posted speed limits and must come to a stop at traffic signals displaying a red indication and stop signs, and departments have had recent struggles in meeting response time benchmarks, it is understandable that these agencies are sensitive to adding treatments that could cause more response time delays, despite the fact that it would only affect their department ratings if they utilized the secondary method for the deployment analysis. For this reason, it will be important to develop an approach to speed management implementation that is sensitive to the context of the roadway. Measures being implemented on primary emergency response routes should take delays of emergency vehicles into account and consist of strategies that inflict as few delays on emergency vehicles as possible.

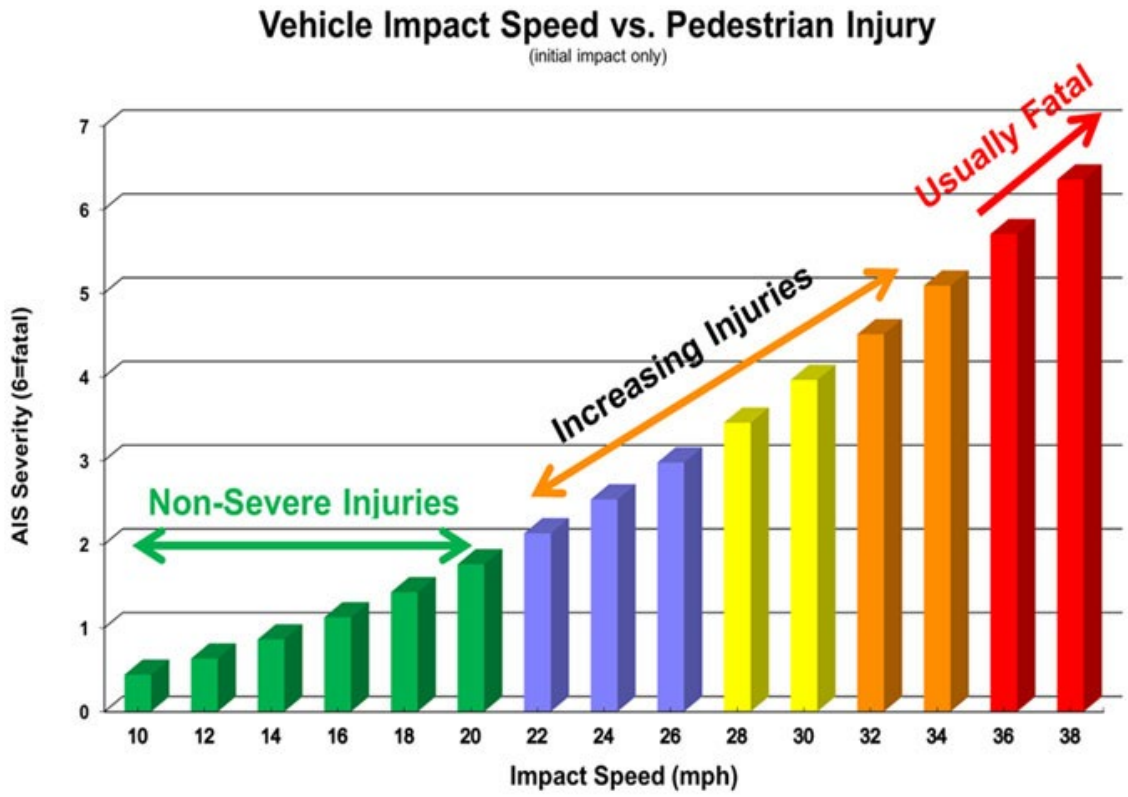
3 Speed Management Considerations

3.1 SPEED MANAGEMENT DESIGN GUIDELINES

NFPA 1 criteria mandates that a minimum clear width of 20 feet for fire department vehicle operational access, with a 20-foot by 60-foot operational bay. The minimum 20-foot clear width is not necessarily required to be paved roadway; shoulders and bicycle lanes are also acceptable. The minimum width of travel access for fire department vehicles is 12 feet, and the minimum interior turning radius at intersections is 25 feet, although it can be less if effective clearance is maintained or if a mountable curb is present. For low-speed roads, raised intersections are listed as an alternative that can slow down regular drivers while also providing adequate emergency vehicle access, as well as shared streets if they create sufficient travel and operational access alternatives.

Traffic-calming measures are used to reduce vehicle speeds, which has a significant effect on the severity of pedestrian injuries from vehicle impacts, as demonstrated in **Figure 3** from the FHWA Traffic Calming ePrimer.[19]

Figure 3: Speed/Pedestrian Injury Severity Correlation



Source: FHWA Traffic Calming ePrimer

Therefore, traffic calming has been an important tool to increase roadway safety and decrease the potential of collisions with severe injuries and fatalities, especially in areas where there are high-usage pedestrian facilities adjacent to the roadway, which in turn leads to a reduction of calls to EMS.

Table 6 shows how different sources separate speed management measures. The VDOT Traffic Calming Guide for Neighborhood Streets[20] also includes "non-intrusive" devices such as community education, community gateways, pavement markings, pole mounted speed display signs, and additional $200 fine signs, but ITE and the FHWA Traffic Calming ePrimer does not consider these measures as "traffic calming." In addition, the FDOT Design Manual (FDM)[21] lists strategies based on roadway context classification and target speed.

Table 6: Speed Management Measure Categories

Resource	Speed Management Measure Categories
Orange County Traffic Calming Toolbox (Local)[22]	• **Pedestrian toolbox treatments:** signs and markings, marked crosswalks, in-street pedestrian crossing signs, rectangular rapid flashing beacons (RRFBs), in-roadway lighting, pedestrian refuges and Z crossings, reduced curb radii, curb extensions, raised crosswalks, raised intersections, and pedestrian hybrid beacons (PHBs) • **Multimodal operations toolbox treatments:** textured pavement, turn restrictions, protected left turns, directional medians, all way stops, pedestrian countdowns, leading pedestrian intervals (LPIs), and new signals • **Speed management toolbox treatments:** speed feedback signs, roundabouts, mini roundabouts, traffic circles, chokers, chicanes, median islands, speed cushions, speed tables, rumble strips, speed pavement markings, optical speed markings, and street trees • **Volume management toolbox treatments:** diverters and half closures • **Street grid management toolbox treatments:** lane striping modifications, lane reassignments, one-way conversions, two-way conversions, and simplified intersections
Florida Greenbook (State)[23]	• **Vertical treatments:** depend upon a change in vertical alignment to cause drivers to slow down • **Horizontal treatments:** use changes in horizontal alignment to slow drivers; often more expensive than vertical deflection but less impacts in emergency responders • **Neighborhood entry control:** including partial street closures and gateway type tools, used to reduce speeds and volume at neighborhood access points • **Diverters:** islands or curbed enclosures preventing certain movements at intersections and reducing speeds and volumes
ITE Traffic Calming Measures (Federal)[24]	• **Vertical deflections:** create a change in the height of the roadway that typically forces a motorist to slow down to maintain an acceptable level of comfort • **Horizontal deflections:** hinder the ability of a motorist to drive in a straight path by creating a horizontal shift in the roadway, reducing speeds • **Street width reductions:** narrow the width of a vehicle travel lane or roadway so a motorist likely needs to slow the vehicle to maintain an acceptable level of comfort and safety • **Routing restrictions:** prevent particular vehicle movements at an intersection and are intended to eliminate some portions of cut-through traffic

Based on the measures listed in these sources, **Table 7** to **Table 11** were created to compile a list of speed management strategies, examples, typical applications, and appropriateness for primary emergency response routes for different measures. Note that less intrusive measures such as signage, signalization, pavement markings, education, and enforcement, may help slow vehicular speeds but are not included in the table due to them not being categorized by FHWA or ITE as "traffic calming." The specific criteria and threshold vary across the region for jurisdictions with an adopted traffic calming program.

It should be noted that those tables all follow the context class information from 2026 FDM. Appropriateness assumes compliance with applicable design standards and early coordination with local fire and EMS departments. The Primary Emergency Route Appropriateness can be interpreted as following:

- **Appropriate**: Suitable for use on primary emergency response routes when designed in coordination with fire and EMS agencies.
- **Conditionally Appropriate**: May be used if geometric deflection is minimized or mountable elements are provided.
- **Generally Not Appropriate**: Likely to create routing or response delays unless removable or emergency-access features are incorporated.

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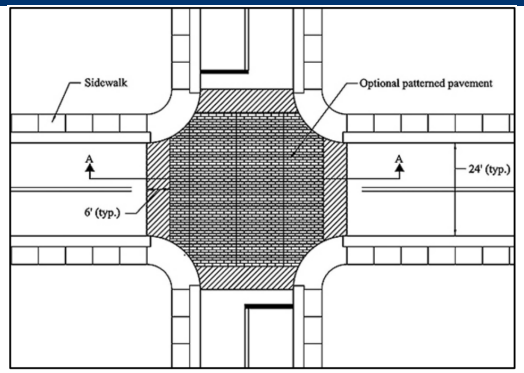
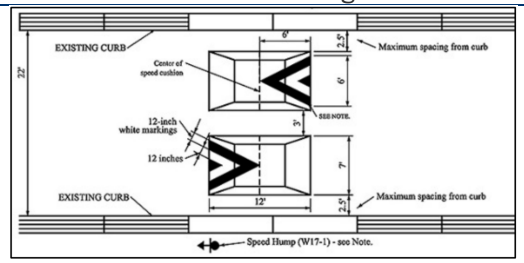
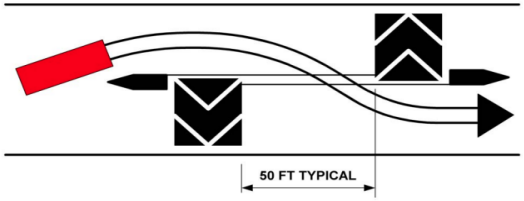
Table 7: List of Speed Management Strategies for Vertical Deflection Measures

Speed Management Strategy	Depiction	Typical Application	Primary Emergency Route Appropriateness
Raised intersections: Flat, raised areas covering an entire intersection with ramps on each approach (speed table covering entire intersection including crosswalks)	 *Source: ITE Traffic Calming Measures*	• Intersections of collector/local/residential streets • Signalized/stop-controlled intersections with high pedestrian crossing demand • Target speed: 30 mph or less • Context class: C2T, C4, C5, C6*	Appropriate
Speed cushions: Two or more raised areas placed laterally across the roadway, with gaps or cutouts allowing vehicles with wide tracks (typically emergency vehicles) and bicycles to pass through with no vertical deflection	 *Source: ITE Traffic Calming Measures*	• Often placed in series (260-500 feet apart) • Local/collector streets • Mid-block locations only • Typically 12-14 feet in length and 7 feet in width, 3-4 inches tall • Target speed: 30 mph or less • Context class: C2T, C4, C5, C6	Appropriate
Offset speed tables: Raised areas placed across the roadway to limit speeds at which vehicles traverse it, separated apart at a distance for emergency vehicles to bypass them by traveling in the opposing traffic lane for a short distance	 *Source: Offset Speed Tables for Reduced Emergency Response Delay*	• Local/collector/some arterials with low volumes • Target speed: 30 mph or less • Context class: C2T, C4, C5, C6	Not Appropriate

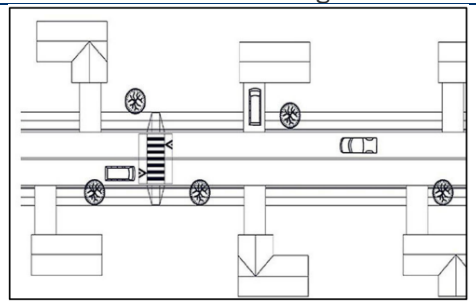
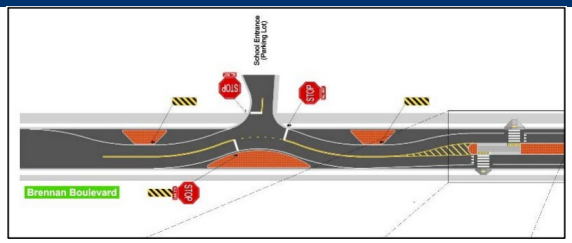
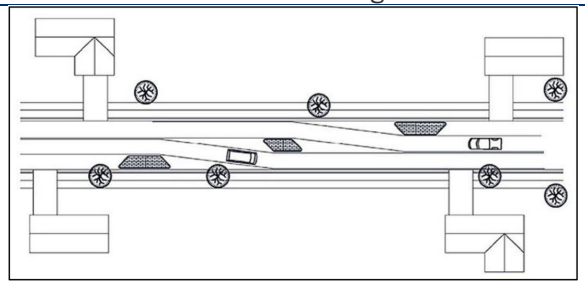
Speed Management Strategy	Depiction	Typical Application	Primary Emergency Route Appropriateness
Speed humps: Elongated mounds in the roadway pavement surface extending across the travel way, typically 3 inches in height and 12-14 feet in length, often placed in series (260-500 feet apart) to limit speeds of vehicles traversing them	 *Source: ITE Traffic Calming Measures*	• Local streets and residential/neighborhood collectors (not used on major roads, bus routes, or primary emergency response routes) • Target speed: 30 mph or less • Context class: C2T, C4, C5, C6	Generally Not Appropriate (speed cushion or table is more appropriate)
Speed tables / raised crosswalks: Raised areas placed across roadway, with a long enough flat top (typically 10 feet) to accommodate wheelbases of most cars, generally producing less delays for emergency vehicles than speed humps	 *Source: ITE Traffic Calming Measures*	• Local/collector/some arterials • Target speed: 35 mph or less (not appropriate for speeds 45 mph or more) • Context class: all*	Conditionally Appropriate

Table 8: List of Speed Management Strategies for Horizontal Deflection Measures

Speed Management Strategy	Depiction	Typical Application	Primary Emergency Route Appropriateness
Chicanes: Series of alternating curves or lane shifts reducing speeds through a slalom effect, can provide additional public spaces (seating, landscaping, etc.)	 *Source: ITE Traffic Calming Measures*	• Typically implemented on residential or urban center roadways • Low volumes on both approaches • Target speed: 35 mph or less • Context class: all	Appropriate
Lateral shifts: Realignments of an otherwise straight street causing lanes to shift in one direction, reducing vehicular speeds	 *Source: ITE Traffic Calming Measures*	• Local/collector/arterial roadways • Target speed: 35 mph or less • Context class: all	Appropriate
Traffic circles: Raised islands placed within unsignalized intersections, around which traffic circulates, reducing speeds at the intersection	 *Source: ITE Traffic Calming Measures*	• Unsignalized intersections • Intersections of local streets (one lane in each direction) • Target speed: 30 mph or less	Conditionally Appropriate

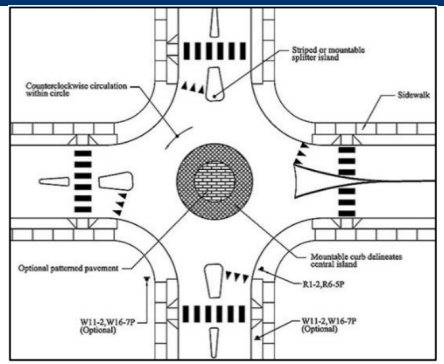
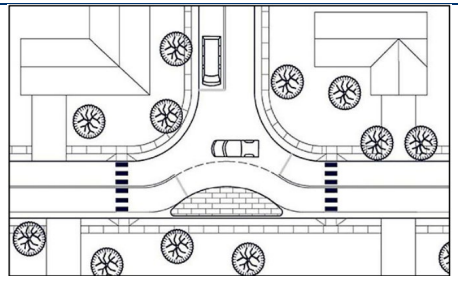
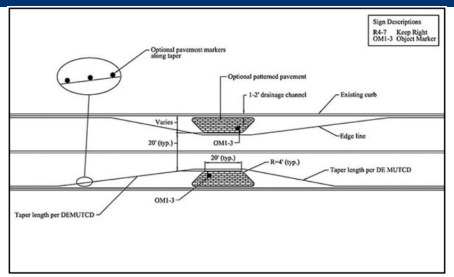
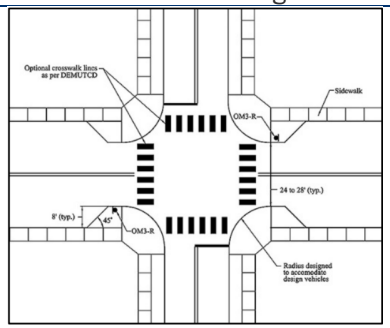
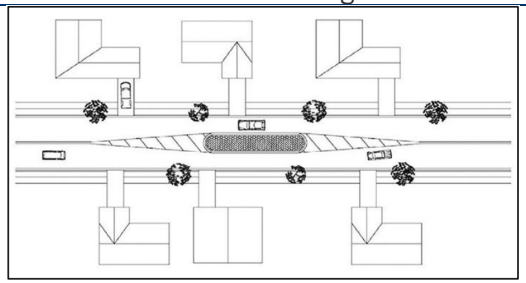
Speed Management Strategy	Depiction	Typical Application	Primary Emergency Route Appropriateness
Mini roundabouts: Raised islands placed within unsignalized intersections, around which traffic circulates, reducing speeds at the intersection (designed according to roundabout design principles, a portion of the center island—the apron--is traversable)	 *Source: ITE Traffic Calming Measures*	• Unsignalized intersections • Local/collector street intersections • Low speed limits • Context class: C2T, C4, C5, C6	Appropriate
Roundabouts: Intersection designs acting as a replacement to signalization or stop control, providing horizontal deflection with an island at the entry point and requiring every vehicle to follow a circuitous path no matter which departure leg of the intersection is the destination (sized to accommodate all large vehicles, with a portion of the center island—the apron—being traversable)	 *Source: ITE Traffic Calming Measures*	• Intersections of arterials/collector streets • Target speed: any urban speed • Context class: all	Appropriate
Realigned intersections: Reconfigurations of intersections with perpendicular angles to have skewed approaches or travel paths through the intersection	 *Source: ITE Traffic Calming Measures*	• Local/collector/subdivision roadway • Target speed: 25 mph or less • Context class: all	Appropriate

Table 9: List of Speed Management Strategies for Street Width Reduction Measures

Speed Management Strategy	Depiction	Typical Application	Primary Emergency Route Appropriateness
Chokers: Narrowing of roadways using curb extensions or roadside islands, creating a sense of enclosure for motorists	 *Source: ITE Traffic Calming Measures*	• Arterial/collector/local roadway • Mid-block locations • Target speed: any • Context class: all	Appropriate (ensure sufficient clear width)
Corner extensions / bulb-outs: Horizontal extensions of the sidewalk resulting in a narrower roadway section and tighter vehicle turn radii	 *Source: ITE Traffic Calming Measures*	• Any street type • Target speed: any • Context class: all*	Appropriate (ensure sufficient turning radii)
Median islands / pedestrian or bicycle refuges: Raised islands located along street centerlines narrowing the travel lanes, creating a sense of enclosure for motorists	 *Source: ITE Traffic Calming Measures*	• Local/collector/arterial roadway, or on approaches to intersections between two-lane roadways • Target speed: any urban speed • Context class: all*	Appropriate (ensure sufficient clear width and radii)

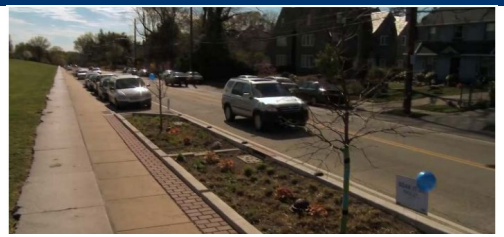
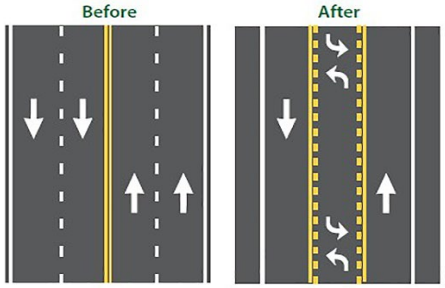
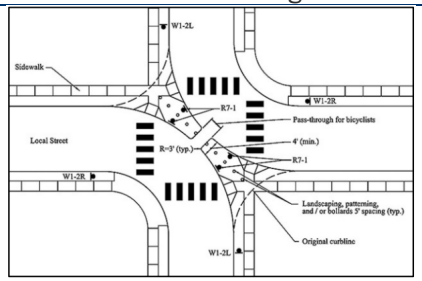
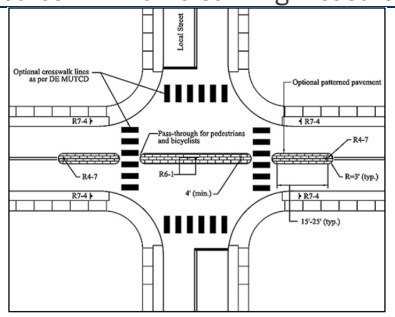
Speed Management Strategy	Depiction	Typical Application	Primary Emergency Route Appropriateness
On-street parking: Can effectively narrow roadway travel lanes by adding side friction to the traffic flow	 *Source: ITE Traffic Calming Measures*	• Nearly all roadway functional classifications • Target speed: 35 mph or less • Context class: all*	Appropriate (ensure sufficient clear width and access to buildings)
Road diet: Conversion of an undivided roadway to a cross-section with fewer or narrower through lanes for vehicles**	 *Source: FHWA Traffic Calming ePrimer*	• Nearly all roadway functional classifications • Target speed: most common urban speeds • Context class: all	Appropriate (ensure sufficient clear width and access to buildings)

Table 10: List of Speed Management Strategies for Routing Restrictions

Speed Management Strategy	Depiction	Typical Application	Primary Emergency Route Appropriateness
Closures: Physical barriers placed across the street to close it in one direction (**half closures**) or completely to through vehicle traffic (**full closures**)	 *Source: ITE Traffic Calming Measures*	• Subdivision/local streets (for half and full closures) • At intersections (for half and full closures) • At midblock locations (for only full closures) • Context class: C2T, C4, C5, C6	Generally Not Appropriate
Diagonal diverters: Physical barriers placed across four-legged intersections, creating two unconnected intersections (cutouts or gaps may be provided for bicyclists)	 *Source: ITE Traffic Calming Measures*	• 4-leg intersections • Subdivision/local/minor collector roadways • Target speed: 25 mph or less • Context class: C2T, C4, C5, C6	Generally Not Appropriate
Median barriers: Raised islands placed through intersections, along the roadway centerline, preventing vehicles from traveling straight through on side streets	 *Source: ITE Traffic Calming Measures*	• Arterial/collector roadways • Target speed: 25 mph or less • Context class: C2T, C4, C5, C6	Generally Not Appropriate

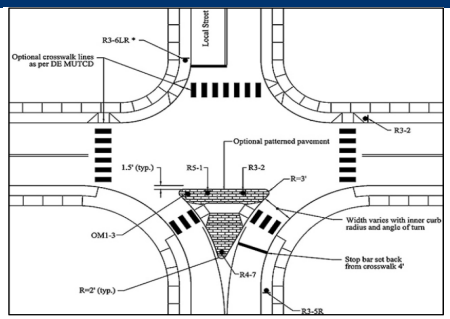
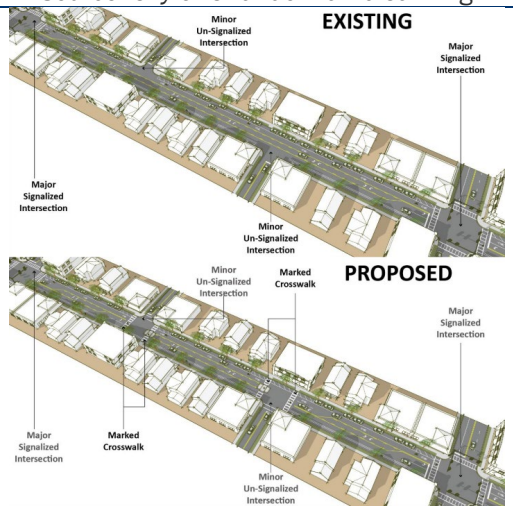
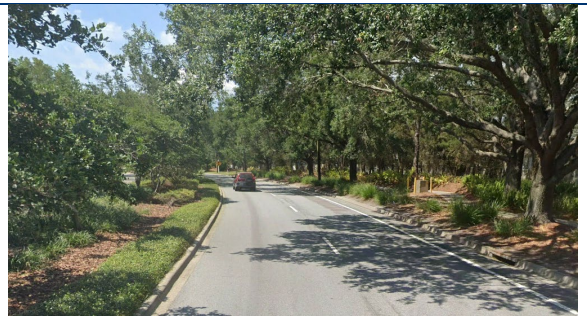
Speed Management Strategy	Depiction	Typical Application	Primary Emergency Route Appropriateness
Forced turn islands: Raised traffic islands (typically triangular) placed at mouths of intersections, blocking certain movements at the approach	 *Source: ITE Traffic Calming Measures*	• Arterial/collector roadways • Target speed: 25 mph or less • Context class: C2T, C4, C5, C6	Generally Not Appropriate

Table 11: List of Speed Management Strategies for Other Measures

Speed Management Strategy	Depiction	Typical Application	Primary Emergency Route Appropriateness
Brick streets: Brick streets use textured, uneven paving surfaces to create visual and physical cues that encourage drivers to reduce speeds and operate more cautiously	 *Source: College Park Community Paper*	• Local/neighborhood streets with low volumes • Target speed: 30 mph or less • Context class: C2T, C4, C5, C6	Not Appropriate
Terminated vistas: Creates enclosure for motorists by providing an enclosed (terminated) view ahead (vista)	 *Source: 2026 FDM*	• Most functional classifications • Target speed: any • Context class: all*	Appropriate

Speed Management Strategy	Depiction	Typical Application	Primary Emergency Route Appropriateness
Shared streets / slow streets: Streets on which space is shared by all users, with priority given to people walking and biking, usually restricted to only local traffic	 *Source: City of Orlando Traffic Calming*	• Low volume streets, typically residential, non-bus route • Target speed: 25 mph or less • Context class: C2T, C4, C5, C6	Conditionally Appropriate
Short blocks: Blocks of 500 feet or less manage speed by limiting driver acceleration distance between intersections, may also create engagement if used in conjunction with marked crosswalks, marking crosswalks at unsignalized intersections can help reinforce presence of short blocks where they already exist	 *Source: 2026 FDM*	• PHBs and RRFBs can help establish shorter block lengths • Most functional classifications • Target speed: any • Context class: all	Appropriate
Street trees: Trees placed close to the roadway used to form a continuous “wall” effect when most effective	 *Source: Google Maps Street View*	• Most functional classifications • Target speed: any • Context class: all	Appropriate

As shown by findings from these sources, most speed management devices are considered appropriate on primary emergency response routes because they incur little to no delays on emergency vehicles. Routing restrictions are deemed to not be appropriate on primary emergency response routes as they can change emergency vehicle routes, unless a removable, breakaway, or mountable element is used to allow for emergency vehicles to drive through the treatment. In addition, speed tables and speed humps are not listed as appropriate on primary emergency response routes due to delays incurred on emergency vehicles, with speed tables being preferred over speed humps as their delays are smaller.

For these vertical deflection measures, two alternatives to speed humps and speed tables have emerged that incur little to no delays on emergency response vehicles: **speed cushions** and **offset speed tables**.

Speed cushions, also called speed lumps, consist of two or more raised and rounded areas placed laterally across a roadway, with gaps for wheels to pass between the cushions. They are designed to allow the wheel tracks of fire vehicles to pass without significant jostling or displacement, allowing these vehicles to maintain speeds like those at which they would travel on the roadway without traffic calming. Compliance by passenger car drivers is often reinforced by having wide cushions in the travel lanes and a narrow cushion along the centerline. Fire-rescue vehicles cross the centerline to straddle the smaller center cushion, while very few passenger cars are observed to do so. Cushions to the outside are wider and function more like speed humps for the passenger cars that stay in their lanes. As a result, tests have shown that on average speed cushions reduce the 85th percentile speed by 25% (or 9 mph), comparable to speed humps, for passenger vehicles. Jurisdictions across the country use different center lump widths, varying from five and a half feet to seven feet in width. Most locations have an approximately six-foot-wide center lump, which can be straddled by fire-rescue vehicles but not passenger cars. The lateral distance between lumps is crucial for fire-rescue vehicles, and gaps of at least one foot must be provided. Tests from La Habra, California[25] found that 1-foot spacing between the lumps resulted in minimal vertical deflection of fire-rescue vehicles. To increase the ease of navigation for fire rescue drivers, a larger wheel gap of two feet was chosen as the optimum design. To minimize driver confusion and emergency vehicle delay as much as possible, a study from King County, Washington[26] recommends the development of a “regional standard” for speed cushions.

Offset speed tables are an alternative to speed cushions, where two speed tables are placed on a roadway with sufficient distance between them to allow for emergency vehicles to weave between them at speeds like the roadway posted speed limit. In Portland, the typical distance between offset speed tables was 50 feet. These tests in Portland[27] showed that fire trucks could pass between the pair of speed tables successfully at 20-30 mph speeds, which greatly reduced delays of these vehicles compared to traditional speed tables.

As mentioned in the VDOT Traffic Calming Guide for Neighborhood Streets (and with some measures included in the Florida Greenbook and FDM), “non-intrusive” devices can be used (and are recommended to be considered first), which offer the advantage that they do not physically constrain vehicle maneuvers and thus are less invasive, hence being desirable for major emergency and bus routes. The VDOT guide recommends that non-intrusive devices and speed cushions be used on streets near fire and rescue services, hospitals, or in areas identified by the local fire and rescue chief as having significant usage by their vehicles. However, these non-intrusive measures are excluded from “traffic calming” by ITE because either they are standard traffic control measures typically used for improving traffic flow and have a secondary benefit for non-motorist safety; they produce only a temporary benefit; they require additional enforcement beyond typical activities; or they have minimal or no measurable effect on vehicle speed or non-motorist safety. However, ITE[28] states that despite their lack of inclusion as “traffic calming,” non-physical measures such as education and enforcement can also be effective as part of traffic-

calming efforts and should continue to be used as supplements to physical treatments or as precursors to physical measures.

3.2 SPEED MANAGEMENT EFFECTS ON EMERGENCY RESPONSE

As mentioned by the FHWA Traffic Calming ePrimer, the local fire department generally is the first responder to an emergency medical situation, hence the time it takes for a fire vehicle to arrive is a primary concern along with the safety of all emergency vehicle occupants. As a result, fire departments have traditionally been the most vocal of the emergency services about traffic calming. As noted by Montgomery County, Maryland in their Fact Sheet Impact on Traffic-Calming Measures on Fire-Rescue Response, seconds count when emergency vehicles are responding to life-threatening events, and response time delays are experienced both to emergency events and during transport of patients to hospitals. Also, patients being transported by ambulance may experience adverse effects that exacerbate their injuries/illnesses while the ambulance traverses speed humps. In addition, opinions by some critics in the 1990s and early 2000s were that traffic-calming measures caused damage to fire vehicles—however, early studies have found no data to substantiate these claims.

Numerous studies have been conducted to determine delays associated with different traffic-calming measures, leading to a wide range of delays for each, varying on four factors: vehicle type and size (including whether tanks are loaded with water), type of traffic-calming measure, testing procedure, and driver discretion regarding speed. Fire engines (fire vehicles that carry hoses, ladders, and pump water) and fire trucks (generally larger fire vehicles with attached, hydraulic ladders) are the fire vehicles that generally guide the discussion. **Table 12** tabulates delays associated with each measure below.

Florida Statute Chapter 633[47] requires the State Fire Marshal to adopt the Florida Fire Prevention Code (FFPC), and local jurisdictions are responsible for enforcing the code. Florida Statutes Sections 633.202 and 633.208, Florida Statutes, incorporate NFPA 1 (Fire Code) and NFPA (101) Life Safety Code) into the FFPC. NFPA 1 includes provisions stating that traffic calming devices shall be approved by the Authority Having Jurisdiction (AHJ). In Florida, the AHJ is defined by the local jurisdiction and is not necessarily the fire department. Depending on the local government structure, the AHJ could be the fire marshal, fire department, public works department, transportation agency, or another designated official/entity.

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Table 12: Speed Management Measure Delays on Emergency Response Vehicles

Type of Measure	Delay Ranges (Fire Trucks)	Delay Ranges (Ambulances)
Raised Intersections	• 4 to 6 seconds (Caltrans) • Note: Vehicles must come to a stop regardless if placed at an intersection with stop control	
Speed Cushions	• No delay (San Diego, CA; Danville, CA; and Sacramento, CA) • Less than 1 second (Austin, TX) • 1.76 seconds less than speed humps for fire vehicles (Mobile, AL) • 3.5 seconds (Seminole County, FL – from Stakeholder Outreach) • Similar speeds to roadway operating speeds (Orange County, CA) • Large delays (Elk Grove, CA)	• 4.75 seconds less than speed humps (Mobile, AL)
Offset Speed Tables	• 2 seconds (Portland, OR)	
Speed Humps	• 1-9.4 seconds (Portland, OR) • 2.8-6 seconds (Boulder, CO) • 2.8-7.3 seconds (Montgomery County, MD) • 2.3-9.7 seconds (Austin, TX) • 3-5 seconds (FHWA) • 3.6 second average and an overall 6.5 second delay (Eugene, OR) • 4.7 seconds (Sarasota, FL) • 10 seconds (Berkeley, CA) • 10-15 seconds (Danville, CA) • 10-15 seconds (Seminole County, FL – from Stakeholder Outreach)	• 3.8 seconds (Montgomery County, MD) • 5.74-8.96 seconds for 50 km/h speed, 7.22-9.84 seconds for 60 km/h speed, and 8.41-10.14 seconds for 70 km/h speed (Adıyaman, Turkey)[29] • Up to 10 seconds for ambulances with patients (FHWA)
Speed Tables / Raised Crosswalks	• 0-9.2 seconds (Portland, OR) • Less than 3 seconds per table for fire trucks (ITE) • 10-15 seconds (Seminole County, FL – from Stakeholder Outreach) • 20-25 seconds (Altamonte Springs, FL – from Stakeholder Outreach)	
Traffic Circles	• 1.3-10.7 seconds (Portland, OR) • 3-7 seconds (Montgomery County, MD) • Note: Placement of aprons can minimize deflections and decrease delays	• 3.2 seconds (Montgomery County, MD)

Across multiple studies and jurisdictions, **speed cushions** and **offset speed tables** consistently demonstrate the lowest delay for emergency response vehicles, often resulting in negligible or no measurable impact. Traditional speed humps and vertical deflection measures produce higher and more variable delays, particularly for ambulances transporting patients.

To avoid the large delays from Elk Grove, California, speed cushions should be designed adequately to allow for the wheelbase of emergency vehicles to drive between the cushion cutouts. Also, flat-top speed humps such as speed tables cause less delay than parabolic speed humps and traffic circles. To ensure that traffic circles do not cause substantial delays, an apron in the center island is recommended to reduce deflection of emergency response

vehicles and reduce delays. Also, an increase in height of vertical deflection measures increases the length of delays they incur.

Other safety measures did not have specific delays corresponding to them; however, some sources list measures qualitatively based on emergency response impacts, as displayed in **Table 13**.

Table 13: Qualitative Delay Information for Speed Management Measures on Emergency Response Vehicles

Type of Measure	Qualitative Delays / Impacts to Emergency Response
Speed Cushions	• Negligible impacts (Caltrans) [30]
Speed Humps	• Impacts to emergency response (Caltrans)
Speed Tables / Raised Crosswalks	• Impacts to emergency response (Caltrans)
Raised Intersections	• Impacts to emergency response (Caltrans)
Roundabouts	• Minimal impacts (Caltrans)
Realigned Intersections	• Minimal impacts (Caltrans)
Corner Extensions / Bulb-outs	• Minimal impacts (Caltrans)
Offset Speed Tables	• Minimal impacts (Caltrans)
Lateral Shifts	• Minimal impacts (Caltrans)
Chicanes	• Minimal impacts (Caltrans) • Non-appreciable delays (Montgomery County, MD) [31]
Road Diets	• Minimal impacts (Caltrans) • Non-appreciable delays (Montgomery County, MD) • No meaningful increase in delays (Iowa) [32]
Chokers	• Minimal impacts (Caltrans) • Non-appreciable delays (Montgomery County, MD)
On-street Parking	• Minimal impacts (Caltrans)
Median Islands / Pedestrian or Bicycle Refuges	• Minimal impacts (Caltrans)
Street Trees	• Minimal impacts (Caltrans)
Landscaping	• Minimal impacts (Caltrans)
Closures	• Impacts to existing/potential future evacuation routes need to be considered (Caltrans)
Median Barriers	• Impacts to existing/potential future evacuation routes need to be considered (Caltrans)
Forced Turn Islands	• Impacts to existing/potential future evacuation routes need to be considered (Caltrans)

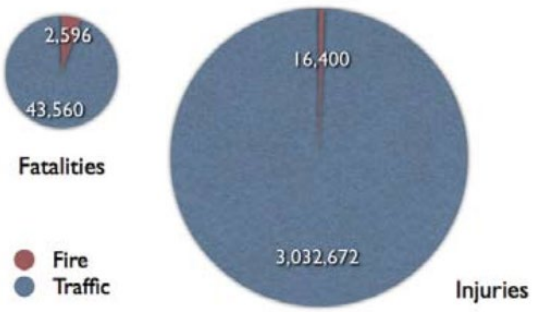
When developing traffic-calming measures, the Florida Greenbook recommends installing temporary calming features and monitoring them before installing permanent features. Also, to reduce on-street parking conflicts with emergency vehicles, the Florida Greenbook recommends adding additional no parking zones and enforcement of parking restrictions where needed to prevent parked cars from blocking the access of emergency vehicles.

In addition, the Florida Greenbook recommends consulting with fire department and EMS personnel to develop the preferred design of speed management measures, particularly with speed humps and traffic circles, by setting up traffic circles with cones and having fire trucks and other emergency vehicles drive around them. The same process can be used in the design of speed humps. This can help guide the design of these measures and helps

increase emergency responders' familiarity with these measures. As noted by the FHWA Traffic Calming ePrimer, Bellevue, Washington drafted a memorandum of understanding between the fire department and transportation department, where the fire department would be invited to a field visit before the installation of each traffic-calming measure. At the field visit the measure would be laid out with paint and cones and the fire department could use the opportunity to test applicability with their vehicles, with a similar process in San Diego, California. Most of the sources reviewed stressed the importance of working with local emergency response departments to ensure speed management measures can be negotiated by emergency response vehicles safely and timely without incurring damage to vehicles.

The Congress for New Urbanism (CNU), the U.S. Environmental Protection Agency (EPA), and fire marshals partnered together on an Emergency Response & Street Design Initiative[33] to find common ground for solutions, as streets in connected networks can improve emergency response times by providing several routes, and are safer for pedestrians, drivers, and emergency responders due to calming traffic below speeds that are more likely to lead to fatal/serious injury collisions. Most emergency calls nationwide are due to medical or traffic injuries rather than fire-related issues, and traffic injuries and fatalities greatly outnumber those from fire, as shown in **Figure 4**.

Figure 4: Fire vs. Traffic Injuries and Fatalities



Source: CNU Emergency Response & Street Design

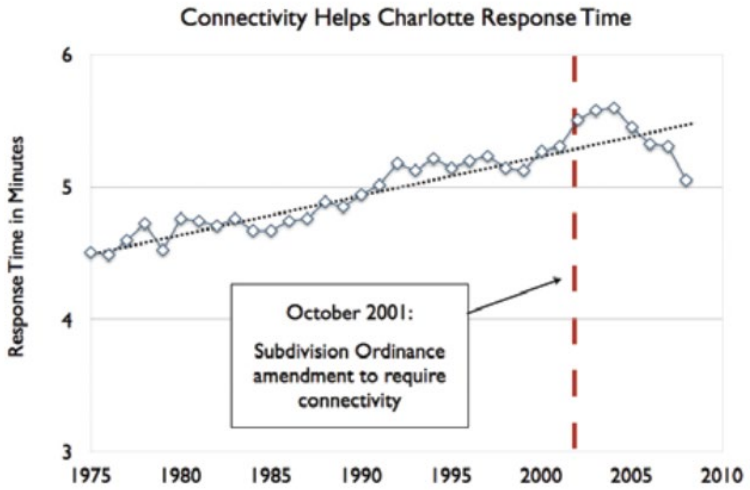
The CNU found that the best way to affect practice is to amend national fire codes in ways that empower local fire officials to approve streets with less than 20 feet clear in specific circumstances. Recent studies show that wider streets increase vehicle speeds and lead to more traffic injuries and fatalities, leading to an increase in emergency response services, as illustrated in **Figure 5**.

Figure 5: Street Width vs. Accidents per Year Per Mile

Source: CNU Emergency Response & Street Design

Research shows that better connected street systems and narrower streets and lanes (26 to 28-foot-wide local streets or nine to 10-foot lanes) are the safest. It also emphasizes that fire department personnel must be at the table to ensure emergency response times are given full consideration. The 4 to 6-minute response time from the NFPA Standard 1710 is critical since a person who has collapsed and stops breathing starts suffering brain damage in this time, fires reach an uncontrollable "flashover" condition in three to eight minutes, and a prompt response time mitigates unavoidable lag time. As a result, increasing street connectivity can reduce response times, even with narrower streets. In Charlotte, North Carolina, the average response time dropped by 30 seconds after an ordinance requiring street connectivity was instituted. This is illustrated in **Figure 6**. Better street connectivity was also found to lead to fire stations serving more households at a lower per capita cost.

Figure 6: Connectivity and Response Time



Source: CNU Emergency Response & Street Design

The *A Safety-Safety Dilemma: Understanding and Overcoming Conflicts Between Safe Streets Improvements and Fire/EMS Response* study[34] was also conducted examining conflicts between safe streets improvements and emergency response, including case studies for four cities. The study created a database with 30 documented conflicts and 70 documented solutions, which included lots of interactions between different types, outlined in **Table 14**.

Table 14: Conflicts between Safe Streets Improvement and Emergency Response and Solutions

Type of Conflict / Solution	Conflicts	Solutions
Physical	• **Access** (road width, ladder access, hydrant access, turning radii/user space) • **Response time delays** and **loss of pullover space** • **Evacuation capacity** (traffic congestion)	• **Designs** (mountable curbs, utility relocation) • **Pilot testing/mockups** • **Pre-approved designs** • **Equipment changes** like San Francisco's "Vision Zero" trucks with a narrower body, tighter turn radius, and blind spot monitoring
Institutional	• **Conflicting standard/regulations** (complete streets vs. evacuation route design guidelines) • **Conflicting performance metrics** (reliance on response time) • **Process complaints** (not enough consultation with fire departments/emergency institutions)	• **Standards and definitions updated** • **Code adoption/reform** • **Design review process** • **Operating procedures** (new dispatch and call screening to send correct crew/vehicle for each call) • **Equipment procurement**
Social / Cultural	• **Differing perspectives** (some fire departments have complained that bicycles/pedestrians don't appreciate their needs and vice versa) • **Ideological bias**, **culture war**, etc.	• **Shifting/expanding fire department missions** • **Relationship/trust building** (efforts to build stronger relationships between heads and unions) • **Changing incentives** (more holistic evaluation rather than just response times)

Shared interests found between safe streets engineers and emergency response departments included emergency access on protected lanes, connected street grids, and corner daylighting and visibility improvements. For the four U.S. cities that were included as part of the study, solutions for each were identified based on issues arising from a greater desire to implement safe streets improvements.

Case Study #1: Austin, Texas. Austin is a large city with wide streets, rapid recent growth, densification, and new development, there was growing support in the city for multimodal transportation. The Austin Fire Department (AFD) handles fire and severe medical calls, while another provider also supports EMS. No large public outcry, clear width of fire apparatus (which include fire engines and fire trucks, as defined earlier in the subsection **Speed Management Effects on Emergency Response**), and veto power of the fire chief were motivating factors for choosing the City for the case study. Solutions for the city included collaborative policymaking and design standards and a culture of learning and cooperating, which involved the fire department taking a trip to the Netherlands to learn about their approach for fire and EMS. Keys to progress include flexible code application, pre-approved design standards, flexible dispatching, AFD experience with event road closures, and a can-do mindset. Continuing rapid growth in the city remains a challenge.

Case Study #2: Baltimore, Maryland. Baltimore is a large city that is diverse but segregated and has been losing population since the 1950s. The city features a defined grid with narrow streets, strong transit ridership (25% of households lack a vehicle), and a strong and unionized fire department with many firefighters living outside of the city. The reason for choosing the City for the case study was public and fire department outcry from the Potomac Street protected cycle track, which reflected political divisions and allegiances, distrust, and poor communication and high turnover. As solutions, parts of the fire code were removed (i.e. 26-foot streetwidth requirements were replaced with NACTO guidelines), plan review was formalized, and a more holistic planning process was developed. Strong community advocacy, political leadership, and a legislative approach have been keys to progress. Remaining challenges include remaining skepticism in the fire department regarding bicycle infrastructure, limited collaboration, staffing issues at the state department of transportation, and an antagonistic approach to code change.

Case Study #3: Berkeley, California. Berkeley is a medium-sized college and commuter town with high and increasing density, a very high bicycle and pedestrian modal share, a tradition of safe streets activism, high emergency call volume, and dual fire and EMS responsibilities. Reasons for choosing the City for the case study included placemaking and a protected cycle track adjacent to the commercial district—which conflicted with fire apparatus clear width and emergency evacuation constraints—inadequate and late fire department consultation, staff and leadership turnover, a generational culture war among residents, and merchant parking concerns. Solutions included the formalization of review and consultation (with a clear timeline, comment, and review procedures), and the development of the Street Trauma Prevention Program, which included adding a staffed position within the fire department focused on preventing street trauma. Keys to progress have included consensus-minded fire department leadership, sustained community advocacy, and a focus on fire department strengths. A persistent culture war, conflicting expectations about the Street Trauma Prevention Program, and low morale within the City's Transportation Division have been challenges that have continued.

Case Study #4: Nashville, Tennessee. Nashville is a large state capital with a newly formed Department of Transportation that pulled transportation planning out of the Department of Public Works. The city has seen recent growth and growth-driven congestion leading to many new arrivals wanting more transportation options and political support for multimodal transportation. The fire department in the city is collaboratively oriented and has special events experience. A major expansion of traffic calming and bike infrastructure within the City with little to no fire department consultation—along with no formalized review and comment process with the fire department were motivating factors for choosing the City for the case study, in addition to fire department policy holding personnel responsible for equipment challenges, and a strong car and truck culture throughout the City. As solutions, a formalized review process with a new access group to aid coordination was created, along with the development of pre-approved designs and mapping fire access areas with GIS. Keys to progress in Nashville included: city growth and demographic changes, political leadership support for multimodal transportation, consensus-minded leadership, the launch of the new Department of Transportation, and large crowd event experience. Remaining challenges have included new practices still developing and conflicting ambitions in new district designs, such as with the new Tennessee Titans stadium.

Emerging themes from these case studies include trusting and collaborative relationships, flexible and solution-oriented staff, formalization of review processes, re-approval of common elements/designs informed by testing, balancing contextual sensitivity with learning from elsewhere, stable and supportive leadership (elected and agency), and understanding that physical conflicts can become proxies for cultural conflicts.

3.3 EXISTING SPEED MANAGEMENT IMPLEMENTATION GUIDELINES

Seminole, Orange, and Osceola Counties have guidelines in place for the implementation of traffic-calming measures, which are listed in **Table 15**.

Table 15: Central Florida County Traffic-Calming Guidelines

Jurisdiction	Recommended Traffic-Calming Devices	Traffic-Calming Guidelines / Criteria
Seminole County[35]	• Speed cushions • Midblock chokers • Chicanes • Median/center islands • Roundabouts • Traffic circles • Gateway/entry features	• A documented speeding issue (with an 85th percentile speed greater than eight mph over the posted speed limit) • A maximum roadway volume of 3,000 vehicles per day • A maximum posted speed limit of 30 mph • 65% of property owners along the roadway voting to approve the installation of these devices • Functional spacing of 300-400 feet between devices, no installation on curves/turns, and a minimum of 100 feet from intersections/curves/turns • Driveways must be directly accessing the road • A roadway that is not a principal arterial, minor arterial, or major collector roadway (must be a local street or a minor collector) • A roadway that is NOT a primary or routine response route for emergency vehicles • Response times must not increase by more than one minute and the total travel time to the furthest protected structure along the response route should be no more than five minutes
Orange County[36,48]	• Speed humps • Pedestrian refuge • Curb extension/bulb-outs • Raised crosswalks • Raised intersections • Textured pavement • Mini roundabouts • Chokers • Chicanes • Speed cushions • Speed tables • Optical speed marking • Speed pavement markings • Speed feedback sign • Half closure • Lane redesignation	Traffic Calming Policy • Any roadway maintained by Orange County may be eligible for traffic calming and/or safety improvements if they meet certain criteria • A local residential street with a minimum average daily traffic count of 800 vehicles per day and a maximum of 3,000 vehicles per day • A posted speed limit of 30 mph or less • An observed 85th percentile speed greater than 30 mph • A maximum street width of 24 feet • Orange County ensures that all modifications to roadways maintain accessibility for emergency vehicles, preserving response times and public safety • In order for a treatment to move forward, the County must receive support from at least 67% of returned ballots Specific criteria for traffic-calming devices: • Speed humps approximately 16 feet long and not exceeding 3 inches in height may be installed at neighborhood entrances. • Pedestrian refuge is appropriate on roads with posted speed of 45 mph or less, or at signalized intersections with posted speed of 50 mph or less. A refuge island is also required when crossing at a midblock location is longer than 60-feet. • Curb extension/bulb-outs are appropriate for roads with posted speed of 35 mph or less and must consider truck traffic and larger vehicles.

		• Raised crosswalks are appropriate for 2-4 lane local, collector, and possibly minor arterial roads with posted speed of 30 mph or less and up to 10,000 vehicles per lane per direction per day. Must consider truck traffic and larger vehicles. May be considered roads with posted speeds of 35 mph if a maximum slope of 1:20 is used. • Raised intersections are appropriate for 2-4 lane curbed roads with posted speed of 30 mph or less and up to 10,000 vehicles per lane per direction per day. They should be considered when raised crosswalks or speed cushions are not a viable option. May be considered roads with posted speeds of 35 mph if a maximum slope of 1:20 is used. • Textured pavement is appropriate for roads with posted speed of 45 mph or less. • Roundabouts are appropriate for 2-4 lane roads up to 30,000 entering vehicles per day for 2-lane and up to 45,000 entering vehicles per day for 4-lane. • Mini roundabouts are appropriate for 2-lane undivided roads with posted speed of 30 mph or less and up to 15,000 total entering vehicles per day. • Chokers are appropriate on 2-lane undivided roads with posted speed of 25 mph or less and 500-2,000 vehicles per day. • Chicanes are appropriate for 2-4 lane undivided roads with posted speed by 35 mph or less and 10,000 vehicles per day. • Speed cushions with cutouts are appropriate for 2-4 lane local and collector roads with posted speed of 30 mph or less and 500-7,500 vehicles per day. Best for lower-volume roadways that need emergency vehicle access. • Speed tables are appropriate for 2-4 lane local, collector and possible minor arterial roads with posted speed of 30 mph or less and up to 10,000 vehicle per lane per direction per day. Generally, not appropriate on emergency routes. • Optical speed markings are best for transitioning between context classifications, along curves, and approaches to intersections • Half closure is appropriate for local 2-lane roads with posted speed of 30 mph or less and up to 3,500 vehicles per day. • Lane redesignation on up to 3-lanes per direction and up to 20,000 vehicles per day.
Osceola County[37]	• Recommended **non-restrictive** measures: neighborhood education, selective enforcement, regular signing, temporary radar signs, permanent radar signs, and landscaping. • Recommended **restrictive** measures: median chokers, speed tables, speed humps, traffic circles, and turn prohibition.	• Less restrictive and less expensive measures should be attempted prior to the use of more restrictive measures • Restrictive traffic-calming devices should not be applied on classified roadways, such as collectors and arterials • A local street or a qualifying collector • An average daily traffic (ADT) of less than 2,000 vehicles per day • A roadway length of less than 1,500 feet • A posted speed limit of 35 mph or less • A median speed at least 25% over the posted speed

For Seminole County, the code mentions that "nothing above limits the County Traffic Engineer's or County Engineer's ability to install any devices on the County roadway system that in their sole opinion is justified for the maximum safety of the motorists or residents and does not impede Public Safety operations" despite the criteria above. Volumes, speeds, crashes, pedestrian facilities, and schools are evaluated using a points system to determine further evaluation and ranking, and the list of County-approved devices excluding the gateway/entry features and speed cushions are listed to have "some" emergency impacts, with the chokers, traffic circles/roundabouts, and chicanes stated to have minor and negotiable impacts for emergency vehicles.[38]

Seminole County has a Municipal Services Benefit Unit (MSBU) program for communities to install traffic-calming devices.[39] Once a speeding complaint is received, the County will field-verify that adequate speed limit signage is in place, make any necessary changes, and schedule a speed and volume study. If the speed and volume study indicates that the 85th percentile speed is at least 5 mph over the posted speed limit, the County will first consider non-restrictive measures and then will conduct another speed study after 60 days. If the second speed study still indicates that the 85th percentile speed is at least 5 mph over the posted speed limit, the County may consider additional non-restrictive measures and evaluate their effectiveness for a minimum of 60 days with an additional speed study. Once all non-restrictive measures have been exhausted and excessive speeds are still indicated after additional speed studies (the 85th percentile speed is at least 8 mph over the posted speed limit), then restrictive measures, such as traffic-calming devices, are considered if feasible.

Any recommendations presented by the County's Traffic Engineering Department are forwarded to SCFD for review and evaluation. If the SCFD does not deny the request based on their initial criteria—the route being a primary or routine route, the response time being increased by more than one minute, or the total travel time to the furthest protected structure along the response route being more than five minutes—they will determine the area beyond the initial roadway in question that may be impacted by increased response times.

3.4 SPEED MANAGEMENT IN PRACTICE

A Facebook post from Orange County[40] lists four traffic-calming measures as part of their Accelerated Transportation Safety Program (ATSP): speed tables, mini roundabouts, raised pedestrian crosswalks, and curb extensions. The ATSP dashboard[41] from the County lists 19 safety improvement projects as part of this program, many of which include traffic-calming measures. One of these projects is the Seidel Road Traffic Calming & Access Management Study.[42] This project modifies the existing pedestrian crossing at Seidel Road and Trinana Circle to a raised crosswalk with RRFBs, installs a new pedestrian crossing with a raised crosswalk and RRFBs between North Summerlake Groves and Golden Harbor Lane, installs six speed feedback sign assemblies, and considers in the long-term converting the half diamond interchange with S.R. 429 to a peanut roundabout.

The City of Orlando[43] lists four traffic-calming measures as project types, with descriptions, typical applications, material types, design considerations, and resources for each one. They include chicanes, medians or pedestrian/bicycle refuge islands, shared streets/slow streets, and speed humps or speed cushions. For each of the measures, it is recommended to provide an appropriate taper, transition zone, turning ability, and access for emergency vehicles.

A recent study[44] conducted in San Francisco examined the effects of streetscape projects on emergency vehicle travel times. Speed management techniques had been increasingly implemented in the city due to safety benefits: a study from Los Angeles was cited finding that collisions along roadways that had undergone road diets were reduced by 31–100%, while traffic speeds were reduced by 6.7% during peak hours and 7.9% during off-peak hours. Also, other investigations concluded that bicycle protection and traffic calming may improve response times by using speed cushions instead of speed humps, using roundabouts instead of intersection control, and

integrating bicycle lanes into emergency response routes. In San Francisco, average travel time for ambulance trips increased from 5.5 minutes in 2017 to 6.9 minutes in 2022. Engine and truck average travel times increased from 2.4 minutes to 2.6 minutes and 2.8 minutes to 2.9 minutes respectively over that same period. Ambulance trip average travel distance increased significantly over this period, particularly between 2020 and 2022.

The analysis as part of the study found that traditional vertical deflection traffic-calming measures (e.g., speed humps and raised crosswalks) are consistently, yet weakly, associated with slower emergency vehicle travel times. By comparison, emergency vehicle-friendly vertical deflection measures such as the "three-lump" speed cushions were not associated with slower emergency vehicle travel times. Furthermore, greater proximity to Class II or III bikeways is associated with faster travel times, all else equal. Citywide analysis showed little to no widespread relationship between street safety improvements and emergency vehicle travel times. Corridor analysis showed one corridor with significant treatment effect for some vehicles at some times, and conversely other corridors with similar street changes that had no treatment effects for vehicles. As a result, the study recommends identifying incident response routes and problematic corridors and intersections, assessing streetscape design on highly congested streets to better accommodate emergency vehicle access, and exploring transit lanes, two-way bikeways, traffic signal priority technology, and education.

Lastly, in 2002 the Iowa Department of Transportation in cooperation with Iowa State University conducted an evaluation[45] of speed humps on vehicle speeds and traffic volumes. A 25 mph temporary speed hump and 30 mph temporary speed table was used. The speed hump was installed first and then converted into a speed table. Both devices were effective, but the speed table performed as well or better than the speed hump for reducing vehicular speeds. Both the temporary speed hump and the temporary speed table effectively reduce 85th percentile speeds at the location of the device for at least 400 feet downstream—however, 85th percentile speeds upstream were not significantly influenced by the presence of either device, which suggests that a single speed hump or table is only effective in the immediate vicinity. The speed table appeared to decrease downstream speeds more than the speed hump. In general, the number of vehicles exceeding the speed limit remained lower once the devices were removed than before installation. The temporary devices also did not divert traffic for the test sites, and most respondents supported the use of these traffic-calming measures. The study also noted the possible effects on emergency response times: the emergency equipment tested in Montgomery County, Maryland was only able to attain an operating speed of about 20 mph while traveling through the test section of speed humps/tables compared to normal operating speeds of 35 to 40 mph. Therefore, the study recommends that local fire and rescue agencies should be consulted to assure emergency response times are not impacted significantly if a network of parallel streets are fitted with speed humps.

Locally, raised crosswalks and roundabouts are some of the speed management measures being considered and implemented, even on collector roadways (such as Seidel Road). Moreover, while speed humps and tables have been shown to increase delays for emergency response vehicles, their implementation only has a weak association with slower emergency vehicle travel times, and other treatments friendlier to emergency vehicles had no association. While street safety improvements had little to no relationship with emergency vehicle travel times, it is still important to coordinate with emergency services when implementing speed management, identifying incident response routes, and seeking accommodations for emergency vehicles on congested corridors.

4 Stakeholder Outreach Summary

4.1 INTRODUCTION

A practitioner roundtable with representatives from area fire departments, city and county governments, and FDOT was facilitated by MetroPlan Orlando on October 29, 2025, from 1:30 PM to 3:00 PM. Attendees included Chief Matt Kinley of the Seminole County Fire Department; Michelle Robinson and District Chief Raphael Ferreira of the Orlando Fire Department; Lenny Barden, Jesse Weed, and Bruce Doig from the City of Altamonte Springs; Kenna Henry from the City of Casselberry; Jacques Coulon from the City of Orlando; Charlie Wetzel from Seminole County; Jerald Marks, Jr., from Orange County; Lori Cox from Osceola County; and Loreen Bobo, Kia Powell, and Jon Scarfe from FDOT District 5. The following sections outline the purpose of this discussion as well as its key takeaways.

The roundtable sought to introduce the white paper's objectives, provide a brief overview of the ISO Class 1 rating and how emergency response time factors into the scoring, and foster a dialogue between transportation professionals, local governments, and fire departments. Discussion questions centered around emergency response times, speed management, and practitioner coordination. They included the following:

- What are your most common calls to respond to? What challenges do you have in responding?
- How does response time factor into your ISO Rating?
- Do you try to avoid routes where speed management/traffic calming has been implemented?
- How do you decide where to implement speed management?
- Are there speed management techniques or measures that are not used in your community (for example, neckdowns or speed tables)? If so, why not?
- Who is involved in the decision-making process for speed management implementation?
- Does the department implementing speed management meet with emergency services prior to advancing a project?
- What are ways that speed management can be implemented without negatively impacting emergency response?
- Are there any other questions or discussion?

The practitioner roundtable reconvened at MetroPlan Orlando on April 8, 2026 from 2:00 PM to 3:30 PM to review and discuss the preliminary findings, and their major recommendations and comments were incorporated into this white paper.

4.2 TAKEAWAYS

4.2.1 NATURE OF CALLS AND RESPONSE PATTERNS

Among the Central Florida fire departments present at the roundtable, roughly 80% to 85% of calls are related to EMS rather than fire. A significant portion of those EMS calls are Basic Life Support (BLS) or non-emergency calls, but Advanced Life Support (ALS) and serious calls still require multiple units despite not making up most calls. Fire departments also stated that engines and rescues respond based on proximity and not call type. Engines often respond first to medical calls because they are closer, and most fire vehicles in the region have paramedics on board so that ALS care can begin before transport arrives. Discussion participants stressed that response time includes not only getting to the scene of the incident but also the time spent transporting to the hospital, which is

affected by congestion and traffic calming on key corridors. A delay of one minute can increase the fatality rate by 20%.

4.2.2 EXISTING TECHNOLOGY AND ROUTING

Area fire departments use computer-aided dispatch (CAD) systems, where routing is currently based on speed limits and distance, not true real-time traffic. Agencies can manually assign extra delay time in CAD for certain routes and devices—for example, a speed table can be treated as another stop or delay. Additionally, most agencies use signal preemption that consists of either old Opticom photoelectric hardware or newer GPS-based systems. FDOT's Signal SIREN system allows for GPS-based preemption without hardware at each signal so that signals know when an emergency vehicle is approaching. This enables emergency vehicles to clear multiple intersections ahead. Agencies expect more integrated, traffic- and device-aware, real-time routing within the next three to five years, which may change how agencies view certain traffic-calming methods.

4.2.3 DEVICES AFFECTING RESPONSE TIMES

The departments present named vertical deflection measures as generally the speed management type that most negatively impacted emergency response, with certain measures having significantly greater impacts than others. Two new raised crosswalks on Central Parkway in Altamonte Springs added 20 to 25 seconds of response time to that segment. The Seminole County Fire Department stated that traditional speed tables and speed humps can add 10 to 15 seconds of delay per device for a fire truck, while speed cushions add about 3.5 seconds per device. There was also some concern expressed about damage to fire apparatus over time when crews push too aggressively over vertical devices.

A segment of S.R. 46 with multiple new roundabouts saw approximately 15 seconds of delay added to response times per roundabout in free-flow conditions. Departments had a mixed view on these treatments—they acknowledged that they may improve general operations at intersections and reduce severe crashes when compared to traffic signals on congested roads; however, they noted that they still slow down heavy fire apparatus, especially at higher volumes and with tighter geometry. Since roundabouts may lead to operational improvements at intersections compared to signalization, emergency response delays at roundabouts could be offset by reduced delays caused by replacing signalized intersections with roundabouts.

Poorly parked vehicles and tight cross-sections caused by on-street parking or narrow streets can physically block emergency response equipment. In some neighborhoods, fire trucks cannot pass when cars park away from the curb. In addition, emergency vehicle operators avoid brick streets and other rough surfaces where possible because of ride quality and equipment wear.

4.2.4 WHERE AND WHY SPEED MANAGEMENT IS USED

FDOT offered examples of recent speed management implementations. The Orange Blossom Trail (U.S. 441/S.R. 7) corridor in Orlando has historically been one of the deadliest segments in FDOT District 5 and has high pedestrian activity. As a result, improvements were made to the corridor including six raised crosswalks, bus stop relocations to match crossings, and median fencing to channel pedestrians and bicyclists to safe locations at midblock crosswalks and intersections. The delay incurred to general drivers through the segment was only around three-and-a-half to four seconds, and there was a substantial reduction in pedestrian fatalities, down to just one since implementation in October 2023. In Flagler County, a rural intersection with high-severity crashes at a two-way stop-controlled intersection was reconstructed with a new roundabout. At Central Florida intersections overall, approximately 0.55% of intersection crashes are fatal; however, at that location, 14% of crashes were fatal before the roundabout, highlighting why it was installed despite the concerns.

In addition, FDOT, counties, and cities have shifted from “Design Speed” to “Target Speed”. Design speed, or posted speed, is the desired operating speed of the roadway. With target speed, streets are designed with measures that make people uncomfortable when driving faster than intended, such as narrower lanes and more visual friction. Shifting to target speed supports the context of the roadway and its surrounding land uses, thereby better balancing vehicular mobility with safety needs of pedestrians, bicyclists, and motorists.

4.2.5 LOCAL GOVERNMENT POLICIES

As mentioned in **Existing Speed Management Implementation Guidelines**, Seminole County has a formal traffic-calming policy that prioritizes non-intrusive measures such as signs, striping, and speed feedback signs first. If the County considers a vertical deflection traffic-calming devices, it usually prioritizes a speed cushion with a fire truck cutout.

The City of Altamonte Springs does not allow vertical deflection on major throughfares in the city, citing Palm Springs Drive as an example of a major corridor serving a hospital. Instead, the city uses painted chicanes, lane narrowing medians, and rumble strips in some areas in lieu of speed humps or speed tables.

In the City of Orlando, resident complaints and speed studies, serious/fatal crash site reviews, and new development street layouts (such as spine streets and streets near schools) have triggered increased interest in speed management. City representatives noted an increased focus on coordinating traffic calming and on-street parking with the fire department, and, in particular, on ensuring there is sufficient room not just for driving through but for staging equipment and accessing hydrants. The city also noted it’s move toward built-in design that supports emergency operations, such as narrowing lanes and tighter geometry, rather than retrofitting speed humps later.

In Orange and Osceola Counties, such as in the Horizon West area, highly connected modern street grids have reduced dead ends and improved street connectivity. Narrow streets, on-street parking, and multiple access points are causing speeding and cut-through complaints.

4.2.6 COORDINATION BETWEEN ENGINEERS AND FIRE / EMS

The roundtable emphasized the importance of coordination between engineers and fire/EMS. Historically, some traffic-calming projects were installed without consulting fire/EMS. Several agencies now require development and roadway plans to be sent to fire/EMS via the Development Review Committee (DRC) and fire marshal review. In addition, several agencies in the region also now update standard details and policy language to explicitly require fire/EMS review for speed cushions, raised crosswalks, lane narrowing, bulb-outs, and the internal streets of new developments.

The roundtable attendees expressed interest in a regional conversation or toolbox—potentially hosted by MetroPlan Orlando and aligned with Vision Zero Countermeasure Toolkits—where all agencies agree on which devices are acceptable, where they can be used (namely street types and contexts), and certain performance targets like maximum added response time. This toolbox would align the region so that member fire departments do not have to guess what they will encounter when crossing jurisdictional boundaries.

The discussion also raised other design and operations topics:

- More acceptable “soft” horizontal deflection measures included painted chicanes, in which the curb stays in place but the visual travel path “weaves”; painted or textured edge treatments, which visually narrow the

lane but preserve usable asphalt for emergency vehicles; and narrower lanes on major roads (such as S.R. 436), which slow drivers without physically constraining fire apparatus.

- Where separated bicycle lanes are present, some drivers have expressed feeling "trapped" between the curb and the bicycle lane separator, and drivers worry about how to move over for emergency vehicles. Agencies noted this issue also exists on fully curbed roads without bicycle lanes. As a result, agencies emphasized that the design must still allow some maneuverability or refuge space where possible.
- For connectivity, more access points mean more routing options and redundancy for incidents, but also result in a redistribution of traffic, which can lead to more locations requesting traffic calming. Neighborhood-level planning would help ensure that one project does not merely shift speeding to the next street and help educate the public on the benefits of street connectivity.
- A question during the roundtable was raised about the use of temporary or portable devices to test effectiveness and impacts of traffic-calming measures before doing full construction. While interested, agencies noted that warranties and installation responsibility issues make some vendors cautious, and that the idea is better suited to pilots and studies.

5 Recommendations for Balancing Speed Management & Emergency Response

This section takes findings from the Emergency Response Considerations, Speed Management Considerations, and Stakeholder Outreach sections to develop recommendations that balance the best policies and practices regarding speed management implementation with the need for effective emergency response times.

The recommendations are intended as advisory guidance to support local agencies. Agencies should tailor these recommendations to their local context, roadway function, and operational needs.

Collectively, these recommendations prioritize early coordination, context-sensitive design, and the selection of speed management strategies that achieve safety objectives while minimizing emergency response delays.

5.1 POLICY FRAMEWORK & IMPLEMENTATION PROCEDURES

When implementing speed management measures, agencies should include emergency services in plans review processes and stakeholder meetings.

Agencies should institute ordinances requiring street connectivity, which has been proven by the CNU to reduce emergency response times. Because greater connectivity can result in redistribution of traffic across the network, as noted during the practitioner roundtable, agencies should find ways to educate the public on the benefits of street connectivity, whether through neighborhood-level planning or by implementing speed management measures that do not significantly delay emergency response vehicles.

Using prototypes of these countermeasures (especially for vertical deflection countermeasures for those with vertical deflection) or laying out cones (especially for horizontal deflection countermeasures) can allow emergency services' to "test drive" the countermeasures, improving their familiarity with them.

The practices used in Seminole, Orange, and Osceola Counties' traffic-calming programs only apply to very low-speed, low-volume roadways. The Florida Greenbook discourages installing traffic-calming devices on streets with ADTs of over 3,000 vehicles per day and posted speeds greater than 30 mph. This does not limit the ability to install any devices on the city or county roadway system that are justified for the maximum safety of motorists or residents, as long as they do not impede public safety operations. However, some speed management strategies,

such as roundabouts and horizontal deflection, are recommended on roadways with 40 to 45 mph target speeds in the FDM and have been installed on state roadways with these higher speeds.

During the practitioner roundtable, stakeholders mentioned their desire for a regional consensus or standardized toolbox, in which neighboring agencies agree on acceptable devices, preferred locations for implementation, and performance targets. This paper cosigns the idea of a regional toolbox that aligns with Vision Zero Countermeasure Toolkits.

Seminole, Orange, and Osceola Counties should maintain a regional database of active speed management measures installed in their jurisdictions and share these databases with emergency services, possibly through an interactive dashboard or GIS. Emergency response services should incorporate the speed management database into their determinations to identify the most efficient route.

5.2 SPEED MANAGEMENT TECHNIQUES GUIDANCE

The suitability of speed management techniques depends on roadway function, area context, emergency response role, and design implementation. The following principles summarize observed performance across multiple studies and jurisdictions.

During the practitioner roundtable, stakeholders mentioned wanting “soft” horizontal deflection measures such as painted chicanes or lane narrowing that preserves usable asphalt for emergency vehicles. Therefore, agencies should first consider measures that impact emergency vehicles less (such as neighborhood education, selective enforcement, signing and pavement markings, speed display signs, community gateways, and landscaping) before considering measures with more impacts on emergency vehicles.

Additionally, agencies can evaluate temporary traffic-calming measures for their efficacy before installing permanent measures. Stakeholders mentioned that vendors are cautious of warranty and installation responsibility issues, so these temporary devices should be used mainly for pilot programs and studies.

In addition to **Table 7**, the FDM, Florida Greenbook, and FHWA Traffic Calming ePrimer should be consulted to determine which speed management techniques are applicable for a roadway’s functional classification, context classification (or land use context if not on state system), and speed limit. Measures implemented on primary emergency response routes should take delays of emergency vehicles into account and inflict as few delays on emergency vehicles as possible.

Horizontal deflection speed management techniques, such as chicanes, lateral shifts, traffic circles, mini-roundabouts, roundabouts, and realigned intersections, present little to no impact on emergency response times and so should be considered for primary emergency response routes. For traffic circles, mini-roundabouts, and roundabouts, designers should ensure that the center truck apron can accommodate emergency vehicle turning movements. If any of these three measures are selected for implementation on primary emergency response routes, they should be designed with elements such as sufficient clear width and/or adequate truck aprons to reduce deflections and minimize response time impacts to emergency vehicles.

Stakeholders also expressed concerns about the potential for poorly parked vehicles, separated bicycle lanes, or curb-protected facilities to slow down or block emergency response vehicles. The Florida Greenbook recommends adding additional “No Parking” zones and enforcing parking restrictions to prevent these blockages. Practitioners should also provide sufficient clear width for emergency vehicles during the design of these facilities.

Speed management techniques that focus on reducing street width, such as chokers, corner extensions, median islands, on-street parking, and road diets, have little or no impact on emergency response times and so are suited

to primary emergency response routes. For each of these techniques, practitioners should provide sufficient clear width and turning radius for emergency vehicles, whether in or adjacent to the street being treated.

Speed management techniques that focus on restricting routes are not recommended on primary emergency response routes. On roadways that are not primary emergency response routes, these techniques (which include closures, diagonal diverters, median barriers, and forced turn islands) are recommended only if they are sufficiently wide enough for emergency vehicles to maneuver around or if they have a mountable or retractable/removeable element that makes them easily traversable by emergency vehicles.

Speed management techniques that focus on vertical deflection, such as raised intersections, speed cushions, and offset speed tables, have little to no impact on emergency response times and so are suited to primary emergency response routes. Speed tables and raised crosswalks are preferable to speed humps, as the former incurs less delay upon emergency response vehicles. Speed humps are not recommended on primary emergency response routes.

Moreover, based on the guidance from King County, Washington, regional transportation authorities should collaborate to develop regional standards for the widths of wheel cutouts in speed cushions in order to mitigate delays. The standardized widths should be wide enough and spaced far enough apart to accommodate track widths of emergency vehicles without requiring these vehicles to significantly reduce their speeds. Widths of both outside cushions would vary based on the width of each roadway, but the widths of the middle cushion and the wheel cutouts should be standardized. For example, Orange County uses details for speed cushions (Seminole County has similar standards) shown in **Figure 7**.

Regional authorities should also set a standard distance between offset speed tables. For example, the typical distance used in Portland, Oregon, is 50 feet apart. Other speed management measures should also have pre-approved design standards.

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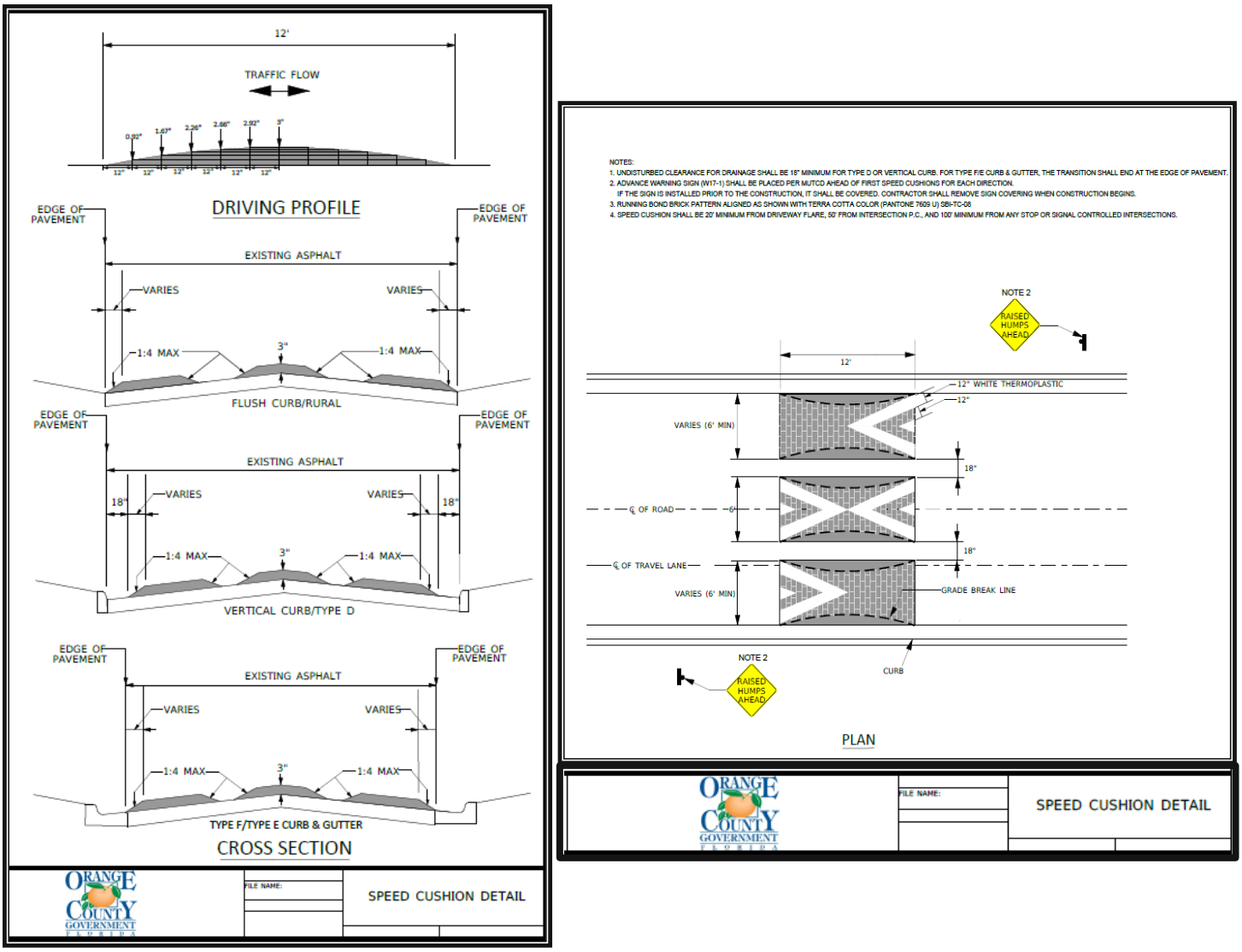
Figure 7: Orange County Speed Cushion Standards



Source: Orange County, Florida

5.3 COMMON MISCONCEPTIONS RELATED TO ISO PPC RATING AND SPEED MANAGEMENT

Despite the limited role that travel time plays in the ISO PPC scoring methodology, stakeholders frequently raised concerns that speed management measures may negatively affect a fire department's ability to achieve or maintain an ISO Class 1 rating. The following clarifications can help address this and other common misconceptions.

- **Myth 1: Speed management measures jeopardize a community's ISO Class 1 rating.**

  Fact: ISO PPC ratings are driven primarily by fire department resources, staffing, training, water supply, emergency communications, and deployment coverage. Of the total possible points in the FSRS, only a small portion of the deployment analysis may be indirectly influenced by response time. The primary method of calculating deployment credit is based on geographic coverage (road miles) rather than

measured response time. In practice, many ISO Class 1 communities, achieve their rating without response time metrics being used in the deployment analysis.

- **Myth 2: ISO PPC response time requirements are equivalent to NFPA response time benchmarks.**

  Fact: ISO PPC scoring and NFPA Standard 1710 serve different purposes and use different performance measures. ISO evaluates a community's fire protection capability for insurance risk purposes, while NFPA Standard 1710 establishes operational performance objectives for fire and EMS response. Meeting NFPA response time benchmarks is important for life safety and operational effectiveness but is not, by itself, determinative of ISO PPC classification.

- **Myth 3: Any increase in emergency vehicle travel time will negatively affect ISO scoring.**

  Fact: Modest changes in travel time resulting from appropriately designed speed management measures do not directly translate into changes in ISO PPC scores. Where response time is considered, ISO allows alternative evaluation methods, and minor travel time variations on individual roadway segments are unlikely to materially affect the percentage of built-upon area served within specified distances of fire apparatus.

- **Myth 4: Speed management and emergency response objectives are inherently incompatible.**

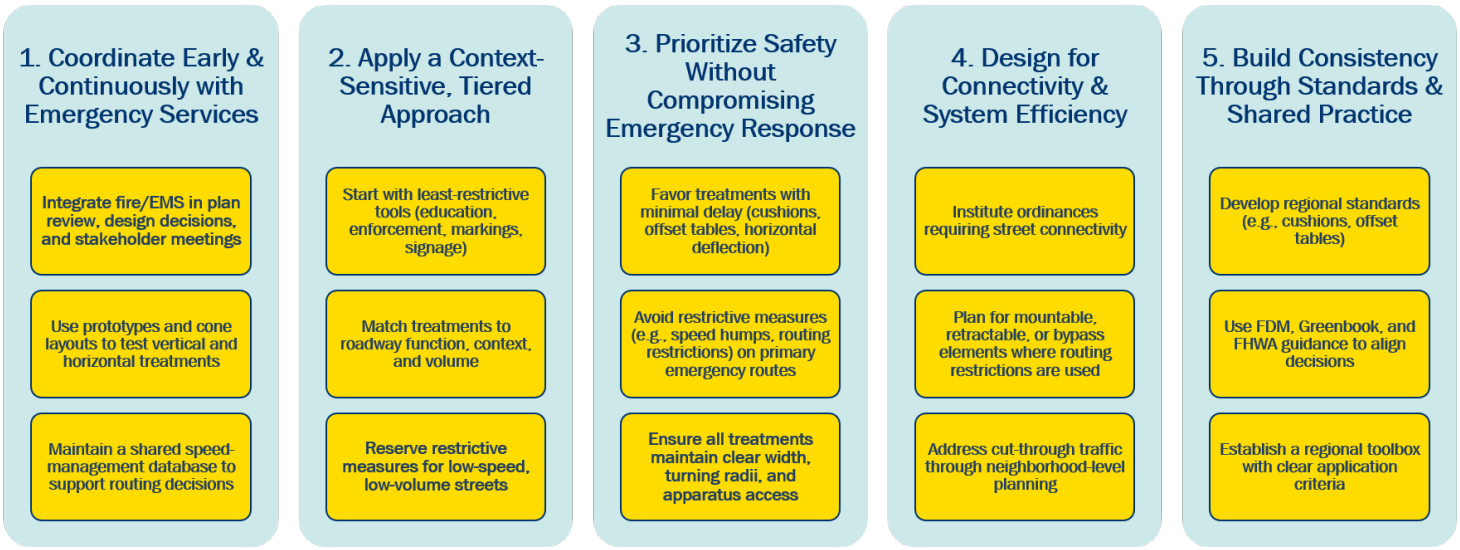
  Fact: Research and practitioner experience demonstrate that many speed management strategies, particularly those that do not rely on significant vertical deflection or that are designed with emergency vehicle accommodation, can reduce serious crashes (thereby lessening the number or criticality of EMS responses) without materially affecting emergency response performance. In some contexts, speed management and network-level design strategies such as improved street connectivity may support *both* roadway safety and emergency response efficiency.

Recognizing these distinctions is critical to informed decision-making. Misinterpretation of ISO PPC requirements can lead to overly restrictive policies that limit the use of effective safety countermeasures without providing any benefit to fire protection ratings or emergency response outcomes.

5.4 SUMMARY OF RECOMMENDATIONS AND CONSIDERATIONS

These recommendations will help transportation professionals select speed management measures that minimize impacts on emergency vehicles while reducing vehicular speeds and making roadways safer. The recommendations are shown in **Figure 8**.

Figure 8: Recommendations to Balance Emergency Response and Speed Management



Below is a list of the recommendations and considerations:

1. Coordinate early and continuously with emergency services:
    a. To comply with Florida Statutes and the NFPA 1, traffic calming devices shall be approved by the AHJ. It is recommended that the AHJ includes the fire marshal or fire department.
    b. Prototypes of speed management measures or laid out cones can allow emergency services to drive over or around them before full implementation.
    c. Local agencies should maintain a database of active speed management items for the region to share with emergency services. Emergency services should incorporate this database into their route determination.
    d. A regional standard for speed cushions and for offset speed table spacing should be developed. Other speed management measures should also have pre-approved design standards.
    e. MetroPlan Orlando may be used to facilitate discussions between emergency services and engineering/public works departments to encourage/facilitate regional consistency.
2. Apply a context-sensitive and tiered approach:
    a. It is recommended to first consider measures that impact emergency vehicles less before considering measures with more significant impacts.
    b. Match treatments to roadway function, context, and volume.
    c. Reserve restrictive measures for low-speed, low-volume streets.
3. Prioritize safety without compromising emergency response:
    a. Favor treatments with minimal delay to emergency service vehicles (e.g., speed table with cutouts, chicanes, roundabouts) and avoid restrictive measures (e.g., speed humps, routing restrictions) as described in **Table 7**.
    b. Ensure all treatments maintain clear width, turning radii, and emergency service apparatus access.
    c. Horizontal deflection speed management techniques are recommended on primary emergency response routes. Traffic circles, mini-roundabouts, and roundabouts should have truck aprons and/or appropriate clear widths to accommodate emergency vehicle turning movements and minimize their deflection.

d. Sufficient clear width, along with additional no parking zones and enforcing parking restrictions, should be used to prevent emergency vehicle slowdowns from poorly parked vehicles and curb-protected facilities.
e. Street width reduction speed management techniques are recommended on primary emergency response routes. For each of these techniques, it is important to ensure sufficient clear width and turning radius is provided on or adjacent to the roadway.
f. For vertical deflection speed management techniques, raised intersections, speed cushions, and offset speed tables are recommended on primary emergency response routes. Speed tables and raised crosswalks are preferred over speed humps, which are not recommended on primary emergency response routes.

4. Design for connectivity and system efficiency:
    a. Institute ordinances requiring street connectivity
    b. Routing restriction speed management techniques are not recommended on primary emergency response routes. Plan for mountable, retractable, or removeable elements where routing restrictions are used.
    c. Neighborhood-level planning should be incorporated to educate the public on the benefits of street connectivity
5. Build consistency through standards and shared practice:
    a. Use **Table 7**, the FDM, Florida Greenbook, and the FHWA Traffic Calming ePrimer together to determine which speed management techniques are appropriate to be used in various contexts
    b. Develop regional standards and design guidelines for speed management techniques (e.g., speed tables with cutouts).
    c. A regional toolbox—potentially hosted by MetroPlan Orlando and aligned with Vision Zero Countermeasure Toolkits—can help agencies agree on the types of acceptable devices, where they can be implemented, and any performance targets should be created.

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6 Conclusions

The literature reviews and roundtable discussions conducted as part of this effort revealed many shared beliefs between transportation professionals and emergency responders about how roadways should function, reflecting the foundational principles established during the CNU Streets and Emergency Response Workshop[46], held in April 2008, revealed many shared beliefs between transportation professionals and emergency responders about how roadways should function:

- Both groups agreed that safety is important, should be inclusive, and should extend from fire to traffic.
- Both groups valued the efficient use of resources (property, services, and infrastructure).
- Both groups valued places that enhance pedestrian activity.
- Both groups valued communities that include a range of neighborhoods and compatible uses.
- Both groups valued streets, structures, and fire protection features that match neighborhood contexts.
- Both groups valued creative collaboration, ongoing education, and capacity-building among those who serve and shape the built environment.
- Both groups valued the ability to adapt to regional differences amidst life-saving responses.

Through its Vision Zero Central Florida initiative, MetroPlan Orlando is committed to reaching zero traffic fatalities and serious injuries in the region by 2050. The ability to balance two safety-focused priorities—effective speed management on local roadways and efficient emergency response times—represents an important step toward this goal.

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