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PUBLIC WORKS DEPARTMENT
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MEMO PUBLIC WORKS & BUILDING COMMITTEE AGENDA

TO: **PUBLIC WORKS AND BUILDINGS COMMITTEE**

FROM: **PETER C. NOURSE, PE**
DIRECTOR OF CITY SERVICES

DATE: November 10, 2022

SUBJECT: Public Works & Buildings Committee Meeting
Meeting Date ***Thursday November 17, 2022 at 7PM***

There will be a Public Works and Buildings Committee Meeting held on Thursday November 17, 2022 at 7PM. This meeting will be at City Hall in City Council Chambers

AGENDA

1. Approval of the October 20, 2022 PWC Minutes
2. Public Input
3. Rt202A Water Main Extension & Tank Project
4. 19 Old Gonic Road New Housing & Utility Impacts
5. Speed Tables
6. DPW Facility Budget Summary
7. Other

U.S. Department of Transportation
Federal Highway Administration
1200 New Jersey Avenue, SE
Washington, DC 20590
202-366-4000

Safety

Traffic Calming ePrimer – Module 5

Effects of Traffic Calming Measures on Non-Personal Passenger Vehicles

5.1 Definition of Non-Personal Passenger Vehicles

Traffic calming measures affect motorist behavior. The effects may be different for a personal passenger vehicle than for a non-personal passenger vehicle. The implications of the effects certainly differ between a personal passenger vehicle and a non-personal passenger vehicle.

The term "non-personal passenger vehicle" describes a vehicle typically larger than a common passenger car, van, motorcycle, pick-up truck or something similar. For the purpose of this ePrimer, non-personal passenger vehicles are grouped into:

- emergency services vehicles – an operator of an emergency services vehicle highly values a well-connected roadway network that enables access between trip origins and destinations with speed and efficiency
  - fire
  - ambulance
  - police
- large vehicles – an operator of a large vehicle requires an accommodating roadway design that limits hindrances and discomfort
  - transit
  - waste removal
  - snow removal
  - truck (issues dealing with trucks are addressed in the Module 3 discussions of impacts by individual traffic calming measure)

It is important to understand how and to what extent a traffic calming measure can affect mobility and accessibility for a non-personal passenger vehicle. With this knowledge, a practitioner is better able to identify an effective and acceptable traffic calming program or measure.

5.2 Emergency Services – Fire

The local fire department is generally the first responder to an emergency medical situation. The time it takes for a fire vehicle to arrive is a primary concerns along with the safety of the emergency vehicle occupants. Of all emergency services, fire departments have traditionally been the most vocal about traffic calming; the traffic calming perspective for accommodating "emergency services" is often understood to be accommodating the fire department.

Fire response vehicles vary in size. Fire engines (the fire vehicles that carry hoses, ladders, and pump water) and fire trucks (the generally larger fire vehicles with attached, hydraulic ladders) are the fire vehicles that guide the discussion.

In 2012, the *International Fire Code (IFC)* was updated to specifically address traffic calming and to better ensure coordination with the fire department during traffic calming implementation. IFC Section 503.4.1 states that traffic calming measures placed on fire apparatus access roads "shall be prohibited unless approved by the fire code official."

The *National Fire Protection Association (NFPA)* provides codes and standards to protect from the danger of fires. The NFPA has many standards relating to a wide range of topics. Standard 1141, titled "Standard for Fire Protection Infrastructure for Land Development in Wildland, Rural, and Suburban Areas," addresses traffic calming. In Section A.5.2.18, NFPA 1141 states that prior to installation of traffic calming, the authority having jurisdiction "should work with the emergency response departments to ensure traffic calming devices can be negotiated by emergency response vehicles in a safe and timely manner without damage to those vehicles."

Implementation of traffic calming should be coordinated with the fire department to comply with local interpretations and requirements of the fire code standards. The International Association of Fire Chiefs agrees that fire officials and engineers will need to collaborate on traffic calming installations to "meet traffic-engineering needs and include the least impact on response time to emergencies."[i]

A video that presents emergency response issues that require consideration during the planning of traffic calming measures can be accessed at the following hyperlink: https://www.youtube.com/watch?v=-R0f1nj7oeM (Source: Tualatin Valley (Oregon) Fire & Rescue)

Measures with Vertical Deflection

A traffic calming measure that causes vertical deflection to a motorist passing over it forces the motorist to slow in order to pass over the measure comfortably. This slowing of an emergency services vehicle results in longer response time. The magnitude of the slowing depends on multiple factors.

The following vertical deflection measures have the potential to negatively affect fire vehicles and are typically contentious with fire departments:

- Speed hump
- Speed table
- Raised intersection
- Raised crosswalk

The *Guidelines for the Design and Application of Speed Humps* published by ITE, which provides guidelines for the most common traffic calming measure, has detailed many of the existing studies relating to emergency response delay associated with vertical traffic calming measures. The document recommends not installing speed humps on roadways that are primary or routine emergency vehicle routes. Other methods used by cities, and mentioned in the guidelines to minimize conflict with fire vehicles, include limiting the height of speed humps.

Damage to fire vehicles is another concern of fire departments. Opinions by some critics in the 1990s and early 2000s were that traffic calming measures caused damage to fire vehicles.[ii] For example, the stress of traveling over speed humps could lead to increased repairs and shorter vehicle life. However, the early studies found no data to substantiate the claims.[iii] In addition, isolating the exact cause of wear and tear on a vehicle can be difficult, whether it was caused by the relatively infrequent crossing of speed humps or the crossing of other frequent undulations in a roadway network, such as potholes, manhole covers, drainage dips, etc.

Two vertical deflection measures have been developed specifically to accommodate fire vehicles. These measures should be considered in a location where mobility of fire vehicles is a high priority:

- Speed cushion (also known as speed slot, speed lump, and speed pillow)
- Offset speed table

Measures with Horizontal Deflection or Street Width Reduction

Studies in the mid-1990s in Portland, Oregon and Montgomery County, Maryland found that fire vehicle delay associated with traffic circles ranged from approximately 1 second to over 10 seconds.[iv,v] A traffic circle can be designed to minimize adverse effects on fire vehicle mobility. A mountable apron can be placed on the outer edge of the circle to allow a fire vehicle to minimize its deflection when passing the measure. In addition, many jurisdictions allow larger vehicles to turn left in front of a traffic circle, reducing the need to circle the measure. A fire vehicle responding to an emergency could make this short left-turn movement.

The results from these early studies did not thwart traffic calming plans, as can be seen by successful installations across the U.S. For example, in 1996, Portland, Oregon found the neighborhood traffic circle to be the most hampering traffic calming measure for their fire department. In contrast, nearby Seattle, Washington continues to install traffic circles and is now presumed to be the city with the most traffic circles in the country.

The other measures in this ePrimer with horizontal deflection or street width reduction can be designed to accommodate large vehicle movements, allowing a fire vehicle responding to an emergency the ability to pass with minimal horizontal deflection. For example, a lateral shift compels a motorist to horizontally deflect the vehicle path. A fire vehicle could take a straight line path through the measure, as other vehicles are expected to yield the right-of-way during an emergency. In addition, the driver of a fire vehicle possesses the necessary skill set for the apparatus being operated, with many states requiring drivers to take accredited training. The number one priority of an emergency vehicle driver is to arrive at the scene safely, which can require maneuvering a vehicle through constrained areas.

Routing Restriction Measures

All routing restriction measures have the potential to adversely affect fire vehicle route planning and response times. For some measures, an emergency vehicle may be able to circumvent the measure (for example, a forced turn island).

However, given the severity of routing restriction measures on the roadway network for non-personal passenger vehicles, coordination with the emergency services departments is a critical step during planning of these measures. For some measures, the installation may be designed to allow passage by a fire vehicle.

5.3 Traffic Calming Measures Developed to Address Emergency Service Vehicle Delay Issues

In response to concerns raised by fire departments about the effects of vertical deflection measures on emergency vehicle mobility, two types of measures have been developed: speed cushions and offset speed tables.

Speed Cushion

A speed cushion (also known as speed lump or speed pillow) has cushions placed longitudinally in the roadway specifically to match the wheel tracks of fire vehicles (see Figure 5.1) [and provide a link to section 3.11 – Speed Cushion]. Field tests have shown speed cushions to reduce general vehicle speeds while providing little to no delay to fire vehicles.[vi] Speed cushions are being used in place of speed humps in many jurisdictions due to their positive reception from fire departments. The following are examples:[vii]

- Austin, Texas found speed cushions have only a minimal, if any, impact on emergency response times with a less than 1 second delay experienced by most emergency vehicles.
- In San Diego, California, fire vehicles can travel over the cushions at full speed with no delay (when driving in the middle of the roadway).

- Sacramento, California found speed cushions cause almost no delay to emergency response time. The city found using speed cushions instead of speed humps results in a savings of almost 13 seconds per typical roadway segment.
- Mobile, Alabama found 1.76 seconds less delay at speed cushions than speed humps for fire vehicles. The delay for ambulances was reduced by 4.75 seconds, when compared to speed humps.
- In Danville, California it was found that no delay occurred in response time with speed cushions, compared to a 10 to 15 second delay observed with speed humps.

Figure 5.1. Fire Engine Straddling Speed Cushion during a Trial Demonstration
(Source: Jeff Gulden)

In Orange County, California tests were conducted to evaluate the effect of speed cushions on delay, comfort, and ease of navigation for fire vehicles. A detailed summary of the study was published in the *ITE Journal* in 2008 and has been one of the key supporting documents for the use of speed cushions to meet the needs of fire vehicles.

The tests were conducted in La Habra, Orange County, California, and involved Brea, California, and Los Angeles County fire department vehicles. Each vehicle traversed a set of three speed cushions with various geometric designs and with different approaches: straddling the smaller cushion and crossing the cushions while staying within the travel lane (similar to a speed hump). The speeds of fire vehicles straddling the smaller, center cushion were similar to normal operating speeds on the roadways, and significant delay at the cushions was not observed. Crossing the cushions while staying in a travel lane (similar to a speed hump) resulted in maximum vertical deflection and lower crossing speeds. The tests led to successful implementation of speed cushions as the key component of neighborhood traffic calming plans in both cities (La Habra and Brea, California). Other jurisdictions have found similar results with speed cushions, that they result in minimal to no delay to fire vehicles.

Speed cushions are effective at reducing speeds on residential roadways while meeting the needs of fire departments. In before-and-after speed data, speed cushions reduced the 85th percentile speed by an average of approximately 9 mph, a reduction of 25 percent.[viii] The speed reductions associated with cushions are similar to those of the speed hump, the current most common traffic calming measure.

Tests conducted in the early 2000s with speed cushions and fire vehicles in King County, Washington resulted in a positive response from the fire department, a minimized increase in response time, and less discomfort from fire personnel in the vehicles.[ix] The same study found that the speed cushions were effective at reducing passenger vehicle speeds and received a positive response from the neighborhood residents.

Offset Speed Table

An offset speed table, a measure that specifically accommodates fire vehicles, allows a fire vehicle responding to an emergency to circumvent the vertical measure by crossing the centerline and briefly traveling against the flow of traffic (see Figure 5.2) [and provide a link to section 3.13 – Offset Speed Table]. A study conducted in Portland, Oregon in the late 1990s found the delay for fire vehicles at offset speed tables to be two seconds, less than the maximum delay associated with traditional speed tables.[x] The Portland experience also shows that a street width of at least 40 feet is needed to allow a fire vehicle to make the s-curve through the offset speed table.[xi]

Figure 5.2. Offset Speed Table with Raised Markers Between the Offset

(Source: Jeff Gulden)

5.4 Emergency Services – Ambulance

An ambulance can be affected by a traffic calming measure, especially a vertical deflection measure. The effects include both the delay associated with slowing to traverse a measure and potential discomfort for those being transported.

Tests conducted in Montgomery County, Maryland in the mid-1990s found that ambulances are delayed by 3.2 seconds at traffic circles and 3.8 seconds at speed humps.[xii] *Traffic Calming: State of the Practice* published data showing an almost 10 second delay per speed hump in both Sarasota, Florida and Austin, Texas.[xiii] Bellevue, Washington found ambulances could comfortably cross a 14-foot speed hump at 17 mph and could navigate a traffic circle at 16 mph, both slower than the desirable travel speeds.[xiv] The ambulances were able to traverse a speed table at close to 35 mph.[xv] There have not been many recent studies relating the effects of traffic calming on ambulance response. This is likely due to the recent improved inclusion of emergency services in the planning and implementation of traffic calming measures.

The needs of ambulances should be considered when developing a traffic calming plan. In some locations, the fire department can speak to the needs of ambulance services; other locations may require the traffic calming practitioner to reach out to individual ambulance providers.

5.5 Emergency Services – Police

Police departments generally approve of traffic calming measures because they slow vehicle speeds without the need for constant or routine enforcement. With traffic calmed roadways, police departments are able to focus their efforts on other areas. Despite this general approval of traffic calming, it is recommended to include the police department in planning and implementation of a traffic calming measure.

A police vehicle in an emergency situation can bypass some traffic calming measures. But is susceptible to reduced speed caused by a vertical deflection feature because a police vehicle is typically the same size as a passenger vehicle. Despite the potential for delay caused by a traffic calming feature, there have been few reported significant complaints raised by police personnel.

Improper design and implementation of a traffic calming measure can result in the need for additional involvement from the police department. For example, a half closure design that does not properly discourage wrong way driving can result in a need for spot enforcement in order to be safe and effective. A speed limit change should be coordinated with the police department to ensure enforcement can occur at the posted speed limit, which often involves a review of the 85th percentile speeds (this also includes posting a speed limit where the default has not been posted).

5.6 Large Vehicles – Transit

Transit needs should be specifically addressed during traffic calming implementation. As a transit vehicle travels around or over some types of measures, the vehicle motion can affect passenger comfort and increase the risk of slips or falls and loose articles being thrown around inside the vehicle. In addition, a heavy passenger load can affect the handling of a bus, potentially affecting the effect of a traffic calming measure.

Transit vehicle drivers are typically trained to be able to navigate through narrow settings, as is often found in a congested urban setting. This constriction can be analogous to that provided by a horizontal deflection, street width reduction, or routing restriction measure.

If traffic calming is to be installed on a roadway used by transit, the design of the traffic calming measure can often be modified to meet the needs of a transit vehicle. This is especially important if the roadway is used by a longer-than-typical bus. Practitioners should be cautious of sacrificing too much in the design of a traffic calming measure because the accommodated transit routes could be modified in the future, leaving a traffic calmed street designed specifically for transit without a transit route.

Transit can be addressed directly in a neighborhood traffic calming program and plan. For example, some cities explicitly discourage and even restrict certain traffic calming measures from being placed on bus routes. New York City for example, does not allow a vertical deflection measures to be placed on a bus route. The ITE *Guidelines for the Design and Application of Speed Humps,* the only traffic calming measure for which ITE provides detailed recommendations, states that when "feasible alternatives are available, speed humps are not recommended for use on streets with public transit."xvi

In neighborhood traffic calming, vertical deflection measures are generally included on lower order roads, such as residential streets, which typically aren't used as transit routes. Therefore, the potential for interaction between transit and vertical deflection measures is minimized. Nevertheless, examples do exist of transit routes on roadways with vertical deflection measures (see Figure 5.3).

The presence of a vertical deflection measure should not be a deterrent to placing a transit route along a roadway. For example, a Salt Lake City, Utah roadway with multiple raised crosswalks, speed humps, and bicycle lanes is also a popular transit route. The example highlights ways in which pedestrian-oriented traffic calming and transit can mix. The raised crosswalks enhance the pedestrian crossings of the roadway and the presence of bicycle lanes and transit adds to the complete street. Transit riders are also often bicyclists or pedestrians for part of their journey, which highlights the benefit of providing transit service on roadways amenable to walking and bicycling.

Consideration should be made where a transit route is combined with a bicycle lane. Conflicts may arise between a bus and a bicyclist if the bicycle lane is to the right of the travel lane because bus passengers board and alight at the curb. It is important to educate both bus operators and bicyclists of this potential hazard.

Figure 5.3. Bus Passing Over a Speed Hump
(Source: Jeff Gulden)

In some jurisdictions, bus drivers are able to influence route location due to ease of driving on roadways. It is conceivable that drivers could influence route location to avoid a traffic calmed roadway if they do not find driving on the roadway to be agreeable. Therefore, although transit can traverse most traffic calming measures, it is recommended to include the transit agency in the planning of traffic calming.

5.7 Large Vehicles – Waste Removal

Vertical deflection, horizontal deflection, and street width reduction measures are not expected to affect the mobility of waste removal vehicle because the vehicle is already travelling a slow speed when servicing the roadway corridor. However, routing restriction measures can complicate the route planning for waste removal. Although not expected to be a significant issue, the needs of waste removal vehicle operators could be solicited early in the planning process.

There is the potential for additional curbside physical features with a horizontal deflection (lateral shift, chicane, realigned intersection), a street width reduction (corner extension, choker), and a routing restriction (full closure, half closure). These features can affect the proper placement of trash cans, which in many communities involve multiple trash cans (for example, one for trash, recyclables, and green waste). The placement could require a resident to walk trash cans to an adjacent property, something that may be met with resistance.

5.8 Large Vehicles – Snow Removal

Traffic calming measures have the potential to affect snow removal vehicles and operations. When traffic calming initially gained popularity across the U.S., snow removal at traffic calming measures was being dealt with for the first time by many agencies. Over the last several decades, agencies have gained significant experience with snow removal issues throughout the country, including Alaska.

The following is a summary of issues and suggested solutions. The issues should be discussed and understood and potential solutions coordinated during the process of developing a traffic calming plan in an area that receives snow. None of the issues represent a fatal flaw as workable solutions have been used across the U.S.

- Potential for damage to traffic calming measures – some jurisdictions mark traffic calming measures or ensure maintenance crew are familiar with their locations on streets they plow.
- Potential for damage to snow removal equipment – potential solutions include using rubber tipped plows, installing gently sloped vertical measures, slightly raising the plow at vertical measures, and using salt (and/or sand) to melt the snow at the measure.
- Snow storage – design horizontal traffic calming measures to accommodate the storage of snow from the roadway, where needed.

In some cases, certain traffic calming measures have been limited for use on priority snow removal routes or snow emergency routes, such as New York City. In Santa Fe, New Mexico, the city restricts the types of measures that can be placed on roads listed on their priority snow removal roads map; horizontal deflection and street width reduction measures are encouraged on priority snow removal roads in the city. Other cities may restrict the usage of speed humps due, in part, to snow removal issues. In Covington, Kentucky, residents are told speed humps are not allowed due to emergency response and snow removal issues.

The option of removing traffic calming measures during winter months exists for some types of installations. Manufacturers of prefabricated vertical measures (speed humps and speed cushions) advertise that one advantage of the prefabricated option is that it can be removed prior to the snow season and reinstalled in the spring. It is unclear as to the extent to which this occurs in the U.S.

The effectiveness of a traffic calming measure does not cease during winter weather. A study presented at the Annual Conference of the Transportation Association of Canada in 2011 found that almost all traffic calming installations remained equally effective during both winter and summer.xviii Most of the traffic calming installations, 71%, did not experience issues with snow removal and in 79% of the cases there were no deteriorations due to snow removal.â„¢"

It is recommended that the group responsible for snow removal be included in the planning and design of a traffic calming plan, no matter the type of measures being considered (e.g., vertical deflection, horizontal deflection, road width reduction, use restriction). There are examples of traffic calming applications along priority snow removal routes. Skilled operators are familiar with the jurisdiction roadway network and can be trained to navigate over and around traffic calming measures.

5.9 Brief History of Relationship of Traffic Calming and Emergency Vehicles

In the 1990s as traffic calming was gaining popularity in the U.S. but still relatively new, there was a strong interest to better understand the impacts of traffic calming on emergency response. Particularly, fire departments were interested in the delay caused by traffic calming measures on their response times. Fire departments typically set maximum response times for emergency situations and there was concern that fire vehicles on traffic calmed streets would encounter unacceptable delay. In addition, there was concern regarding the potential damage that the exposure to traffic calming measures could cause to the fire vehicles, such as the vertical deflection experienced when crossing a speed hump.

Several high profile studies were completed in the 1990s to better understand how traffic calming would impact fire department response. In 1996, the Portland, Oregon Bureau of Traffic Management and the Bureau of Fire, Rescue and Emergency Services conducted tests with six different emergency vehicle types and several different traffic calming measures. The research found the following:[xix] [xx]

- between 0.0 and 9.2 seconds of delay per vehicle per speed table
- between 1.0 and 9.4 seconds of delay per vehicle per speed hump
- between 1.3 and 10.7 seconds of delay per vehicle per traffic circle

Montgomery County, Maryland found that the delay per vehicle caused by speed humps ranged between 2.8 seconds and 7.3 seconds per hump, depending on the type of fire vehicle.[xxi] The County determined that speed humps along an emergency response route would reduce the distance served within 5 minutes from 2 linear miles to 1.3 linear miles.[xxii] The tests also included traffic circles, which delayed the larger fire vehicles by up to 7 seconds.[xxiii]

In Boulder, Colorado, delay associated with speed humps ranged between 2.8 and 4.7 seconds. In Austin, Texas the delay range was much wider, between 1.8 seconds and

9.8 seconds.[xxiv] Speed humps were found to cause a 10 second delay in Berkeley, California.[xxv] [xxvi] [xxvii]

By this time in the U.S. it was clear that speed humps, and other traffic calming measures, adversely affected fire vehicle response time, yet the magnitude of the delay varied significantly. There is no one definitive source as to the exact delay caused by traffic calming measures on fire vehicles. A specific time delay found in one jurisdiction may not be applicable in another jurisdiction.[20]

A study conducted in Eugene, Oregon found an average of 3.6 seconds of delay per speed hump and then compiled data from several studies to determine an overall average delay of 6.5 seconds per speed hump for fire vehicles.[xxviii] Although helpful, the calculated overall average delay wasn't as important as the discussion that had already begun between traffic calming practitioners and fire departments.

Some reviews of the relationship between traffic calming and fire departments have gone beyond the measuring of travel delay for emergency response vehicles. One study[xxix] attempted to quantify the number of additional deaths that would occur in Austin, Texas due to the delay incurred on emergency response vehicles by traffic calming. These viewpoints continue be a topic of discussion between fire departments and livability advocates.

The most important outcome of these early studies was not to establish the exact delay caused by traffic calming but rather to understand the general magnitude that traffic calming has on emergency response. This understanding led to a significant boost for working relationships between fire departments and traffic calming practitioners in the U.S. Although some of those early studies have a confrontational tone toward traffic calming, their effects were instrumental in ensuring that fire departments are a part of the traffic calming discussion in the planning phase.

[20] The amount of fire vehicle delay found in early studies varied significantly. The variance is generally dependent on four factors: vehicle type and size (including whether vehicle tanks are loaded with water), type of traffic calming measure, testing procedure, and driver discretion regarding speed. An often cited study from Portland, Oregon in 1996 stated that fire vehicle performance did not appear to be affected by driving behavior and that the drivers' "choices of deceleration and acceleration rates as well as their choices of minimum speeds near the devices were very consistent."[20] Nevertheless, it is likely that inconsistent driving techniques and testing procedures hinder the ability of an analyst to compare and create a definitive delay estimate per traffic calming measure.

5.10 Process for Coordination with Needs of Emergency Services

As traffic calming has gained widespread acceptance in the U.S., the necessity of fire department involvement has become embedded. The search for new data on the effects of traffic calming on fire vehicles is likely not needed as fire departments already have a seat at the table during traffic calming discussions. The needs of emergency response should be strongly considered when implementing a traffic calming plan. The fire department could be especially helpful during evaluation of the traffic calming measure design, of its exact placement (for example, ensuring a measure does not hinder access to a fire hydrant), and of alternative response routes around the traffic calming installation area.

Fire departments have also been educated to the greater magnitude of risks from motor vehicle fatalities and serious injuries and understand the value of street designs that protect vulnerable road users. In addition, Congress for the New Urbanism has been working with fire authorities on accommodating fire response needs in livable street designs.

The general understanding of the potential adverse effects of traffic calming on emergency response has led to multiple ways that fire departments are accommodated and involved in traffic calming, including the following:

- The limitations that some agencies place on the types of traffic calming measures that can be installed. For example, some cities do not allow vertical traffic calming measures to be installed given their impact on fire vehicles.
- The limitations that some agencies place on where (i.e., which roadways) traffic calming measures can be installed. For example, cities with identified emergency response routes will typically limit the type of measure that can be placed on the priority routes.
- The development or modification of traffic calming measures specifically to accommodate fire vehicles. Examples include the offset speed table and speed cushions. Another example is the cities that have mandated the use of speed cushions over the use of speed humps.
- The inclusion of the fire department as a key stakeholder in community-wide traffic calming plans.
- The involvement of the fire department in all project-specific traffic calming strategies and discussions.

In the late 1990s, the City of Bellevue, Washington conducted traffic calming tests with their fire vehicles and ambulances. The delay associated with speed humps, speed tables, and traffic circles were determined to be similar to the findings of other high profile studies.[xxx] A memorandum of understanding regarding traffic calming was created between the fire department and transportation department. As part of the agreement, 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. The traffic calming plan could be refined based on feedback from the fire department's field visit.

In San Diego, California, the development of the city's traffic calming program included collaboration with the city's fire department. The collaboration included input from both the city and fire responders regarding use of speed humps. The city's prior experience with experimentation of speed cushions and the fire department testing large vehicles

resulted in the insertion of speed cushions as the preferred traffic calming measure over the traditional speed humps.

One of the relatively immediate outcomes of the initial fire vehicle tests was policy changes related to development of an emergency response classification system for streets to guide the implementation of traffic calming measures. Development of policy establishing emergency response routes and traffic calming is often employed by cities and emergency response routes are typically included in neighborhood traffic calming programs. *Pennsylvania's Traffic Calming Handbook* is one example that provides guidance for municipalities in the state on accommodating emergency response with well-planned emergency response routes. Accommodations for emergency response and identification of emergency response routes are a common feature in neighborhood traffic calming programs.

<< **Back to Traffic Calming ePrimer**

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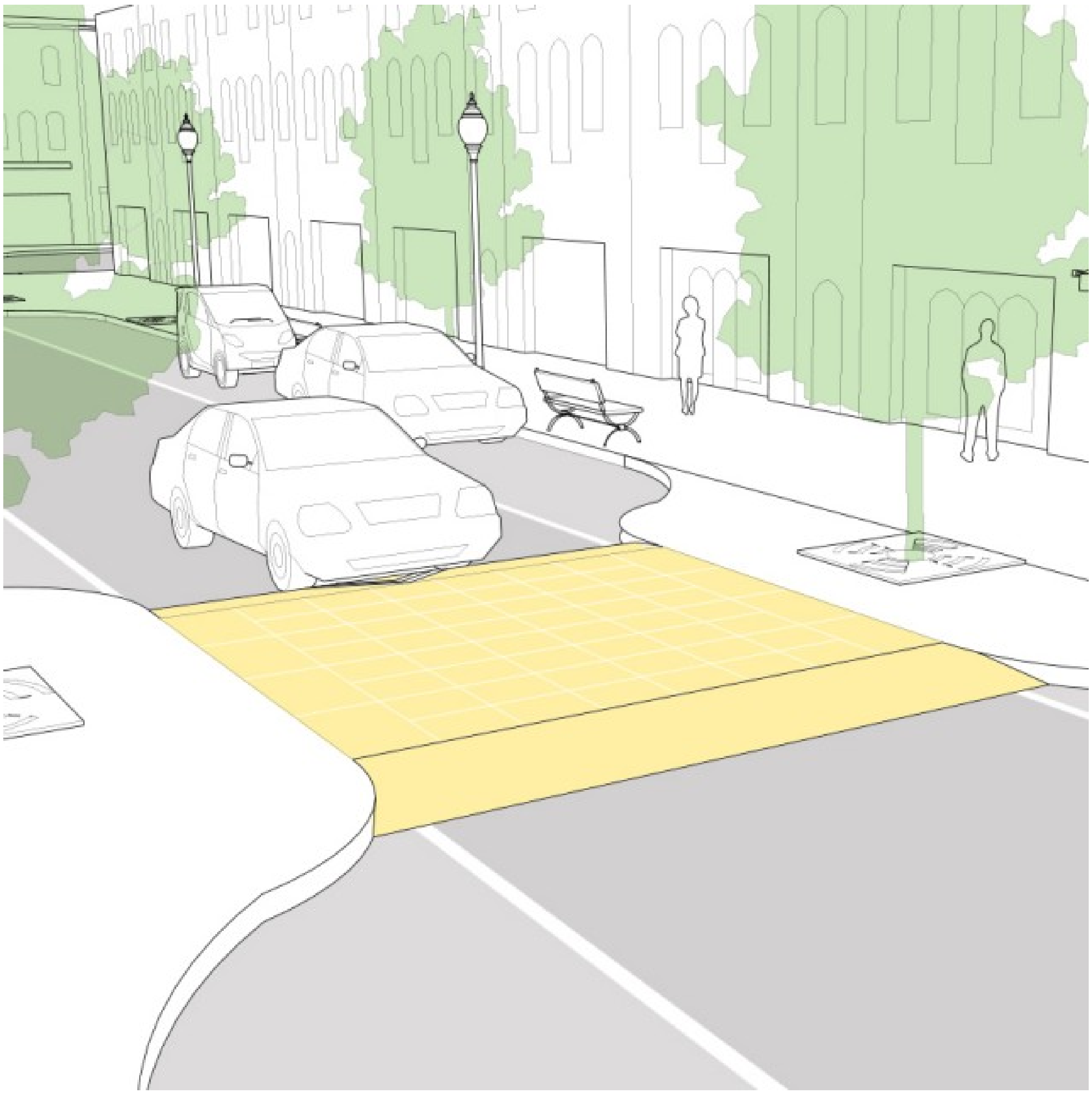

Speed Table

Speed tables are midblock traffic calming devices that raise the entire wheelbase of a vehicle to reduce its traffic speed. Speed tables are longer than speed humps and flat-topped, with a height of 3–3.5 inches and a length of 22 feet. Vehicle operating speeds for streets with speed tables range from 25–45 mph, depending on the spacing.[1]

Speed tables may be used on collector streets and/or transit and emergency response routes. Where applied, speed tables may be designed as raised midblock crossings, often in conjunction with curb extensions.

SPEED TABLE

Where a speed table coincides with a crossing or crosswalk, it should be

designed as a raised crosswalk.

CRITICAL

Speed tables shall be accompanied by a sign warning drivers (MUTCD W17-1).

+ More Info

RECOMMENDED

Speed tables should be designed to the following criteria:

- Slopes should not exceed 1:10 or be less steep than 1:25.
- Side slopes on tapers should be no greater than 1:6.
- The vertical lip should be no more than a quarter-inch high.

Speed tables should not be applied on streets wider than 50 feet. On 2-way streets, speed tables may be applied in both directions.

Where a speed table coincides with a crossing or crosswalk, it should be designed as a raised crosswalk.

+ More Info

Locate vertical speed control elements where there is sufficient visibility and available lighting.

OPTIONAL

Speed tables are often designed using unit pavers or other distinctive materials. Distinctive materials may require additional maintenance responsibilities, but help to highlight and define the speed table for both bicyclists and pedestrians.

+ More Info

FOOTNOTES

+ More Info

Speed Hump

Speed Cushion

Adapted from the Urban Street Design Guide, published by Island Press.

REFERENCES

Urban Street Design Guide

Speed Table Sele

Select city, or leave blank

Keyword

SEARCH AGAIN

REFERENCES FOR SPEED TABLE: 3 FOUND.

Bretherton, W Martin. "Do Speed Tables Improve Safety?." 2003 ITE Annual Meeting, Institute of Transportation Engineers 2003 Annual Meeting , Seattle, WA.

Batson, Scott M. "Offset Speed Tables for Reduced Emergency Response Delay." Institute for Transportation Engineers Technical Conference 2004, Institute for Transportation Engineers, Irvine, CA.

Portland Bureau of Traffic Management. "Speed Bump Peer Review." Bureau of Traffic Management, City of Portland, Portland, OR.

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New DPW Facility Project Funding & Expense Summary					
Appropriations					
Gen	15013010	772000	18526	$9,000,000.00	
	15013010	772000	20584	$2,000,000.00	
Water	55016010	772000	18526	$4,500,000.00	
	55016010	772000	20584	$1,000,000.00	
Sewer	55026020	772000	18526	$4,500,000.00	
	55026020	772000	20584	$1,000,000.00	
				$22,000,000.00	Bonding Authority
UP Front Bonded in advance					
Gen 2020				$5,000,000.00	
Gen 2022				$5,700,000.00	
Water 2020				$2,500,000.00	
Water 2022				$2,870,000.00	
Sewer 2020				$2,500,000.00	
Sewer 2022				$2,870,000.00	
				$21,440,000.00	
Expensed to Date					
Gen	15013010	772000	18526	$9,000,000.00	
	15013010	772000	20584	$1,729,034.64	
Water	55016010	772000	18526	$4,500,000.00	
	55016010	772000	20584	$878,999.39	
Sewer	55026020	772000	18526	$4,500,000.00	
	55026020	772000	20584	$880,850.61	
				$21,488,884.64	**Acutal Epended to date**

Appropriations Total	$22,000,000.00	
less expenses	$21,488,884.64	
Project Balance - Bonding Authority	**$511,115.36**	
Expenses Total	$21,488,884.64	
Advance Bonded (actual)	$21,440,000.00	
Expended over bonded in advance	$48,884.64	
Estimate Building Modification	$47,000.00	If Approved
Estimate Worst Case Sidedwalk	$30,000.00	**Likely negotiated cost share-sidewalks rejected**
Estmate to be spend over bond up front	**$125,884.64**	**change funding to cash instead of Bonding**
Remaining funds with bonding Authority	$511,115.16	
less change of funding from bond authority to cash	$125,884.64	
Under budget - Deauthorization Bonding Auth	**$385,230.52**	