TRAFFIC CALMING AND DESIGN SPEED

Traffic calming is the combination of measures that reduce some of the negative effects of motor vehicle use, alter driver behavior, and improve conditions for vulnerable road users. Traffic calming uses physical measures to slow motor vehicle speeds and encourages desired behaviors to maximize safety, such as yielding to pedestrians and bicyclists. Typical traffic calming measures include cross-section measures, such as street trees, narrower lanes, and on-street parking. They also include periodic measures, such as curb extensions, speed tables, and chicanes. Traffic calming is an important tool to help improve walking and bicycling conditions.

Design speed is a fundamental factor in roadway design and is used to establish design features. It affects horizontal alignment, vertical alignment, and cross section features. Higher design speeds can result in streets that are less comfortable for vulnerable users. As speeds increase, crash severity and fatality rates increase significantly for all users: pedestrians, bicyclists, and people in motor vehicles. Designers have the flexibility to set design speeds lower than the posted speed limit.

KEY DESIGN FLEXIBILITY

The 2011 AASHTO Green Book provides flexibility when it comes to selecting appropriate design speeds given the context of a particular roadway:

“Design speed should be a logical one with respect to the anticipated operating speed, topography, the adjacent land use, and the functional classification of the highway. In selection of design speed every effort should be made to attain a desired combination of safety, mobility, and efficiency within the constraints of environmental quality, economics, aesthetics, and social or political impacts”

AASHTO Green Book 2011, p. 2-54

OTHER RESOURCES

“In urban areas, the design of the street should generally be such that it limits the maximum speed at which drivers can operate comfortably, as needed to balance the needs of all users.”

FHWA, “Relationship between Design Speed and Posted Speed,” memorandum, October 7, 2015

“The severity of pedestrian crashes, a significant concern in urban areas, is greatly increased as speeds increase. Context-sensitive solutions for the urban environment often involve creating a safe roadway environment in which the driver is encouraged by the roadway’s features and the surrounding areas to operate at low speeds.”

AASHTO Flexibility Guide 2004, p. 19

“There is a direct correlation between higher speeds, crash risk, and the severity of injuries... Design streets using target speed, the speed you intend for drivers to go, rather than operating speed. The 85th percentile of observed target speeds should fall between 10–30 mph on most urban streets.”

NACTO Urban Street Design Guide 2014, pp. 140–141

“Traffic calming challenges the traditional design view of a roadway design, namely, that higher speeds are desirable and indicative of a high-quality design.”

AASHTO Flexibility Guide 2004, p. 88
TRAFFIC CALMING AND DESIGN SPEED MYTHS

This design topic addresses myths related to traffic calming and setting appropriate design speeds for new roadways and retrofit projects.

MYTH 1: ROUTE MODIFICATIONS ARE A FORM OF TRAFFIC CALMING

Traffic calming is about reducing speeds, not about removing pieces of the street network or changing the route people take from Point A to Point B. These techniques are called “route modifications.” Route modifications remove access through signing and minor geometric changes (i.e., one-way restrictions, street closures, partial closures, turn prohibitions, and diverters). In general, they should be used with caution, because they can have the impact of increasing traffic volumes on other streets that also serve pedestrians and bicyclists. However, route modification can be used to compliment traffic calming efforts on certain project types, such as neighborhood greenways or bike boulevards. In some cases, traffic calming projects may result in reduced traffic volumes and motorists may divert to other routes. This outcome should be factored into a network approach to traffic calming.

MYTH 2: STOP SIGNS ARE TRAFFIC CALMING MEASURES

Sometimes residents request STOP signs to deter drivers from speeding in their neighborhoods. However, STOP signs must meet certain criteria in order to maintain effectiveness. STOP signs installed for the purpose of slowing motorists can be counterproductive: motorists may accelerate rapidly after a stop and maintain higher speeds between signs. This behavior is called “speed spiking.” Additionally, motorists may roll through STOP signs, endangering pedestrians who are expecting vehicles to come to a complete stop.

MYTH 3: DESIGN SPEED SHOULD BE GREATER THAN POSTED SPEED

Some designers use a design speed that is higher than the posted speed with the goal of improving safety. However, higher design speeds can result in more generous vehicular designs that cause motorists to drive faster, which reduces safety. Best practices from ITE and NACTO recommend setting a design speed equal to the target speed. As defined in the ITE Designing Walkable Urban Thoroughfares, “Target speed is the highest speed at which vehicles should operate on a roadway consistent with the level of multimodal activity and adjacent land uses to provide both mobility for motor vehicles and a safe environment for pedestrians, bicyclists, and public transit users” (2010, p. 108). Designers should consider several factors in addition to the posted speed to determine an appropriate design speed including, but not limited to, target operating speed, type and density of adjacent land uses, level of pedestrian, bicycle, and transit activity, and frequency of driveways.

MYTH 4: POSTED SPEED LIMITS MUST USE THE 85TH PERCENTILE METHODOLOGY

The FHWA Methods and Practices for Setting Speed Limits summarizes several engineering approaches to setting speed limits. The “Engineering approach” and “Expert system approach” are the most commonly used. The Engineering approach primarily uses the 85th percentile speed (2012, p. 10). However, from a safety perspective this approach can result in excessive speeds. For the Expert system approach, FHWA developed a model called USLIMITS2, which determines an appropriate speed limit for all roadway users. For roadway segments that experience high pedestrian and bicyclist activities, USLIMITS2 recommends speed limits close to 50th percentile instead of 85th percentile speed.

A third approach set forward in Methods and Practices for Setting Speed Limits called the “Injury minimization” or “safe system approach.” This approach is often more appropriate in locations with pedestrian and bicycle activity. In this approach, “speed limits are set according to the crash types that are likely to occur, the impact forces that result, and the human body’s tolerance to withstand these forces” (2012, p. 10). This approach is consistent with Vision Zero principles—which state that no loss of life on a road system is acceptable. The “injury minimization” approach is therefore highly appropriate in contexts where people commonly walk or bike. After traffic calming measures have been implemented, a speed study should be conducted to determine if the speed limit can be reduced.

MYTH 5: CLEAR ZONES SHOULD BE APPLIED EQUALLY ON ALL STREETS

Clear zones are a “forgiving” roadside design concept intended to decrease the frequency and severity of fixed-object crashes by providing a space for errant vehicles to recover after leaving the roadway. While clear zones are appropriate for freeways and high speed roadways, the AASHTO Roadside Design Guide recognizes that there are practical limitations to clear zones on low-speed curbed streets. In urban, suburban, and small town rural settings where pedestrian and bicycle activity is expected and the traffic speed is lower and depending on the context, roadway design may incorporate street trees, furnishings, and plantings to create a sense of enclosure. This provides a traffic calming effect, which may increase comfort and safety for vulnerable road users.
As motor vehicle speeds increase, the risk of serious injury or fatality for a pedestrian also increases (AARP Impact Speed and a Pedestrian’s Risk of Severe Injury or Death 2011, p. 1). Also, motorist visual field and peripheral vision is reduced at higher speeds.

**MYTH 6: RAISED INTERSECTIONS AND RAISED CROSSWALKS ARE NOT APPROPRIATE ON ARTERIAL STREETS**

Raised measures require motor vehicles to reduce speeds and can be appropriate on arterial roadways, particularly at intersections with slip lanes and on intersecting side streets. As stated in the AASHTO Flexibility Guide, “traffic calming techniques may apply on arterials, collectors, or local streets” (2004, p. 87). Raised measures may not be appropriate on higher speed roads. If raised measures are desired to improve pedestrian or bicyclist safety, designers should consider completing a study and reducing the speed limit to 35 mi/h or lower. Raised measures can minimize impacts to emergency vehicle response times through strategic placement and design details such as longer ramps, slots, or tire grooves. Gradual transitions on raised measures benefit passenger comfort and pavement conditions. These slots or grooves can be placed at locations that correspond to emergency vehicle wheelbases.

**MYTH 7: LOWER SPEEDS ALWAYS INCREASE TRAVEL TIMES**

Roadways designed for lower motor vehicle speeds may not result in longer travel times compared to similar streets with higher motor vehicle speeds. Travel times depend on a wide variety of factors, such as intersection frequency, operational efficiency, and driver characteristics. Delay for motorists in suburban and urban areas is often due to congestion at signalized intersections, and usually not travel speeds between intersections. There are several techniques to lower motor vehicle speeds that improve safety for all roadway users while simultaneously reducing congestion. Replacing signalized intersections with modern roundabouts, a Proven Safety Countermeasure, or coordinating signals for speeds of 15 to 25 mi/h (AASHTO Green Book 2011, pg. 2-57) can maintain or reduce vehicular travel times on a corridor.

**ADDITIONAL RESOURCES**

There are several comprehensive guides to traffic calming that provide additional information such as Traffic Calming: State of the Practice (1999) by FHWA and ITE, the Traffic Calming Website (http://www.ite.org/traffic/) by ITE, and LA Living Streets Manual: Chapter 10 Traffic Calming (2012) by the City of Los Angeles.
CASE STUDIES

SOUTH GOLDEN ROAD
GOLDEN, CO

The City of Golden installed a series of four roundabouts resulting in improvements to traffic operations and economic development. Initially, South Golden Road served 12,000 vehicles per day via four travel lanes and one center turn lane. The wide roadway, inconsistent sidewalks, and numerous driveways contributed to speeding and reduced access to side streets. In 1999, four roundabouts and raised medians were constructed. After installation, the 85th percentile travel speed decreased from 47 mi/h to 35 mi/h, and travel time decreased from an average of 103 to 78 seconds. The crash rate dropped 67 percent and traffic-related injuries dropped over 80 percent. The more pedestrian-oriented environment contributed to economic activity, and sales tax revenue increased 68 percent.

OLIVE AVENUE
WEST PALM BEACH, FL

In 1999, the City of West Palm Beach completed a traffic calming project on Olive Avenue, a State arterial roadway. The road had been one-way with approximately 12,000 vehicles per day and relatively high speeds. Beach Atlantic College, which occupies both sides of Olive Avenue, was considering building two pedestrian bridges to connect their severed campus. The City of West Palm Beach, the Florida Department of Transportation, and the College collaborated to improve the design. The new design narrowed travel lanes, added landscaping and street trees, and converted the arterial from one-way to two-way. The project incorporated raised crossings, designed with transitions suitable for emergency vehicles. The result provided comfortable at-grade crossings, increased property values, improved quality of life, and reduced traffic volumes.

ARTERIAL SLOW ZONE PROGRAM
NEW YORK CITY, NY

One strategy to create self-enforcing, slower speeds is through signal progression along signalized corridors, supplemented by other traffic calming measures, education, and enforcement. As a part of New York City’s Vision Zero initiative, the Arterial Slow Zone Program focuses on reducing speeds along corridors with high crash rates. On the 25 corridors selected as Arterial Slow Zones, signals were retimed for 25 mi/h speed progression. Slow Zone branding signs similar to the City’s Neighborhood Slow Zones program were added to the corridor. In addition, police provide focused enforcement along these zones for speeding, failure to obey traffic signals, and failure to yield to pedestrians.