Exhibit "A"

City of El Paso

Neighborhood Traffic Management Program

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Acknowledgements

City of El Paso

Mayor
Dee Margo

City Council
Peter Svarzbein, District 1
Alexsandra Annello, District 2
Cassandra Hernandez, District 3
Dr. Sam Morgan, District 4
Dr. Michiel Noe, District 5
Claudia Ordez Perez, District 6
Henry Rivera, District 7
Cissy Lizarraga, District 8

City Management
Tommy Gonzalez
Ted Marquez

Traffic Division of Streets and Maintenance Department
Richard Bristol
Keith Bennett
Rudy Pino
Justin Bass

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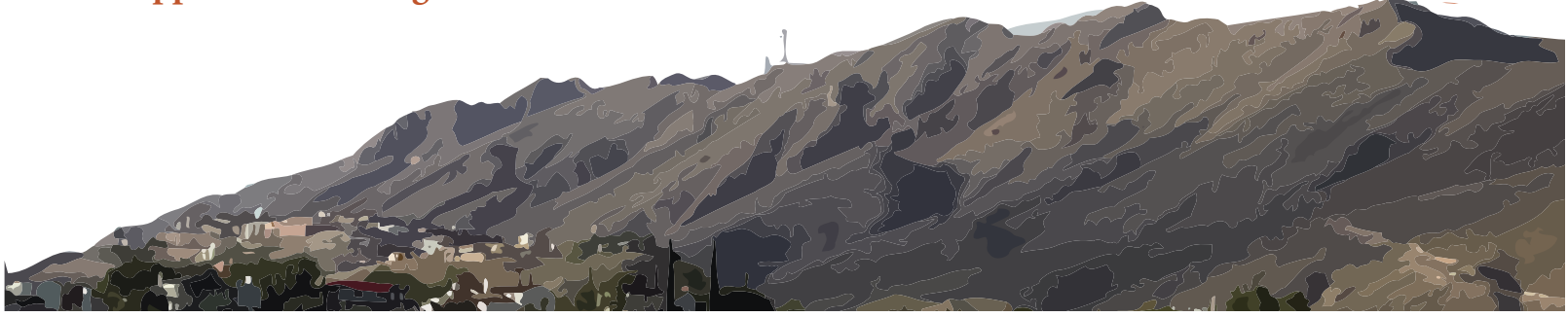


Chapter 1

Introduction to the Neighborhood Traffic Management Program

The City of El Paso's Neighborhood Traffic Management Program (NTMP) addresses concerns primarily related to safety as caused by vehicle traffic on neighborhood streets.

The NTMP includes a formal application and process for the implementation of traffic calming measures in El Paso neighborhoods and a toolbox of those traffic calming measures. This manual documents the purpose of traffic calming, request process and design guidelines for the program.

The first chapter outlines the purpose and elements of the program.

Purpose

The NTMP is designed to address the following neighborhood traffic problems:

Safety & Security — Excessive traffic speeds are a threat to neighborhood security and cause residents to retreat into their homes, essentially abandoning the street to vehicles. Reducing traffic speeds and volumes through traffic calming measures are powerful ways for residents to start to reclaim their streets.

Speeding Trends — Many motorists (neighborhood residents as well as "cut-throughs") drive too fast on local streets. While some speeding is done by irresponsible drivers, speeding may also be the result of normally responsible drivers who find themselves "invited" to speed by the road's design features, such as excessively wide pavement, straight sections of road, and absence of vegetation. In addition to safety concerns, speeding vehicles degrade the quality of the street for all other users, giving the impression that the street is solely for the motorist and not a unifying element for the neighborhood.

Cut-Through Traffic — Cut-through traffic has neither its origin nor destination within a neighborhood, but rather is passing through a neighborhood on local streets. Traffic engineers intend that through traffic use major arterial streets, not neighborhood streets. Unfortunately, motorists often use neighborhood streets to shorten driving distances, avoid signals, or because they are more pleasant and therefore seem faster.

Elements

The problems of safety, security, speeding trends, and cut-through traffic can be addressed in El Paso with a NTMP that utilizes the three "E's" — Education, Enforcement, and Engineering.

Education — Neighborhood traffic management studies have shown that often the residents themselves contribute to the perceived speeding problem within the neighborhood. Because of this fact, the most effective NTMPs use all three "E's" and begin with resident education about the need to obey speed limits and yield to pedestrians. Engineering measures alone may not produce satisfactory results.

Enforcement — Intensified enforcement of traffic regulations can calm traffic, generally by reminding drivers of posted speed limits and enforcing the observance of stop signs. Police officers are the usual source of intensified enforcement, but neighborhood volunteers can also prove effective in this area.

Engineering — Engineering solutions physically modify the roadway in some manner to encourage drivers to alter their behavior by reducing speed, raising awareness of pedestrians and bicyclists, or diverting traffic to a more appropriate street. These engineering solutions are often intended to be "self-enforcing."

The success of the City of El Paso's NTMP will be measured by the usability of the initiative by the general public, and the ease of implementation for the City. The methodology used to define this program is based on listening to the needs of the citizens; understanding the concerns, constraints, and opportunities presented by staff, policy makers, and private developers; and designing a program that does not compromise on critical elements, but rather customizes the NTMP to the unique environmental, cultural, and political factors found in El Paso.

Chapter 2

Neighborhood Traffic Management Program Options

Will traffic calming work in my neighborhood?

Traffic calming can work on most local or collector level streets. The program is not appropriate for arterial streets designed for higher traffic volumes and/or speeds. The El Paso functional classification system defines the streets that traffic calming may be applied to.

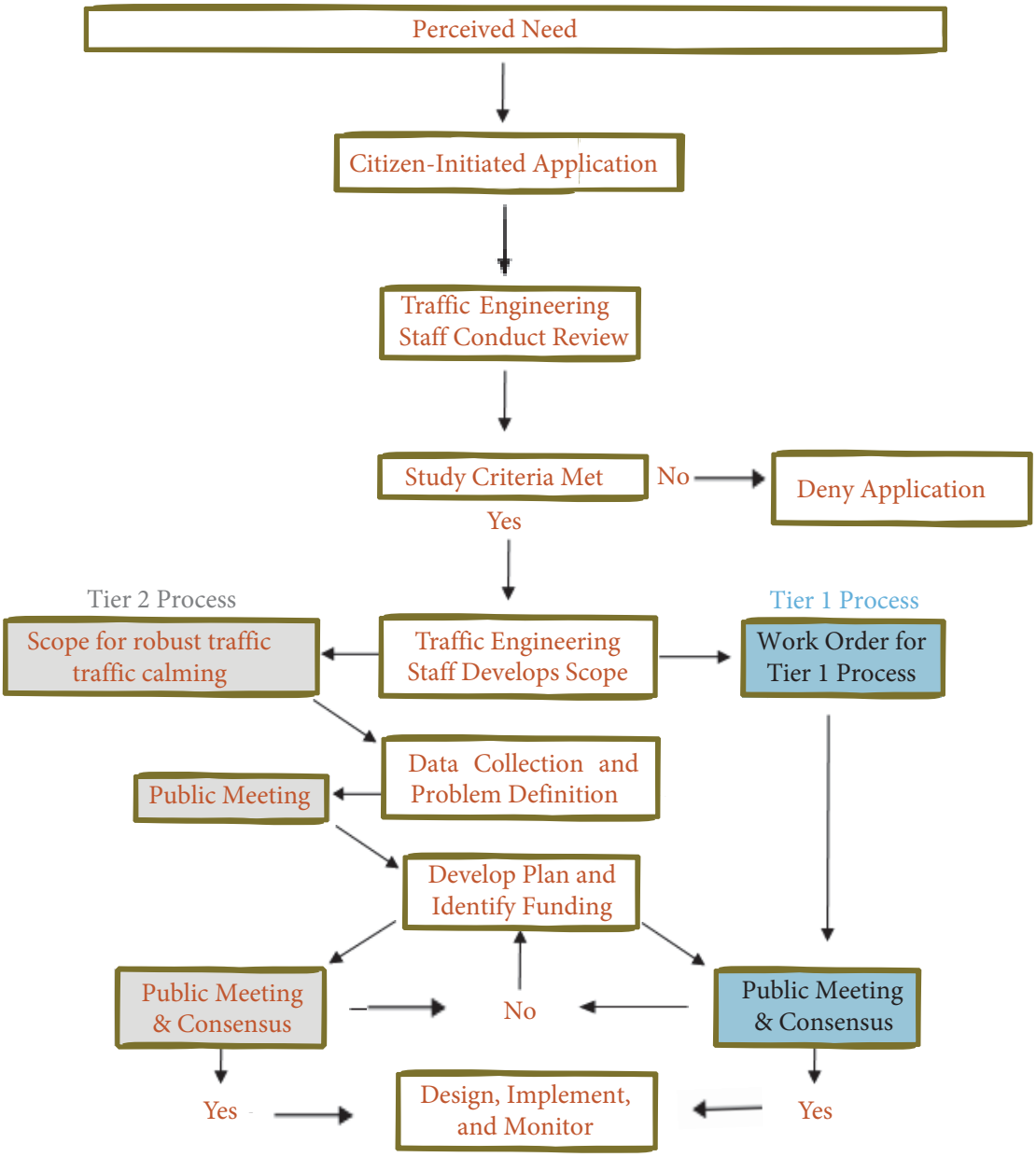
Neighborhood street speeding concerns typically need immediate attention and require an efficient process. For this reason, this manual recommends a two-tiered approach to traffic calming measures. The following chapter details the process for both the Tier 1 and Tier 2 approaches.

NTMP Options

The NTMP Process

The NTMP is a two-tiered program. The "Tier 1" process will be utilized to address most traffic situations. This process can be implemented in less time and typically with in-house resources. The "Tier 2" process is a more robust approach to solving traffic issues using more community-involved, time-intensive and capital-intensive solutions.

The "Tier 2" process can be requested, or the City Traffic Engineer may recommend it, based upon the complexity of the issues defined and the time frame needed to resolve them. The chart below describes the general flow of a NTMP request.



NTMP Options

All of the following criteria must be satisfied for a street to be considered eligible for the NTMP.

1. Petition

A petition that documents that at least 66% of the residential households abutting the street support traffic calming installations.

2. Uses Of Street

The uses on the street where the measure is proposed must be composed primarily of low density residential dwellings.

3. Operational Characteristics Of The Street

a. The street must be used to provide access to abutting residential properties (local residential street) and/ or to collect traffic for such streets (residential collector).
b. There must be no more than one moving lane of traffic in each direction.
c. Traffic volumes must be more than 500 vehicles per day but less than 7,500 vehicles per day.
d. Fifteen percent (15%) of traffic must meet or exceed five miles per hour (MPH) over the posted speed limit.
e. The street must have a speed limit of 20-35 MPH as determined in accordance with State Law.
f. The street must have a crash rate that is at least 25% above the baseline rate established by the City Traffic Engineer. *Meeting this criteria may substitute for Criteria 3d.* * [t]

4. Geometric Characteristics Of The Street

a. The street must have adequate sight distances to safely accommodate the traffic calming device.
b. The street must not have curves or grades that prevent safe placement of devices. Traffic calming devices may be located on streets that contain curves and/or grades, but the device itself must not be located within a horizontal curve, on a vertical grade greater that 8% or on their immediate approaches.
c. The street must be paved. It there are no curbs, a special design must be used to prevent vehicle run-arounds.
d. The elevation of property adjacent to a physical measure location must be above top of curb to minimize potential flooding due to the presence of the traffic calming device in the roadway.

5. Cost Responsibility

If City funding is not available, the cost for NTMP installations (including design, materials and construction/labor), as recommended by the City Traffic Engineer, may be paid 100% by the residents.

** Based on collision patterns, speed cushions may not be the appropriate option to address the issue. Other safety solutions, outside of the NTMP, may be considered and implemented by the City Traffic Engineer.*

[t] *Crash rates are a tool that allow traffic engineers and planners to compare and determine if a given street segment is experiencing a high crash rate. Crash rates are calculated by determining the total number of crashes on a given roadway section taking into consideration the amount of vehicular volume, roadway length, and period of time analyzed. The resulting crash rate is the number of crashes per 100 million vehicle miles driven.*

NTMP Options

Tier 1 Process - Primary Process for Most Streets

Tier 1 includes the option for:

- speed cushions (local residential, residential collector streets),
- speed feedback signage (residential collector streets),
- and any related striping or signage.

Tier 1 is designed to address speeding and cut-through traffic on local or collector streets and/or blocks. Traffic Engineering staff will make recommendations for locations of devices and vet through neighborhood outreach prior to installation.

Since speed cushions can be considered to have undesired impacts - such an noise pollution - for adjacent properties, additional consensus of property owners directly abutting proposed speed cushion locations will also be sought prior to installation.

These measures can be removed at the discretion of the City Traffic Engineer in the following situations:

- To mitigate an unforeseen safety concern.
- To mitigate an unacceptable diversion of traffic.
- In response to a community-driven petition to remove the subject device(s) per Chapter 5 (unless deemed a necessary installation to address a safety issue).

Purpose – Response to block or street–long complaints.

Request process – Petition of 66% of households on block or street.

Study – Speed, volume, and collision analyses.

Implementation and Monitoring – Speed cushions and/or speed feedback signage will be installed after public vetting process. City staff will conduct a study 6-12 months after installation to determine effectiveness. If speeding trend persists, staff may propose additional improvements.

Project Prioritization – Streets are to be addressed in order of submittal of a completed application and as they qualify for the program unless the City Traffic Engineer deems that a street has demonstrated a sufficient need as to warrant an expedited response.

Tier 1 Traffic Calming

Speed Cushions

Speed cushions are two or more raised areas placed laterally across a roadway with gaps between the raised areas. The gaps allow emergency vehicles to pass through at higher speeds. For other vehicles, speed cushions introduce a navigable vertical element that is designed to be traversed at slower speeds without causing discomfort to the driver. Discomfort increases as the speed over the cushions increase.

Measured and Potential Impacts

Speed Impacts – Average reduction in speeds between slow points = 20% - 25%

Volume Impacts – Average reduction in vehicles per day = ~20%

Collision Impacts - Average collision rates reduced by 13%.

Source: ITE Traffic Calming Fact Sheets (May 2018)

Advantages

- Slows traffic immediately, self-enforcing
- Inexpensive
- Does not slow emergency vehicles

Disadvantages

- Motorists tend to speed up between cushions
- Increases noise and pollution in neighborhood
- Motorcycles not impacted

Speed Feedback Signs

A speed feedback sign is a device that measures each approaching vehicle's speed and displays it next to the legal speed limit in clear view of the driver, reminding drivers to slow to the speed limit. Real-time speeds are relayed to drivers and flash when speeds exceed the limit.

Speed feedback signs are also common solutions on arterial streets, although such requests are not processed through the NTMP.

Measured and Potential Impacts

Speed Impacts – Potential reduction in 85th percentile speeds = 5 MPH

Source: FHWA Engineering Speed Management Countermeasures (July 2014)

Advantages

- Inexpensive
- Does not require time for design
- Does not slow emergency vehicles
- Effective in reducing speeds in a short time frame

Disadvantages

- Requires power source
- Only effective for one direction of travel
- Long-term effectiveness uncertain
- Subject to vandalism

NTMP Options

Tier 2 Process - Capital Project

Tier 2 includes options for:

- traffic circles,
- medians/center islands,
- bulb outs/curb extensions, and
- other devices as identified in Chapter 4 and Appendix C

Tier 2 projects use design and engineering to reduce vehicle speeds and to mitigate the negative impacts of vehicular traffic on qualified streets. Tier 2 projects attempt to address traffic issues utilizing robust, best practice improvements. Tier 2 projects require considerably more public input, design, construction, time and capital.

Tier 2 projects require City Council authorization.

These measures can be removed at the discretion of the City Traffic Engineer in the following situations:

- To mitigate an unforeseen safety concern.
- To mitigate an unacceptable diversion of traffic.
- By City Council approval, in response to a community-driven petition to remove the subject device(s) per Chapter 5 (unless deemed a necessary installation to address a safety issue).

Purpose – Response to block or street–long complaints.

Request process – Petition of 66% of households on block or street.

Study – Speed, volume, and collision analyses.

Implementation and Monitoring – Implementation can take years as funding must be available prior to design. Design, public vetting, and construction of projects can also take considerable time.

City staff will conduct a study 6-12 months after installation to determine effectiveness. If speeding trend persists, staff may propose additional improvements.

Project Prioritization – Tier 2 projects will be funded in order of receipt of a completed NTMP application.

NTMP Options

Tier 2 Process - Prioritizing and City Council Authorization

NTMP applicants - with City Traffic Engineer concurrence - that opt for a Tier 2 Process, have the option of temporary or permanent Tier 1 installations while awaiting funding for a Tier 2 project. Tier 2 funding is not guaranteed and may take years to be made available.

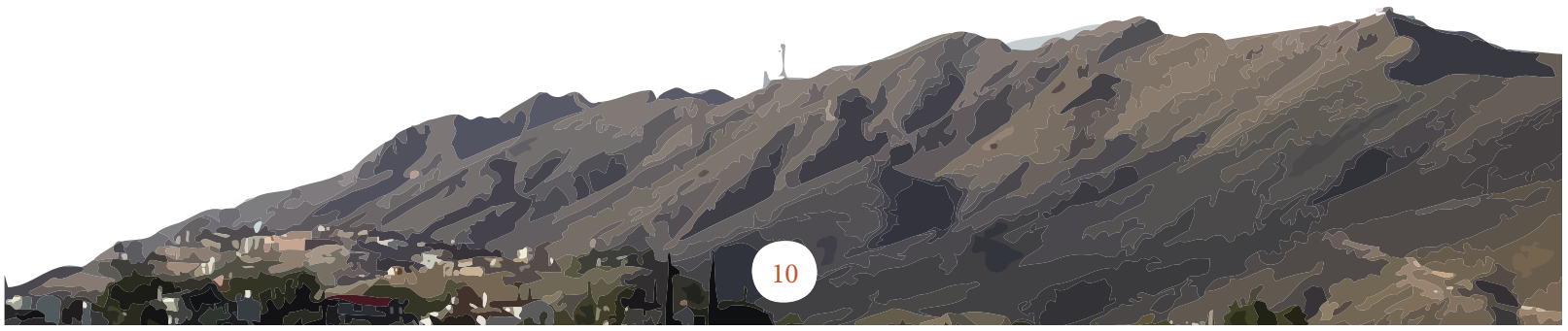
Prioritizing:

Tier 2 projects will be considered based on order of receipt of a completed NTMP application, and the ordered list will be maintained by staff. As funding is authorized, projects will be fully funded based on order. If remaining funding is not sufficient to fully fund the next project, the City Traffic Engineer may determine if a portion of the project is feasible to complete until additional funding can be identified.

City Council Authorization:

Tier 2 projects require City Council authorization. Staff will present the ordered list of any Tier 2 projects on an annual basis to City Council. The presentation will include a schematic design based on the NTMP Manual and other City-approved design guidelines - that has been vetted and has consensus from the applicable street property owners and residents - and an estimate of probable design and construction costs. City Council must review the information, vote to approve the project, and identify an existing or future funding source(s).

If City Council does not approve a Tier 2 project, then the project will be addressed utilizing Tier 1 improvements, if feasible. The applicant may choose to have the project reconsidered by City Council on an annual basis.



Ineligible Traffic Control Devices

Modifications to posted speed limits and the addition of stop signs or traffic signals are not available through the NTMP. The warrants for these devices are explained below.

Speed Limits

Speed limits for collector and arterial roadways are established based upon recognized engineering criteria related to roadway design. Some of the criteria includes:

- Street width
- Lane width
- Sight distance
- The 85th percentile speed (critical speed)

By State statute, local streets, as defined by the vehicle code, have a 30 mph speed limit.

Close proximity to sources of pedestrian usage such as schools and parks may be cause for a lower speed limit, but any speed limit modifications require meeting stringent State requirements and City Council action.

Stop Signs

The City of El Paso does not install stop signs as part of the NTMP. The federal *Manual on Uniform Traffic Control Devices* (MUTCD) which is the recognized authority, states that "Stop Signs shall not be used for speed control." It has been the City's experience that unwarranted stop signs do not make effective traffic calming devices for the following reasons:

- Drivers generally tend to make up the time lost at an unwarranted stop sign by speeding up between signs.
- Stop signs also increase the noise and pollution level in a neighborhood from cars decelerating to stop, then accelerating.
- Drivers tend to run unwarranted stop signs once they notice no traffic on the opposing directions.

Stop signs are installed at locations where right-of-way assignment is required due to a large number of vehicles entering the intersection from all directions.

The following is a procedural list for stop sign traffic control:

1. Residents request for right-of-way management.
2. Analysis is performed, which includes traffic volume counts, pedestrian volume, accident history, sight distance, and on-site observations.
3. If the intersection meets necessary requirements (warrants), then stop sign traffic control is usually recommended.
4. Recommendations for the installation of stop signs at unwarranted locations would need to be forwarded to the to City Council for final approval.

Chapter 3

Traffic Calming Program Implementation

What traffic calming tools will work on my street?

Tier 1 traffic calming can be implemented on most residential streets. This type of approach can result in more timely solutions to documented speeding and traffic issues.

Tier 2 traffic calming may vary by geographic location and the preferences of residents involved in the process. This chapter further defines a process that should be used by residents and Traffic Engineering staff to determine the education, enforcement and engineering techniques that will be successful for a Tier 2 project. By clearly identifying traffic problems, setting goals and objectives, and selecting appropriate traffic calming measures to meet those goals and objectives, residents can develop a plan that has a greater likelihood of being approved and of meeting its goals.

This chapter ends by detailing additional placement guidelines for the installation of speed tables or speed cushions.

Tier 1 NTMP Implementation

Characterizing the Problem and Its Environment

The first step in developing a Tier 1 traffic calming plan is to characterize the problem type and to gather information about other conditions present at the problem location. This is accomplished through three tasks:

- Neighborhood traffic problems are identified and documented by staff and residents
- Characterize problem(s) and detail problem location(s)
- Collecting quantitative data and characterizing physical and environmental conditions

Neighborhood Input

Resident input must be used to determine whether the primary concern is one of vehicle safety, pedestrian safety, congestion, noise, inconvenience, or something else entirely. This can be accomplished by input from the NTMP application form and verified using verbal and written communication from the public.

Characterizing Problem Details

When the primary problem type is determined, the details of the problem need to be characterized: exactly where does it occur, and at what times of day and days of week? Is there a traffic control device (such as all-way stop control at an intersection) that does not seem to work? This type of detail should be accounted for by conducting walking or driving audits of the area by at least one resident of the problem street and Traffic Engineering staff. This detail will give more direction to what quantitative data needs to be collected.

Collecting Data

Knowing the exact nature of the problem, the next step is to collect relevant information about the problem and its environment. Data may actually lead staff to use traffic engineering solutions outside the NTMP to address the problem.

Setting Goals and Objectives

The residents should have some idea of their desired outcome. Goals should also be stated to express in qualitative terms, the kind of street the residents desire. Quantitative objectives should be set for each traffic problem to help assess the success of the traffic calming plan in solving the problems. There are no common or regulatory standards for setting these objectives. Consequently, the objectives should be seen simply as rough yardsticks of success in reviewing the executed plan.

Quick Implementation:

- Applicant submits an application with resident signatures.
- Upon receipt of a completed application, staff schedules applicable studies to determine speed, volume, and accident trends.
- If street qualifies for program, staff drafts plan of device locations.
- Staff holds a public meeting to discuss findings and proposed device locations and to gain consensus.
- Staff confirms device location with directly abutting property owners.
- Devices are installed.
- A follow-up study is conducted 6-12 months after installation to verify effectiveness.

Tier 2 NTMP Implementation

Characterizing the Problem and Its Environment

The first step in developing a Tier 2 traffic calming plan is to characterize the problem type and to gather information about other conditions present at the problem location. This is accomplished through three tasks:

- Neighborhood traffic problems are identified and documented by staff and residents
- Characterize problem(s) and detail problem location(s)
- Collecting quantitative data and characterizing physical and environmental conditions

Neighborhood Input

Resident input must be used to determine whether the primary concern is one of vehicle safety, pedestrian safety, congestion, noise, inconvenience, or something else entirely. This can be accomplished by input from the NTMP request form and from verbal and written communication from the public.

Characterizing Problem Details

When the primary problem type is determined, the details of the problem need to be characterized: exactly where does it occur, and at what times of day and days of week? Is there a traffic control device (such as all-way stop control at an intersection) that does not seem to work? This type of detail should be accounted for by conducting walking or driving audits of the area by at least one resident of the problem street and Traffic Engineering staff. This detail will give more direction to what quantitative data needs to be collected.

Collecting Data

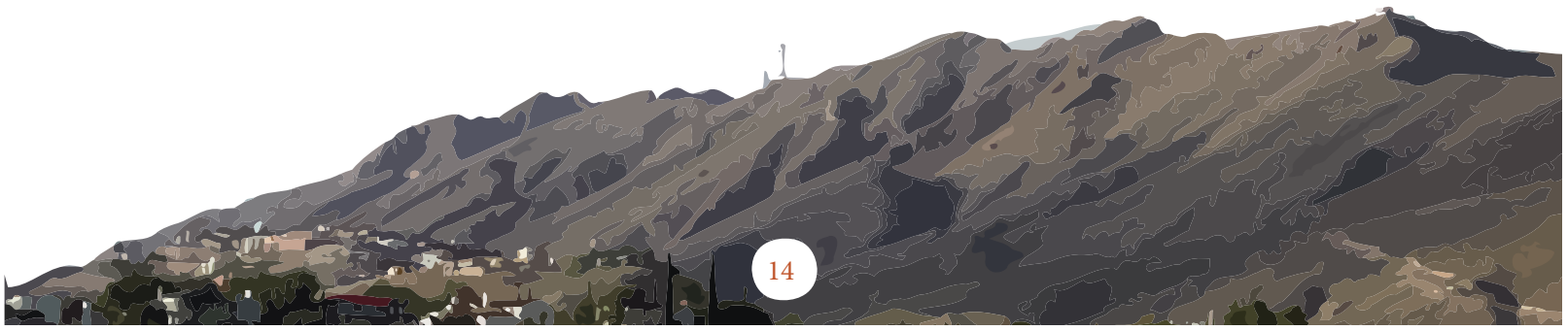
Knowing the exact nature of the problem, the next step is to collect relevant information about the problem and its environment. See the sidebar "Types of Traffic Data" for some examples.

Setting Goals and Objectives

Before selecting traffic calming devices, the residents should have some idea of their desired outcome. Goals should also be stated to express in qualitative terms, the kind of street the residents desire. Quantitative objectives should be set for each traffic problem to help assess the success of the traffic calming plan in solving the problems. There are no common or regulatory standards for setting these objectives. Consequently, the objectives should be seen simply as rough yardsticks of success in reviewing the executed plan.

TYPES OF TRAFFIC DATA:

- Roadway Geometry: Street widths, block lengths, and locations of stop signs and traffic signals.
- Roadway Users: Traffic volumes during peak hours, the entire day, and any particular periods when the problem occurs; pedestrian and bicycle volumes; truck volumes; bus routes; designation as a primary emergency response route; and origin-destination studies.
- Vehicle Performance Data: travel speeds, stop sign violations, rates of unsafe driving practices (e.g. cutting corners or crossing the centerline), and collision records.



Tier 2 NTMP Implementation

Selecting Measures

The first task in developing solutions to the traffic problems is to narrow the toolbox of traffic calming measures to those that will most closely target the key traffic issue, those that are appropriate for the type of location concerned, and those that are compatible with the traffic volumes, geometrics, and adjacent land uses at that location. When the list has been narrowed, devices should be considered that balance effectiveness and likelihood of acceptance. Finally, the selected devices need to be placed in a manner that will produce the desired results.

Selecting Measures for the Problem Type

The first task when selecting the most appropriate traffic calming device is to narrow the field of devices to those that address the primary traffic problem. The major types of problems that result in a desire for traffic calming are:

- Speeding – motor vehicle speeds are too high
- Traffic Volumes – motor vehicle usage levels (all trips or non-local trips only) are too high
- Vehicle Safety – motor vehicles have an inordinate level of risk
- Pedestrian Safety – motor vehicles cause an unnecessary risk to pedestrians
- Noise/Vibration/Air Pollution – motor vehicles cause excessive levels of these environmental effects

Each device in the toolbox is appropriate to a different subset of the above problem types. The appropriateness of each device is summarized in table 3.1 below.

Types of Measures	Type of Problem: Speeding	Traffic Volume	Vehicle Accidents	Pedestrian Safety	Noise
Non-Physical Measures					
Targeted Speed Enforcement	★	○	●	●	●
Radar Trailer	★	○	○	○	●
Speed Feedback Signs	★	○	○	○	●
Edgeline / Centerline Striping	●	○	○	○	○
Optical Speed Bars	●	○	○	○	○
Speed Limit Signage	★	○	○	○	○
Speed Legends	★	○	○	○	○
Truck Restriction Signs	○	●	○	○	★
"Cross Traffic Does Not Stop" Signage	○	○	★	●	○
Raised Pavement Markers	○	○	★	●	○
High-Visibility Crosswalks	●	○	○	★	○
Angled Parking	★	●	○	○	○
Narrowing Measures					
Bulbouts	★	○	○	★	○
Two-Lane Chokers	★	○	○	○	○
Center Island Narrowings / Pedestrian Refuges	★	○		★	○
Horizontal Measures					
Traffic Circles	★	●	★	●	○
Roundabouts (Single-Lane)	●	●	★	○	★
Lateral Shifts	●	●	○	○	○
Chicanes	★	●	○	○	○
Speed Table	★	●	X	●	X
Speed Cushions	●	●	●	X	X
Alternative Measures					
Full Closures	★	★	○	○	○
Half Closures	★	★	○	○	○
Diagonal Diverters	★	★	○	○	○
Median Barriers	○	★	○	○	○
Forced Turn Islands	○	★	●	○	○

Key: ★ = Strongly Appropriate; ● = Moderately Appropriate; X = Inappropriate/Counterproductive; ○ = Indifferent

Tier 2 NTMP Implementation

Selecting Measures for the Location Type

Identification of appropriate traffic calming measures should start by determining which measures are applicable to the location of the problem. If the traffic problem is confined to a specific roadway segment, then only measures applicable to roadway segments can be considered. Some other measures can be considered at intersections. Furthermore, certain types of devices are appropriate in residential areas but not in non-residential areas. Table 3.2 indicates the location(s) where each traffic calming measure is applicable.

Types of Measures		Residential			Non-Residential	
		Midblock	Intersection	Boundary of Area	Midblock	Intersection
Non-Physical Measures						
	Targeted Speed Enforcement	●	●	●	●	●
	Radar Trailer	●	●	●	●	●
	Speed Feedback Signs	●	●	●	●	●
	Edgeline / Centerline Striping	●	X	X	●	X
	Optical Speed Bars	●	X	X	●	X
	Speed Limit Signage	●	●	●	●	●
	Speed Legends	●	●	●	●	●
	Truck Restriction Signs	X	X	●	X	●
	"Cross Traffic Does Not Stop" Signage	X	○	●	X	○
	Botts Dots / Raised Reflectors	On Curves	X	X	●	X
	High-Visibility Crosswalks	●	Unsignalized Intersections	Unsignalized Intersections	●	Unsignalized Intersections
	Angled Parking	●	X	X	●	X
Narrowing Measures						
	Bulbouts	X	●	●	X	●
	Two-Lane Chokers	●	X	X	●	X
	Center Island Narrowings / Pedestrian Refuges	●	●	●	●	●
	Speed Table	○	X	●	●	X
	Speed Cushions	●	X	●	●	X
Horizontal Measures						
	Mini-Roundabouts	X	●	○	X	○
	Roundabouts (Single-Lane)	X	○	○	X	●
	Lateral Shifts	●	X	X	●	X
	Chicanes	●	X	X	●	X
Alternative Measures						
	Full Closures	X	●	●	X	X
	Half Closures	X	●	●	X	X
	Diagonal Diverters	X	●	X	X	X
	Median Barriers	X	○	●	X	X
	Forced Turn Islands	X	○	●	X	●
Key:		● = Generally Applicable ○ = Not applicable except in some cases		X = Seldom or never applicable		

Tier 2 NTMP Implementation

Selecting Measures for the Street Environment

The last step in narrowing the field of devices requires finding which devices are compatible with the traffic volumes, posted speeds, and special roadway users at the proposed location. For example, many devices have an upper boundary of traffic volumes beyond which any greater volume could result in traffic congestion that might be perceived as worse than the original traffic problem.

Also, since most devices cause some delay for emergency vehicles and transit buses, only certain devices can be used on primary emergency response routes and transit routes. Some measures have additional restrictions, such as hills, curves and bicycle routes that must be considered. Table 3.3 and 3.4 summarizes the constraints on the use of traffic calming devices in these various environments.

Types of Measures	Roadway Classification: Local Streets	Roadway Classification: Non-Residential Collectors	Roadway Classification: Residential Collectors	Bus Route	Other Considerations
Non-Physical Measures[1]					
Targeted Speed Enforcement	ADT 500 - 7,500; Speed Limit ≤ 35 mph			OK	(None)
Radar Trailer					
Speed Feedback Signs					
Edgeline / Centerline Striping					
Optical Speed Bars					
Signage					
Speed Legend					
Truck Restriction Signs					
Center Line of Edge Line Botts Dots					
Botts Dots / Raised Reflectors					
High-Visibility Crosswalk					
Angled Parking	ADT 500 - 4,000; Width ≥ 48 feet; Speed Limit ≤ 35 mph			No	Typically not used with bike lanes
Narrowing Measures[1]					
Bulbouts	ADT 500 - 7,500; Speed Limit ≤ 35 mph			OK	
Two-Lane Chokers	ADT 500 - 7,500; Speed Limit ≤ 35 mph				
Center Island Narrowings / Pedestrian Refuges	ADT 500 - 7,500; Speed Limit ≤ 35 mph				On bike routes, design with clear bike accomodations
Horizontal Measures[1]					
Mini-Roundabouts	Daily Entering Volume < 7,500; Speed Limit ≤ 35 mph	May be required at intersections where residential collector streets intersect with local streets		No	Grades ≤ 10%
Roundabouts (Single-Lane)	Daily Entering Volume < 20,000; Speed Limit ≤ 45 mph			Must design inscribed radius to be 100+ feet	Grades ≤ 6%; On bike routes, design with clear bike accomodations
Lateral Shifts	ADT 500 - 7,500; Speed Limit ≤ 35 mph			OK	Grades ≤ 10%
Chicanes	ADT 500 - 7,500; Speed Limit ≤ 35 mph				Grades ≤ 10%
Speed Table	ADT 500 - 7,500; Speed Limit ≤ 35 mph				Grades ≤ 10%
Speed Cushions	ADT 500 - 7,500; Speed Limit ≤ 35 mph			OK	Grades ≤ 8%
Notes: [1]Traffic Calming devices are suitable for existing and new streets					

Types of Measures	Roadway Classification: Local Streets	Roadway Classification: Collectors	Bus Route	Other Considerations
Alternative Restrictive Measures				
Full Closures	ADT 500 - 7,500; > 25% Non-Local Traffic	No	No	Fire Department Review
Half Closures		No	SunMetro must review	
Diagonal Diverters			No	
Median Barriers	ADT 500 - 7,500; > 25% Non-Local Traffic			
Forced Turn Islands				
Combined Measures - Subject to Constraints of Component Measures				

Placing the Traffic Calming Measures

The last task in laying out a traffic calming plan is to identify the actual locations where devices should be placed. Strategies for locating devices differ depending on whether the major issue is speed control, volume-control, or safety.

Tier 2 NTMP Implementation

Placing Speed-Control Measures

If feasible, traffic calming measures should be spaced in such a way that the following two design speeds are achieved.

- Slow-Point 85th Percentile Design Speed – the speed that 85 percent of vehicles are going less than when they are crossing a traffic calming device; the target slow-point speed is defined as five mph below the posted speed limit
- Midpoint 85th Percentile Design Speed – the speed that 85 percent of vehicles are going less than when they are halfway between two traffic calming devices

The spacing of traffic calming measures directly affects the Midpoint speeds: the farther apart they are, the higher the Midpoint speed. See the sidebar for more information on setting spacing based on Midpoint speeds.

Placing Volume-Control Measures

Traffic calming devices intended to control traffic volumes can be placed either at entrances to a neighborhood or internally to the neighborhood.

Gateway Measures

Volume-control measures placed at entrances or gateways to the neighborhood can be more immediately effective in reducing volumes because non-local traffic is made aware even before entering the neighborhood that passing through is not a desirable option, causing them to choose to take other routes. However, these measures can also cause local traffic to take more circuitous paths than internal measures would.

Internal Measures

When placed internal to a neighborhood, measures have a less direct effect on non-local traffic. First-time attempts to cross the neighborhood will occur more frequently, especially soon after the devices are constructed. However, this type of placement can cause less of an inconvenience to local traffic.

Estimating Midpoint Speeds

In mathematical terms, the relationship between midpoint speed and spacing of slow points is given by an exponential function:

$$85\text{th midpoint} = 85\text{th slow point} + (85\text{th street} - 85\text{th slow point}) * 0.56 * (1 - e^{-.004 * \text{spacing}})$$

Where,

- 85th midpoint = resulting 85th percentile speed at midpoint after calming
- 85th slow point = estimated 85th percentile speed at the slow point after treatment
- 85th street = 85th percentile speed of street before treatment
- Spacing = distance in feet between two devices

When placing speed-control measures, the above formula should be used to test proposed spacing to determine whether the estimated midpoint speeds would be acceptable.

Additional Placement Guidelines for Speed Tables and Speed Cushions

Placement of Traffic Calming Devices

The following devices shall be placed in accordance with the guidelines set here in. If all criteria are not met, then these devices are not applicable.

Speed Tables
Speed tables should be considered for desired speeds greater than 20 mph. These devices feature a flat top portion located between the longitudinally sloping sides. Desired speeds range from between 20 and 35 mph. For further clarification, see Page 10-13 of the City of El Paso Design Standards for Construction.

Speed Cushions
Speed cushions are composed of recycled rubber or asphalt. Typical length for these devices is 7 to 10 ft and rise 3 to 4 inches above the existing roadway surface. This device is spaced along the width of the roadway to permit emergency vehicles to partially straddle the device.

Warrants:

The following criteria are used in the definition of the guidelines:

85th Percentile Speed
Statistical measurement of speed which is considered as the division point of reasonable speed. The 85th percentile represents the speed at which the lower 85% of the speeds recorded are represented and the upper 15% are not.

Stopping Sight Distance
The length of roadway ahead that is visible to the driver and that is long enough to enable a vehicle traveling at or near the design speed to stop before reaching a stationary object in its path.

Additional Placement Guidelines for Speed Tables and Speed Cushions

Placement Guidelines

The following criteria must be considered prior to the use of speed tables or cushions:

Roadway Classification

- Speed tables and cushions are applicable for roadways with a classification of Local or Collector Street as defined by the City of El Paso.
- Roadways with bus routes or designated as emergency vehicle routes shall only use speed cushions.

Prevailing Speed

- Speed cushions shall not be installed on roadways whose desired 85th percentile speed exceeds 35 mph.
- Speed tables shall not be installed on roadways whose desired 85th percentile speed exceeds 35 mph.

Street Grade

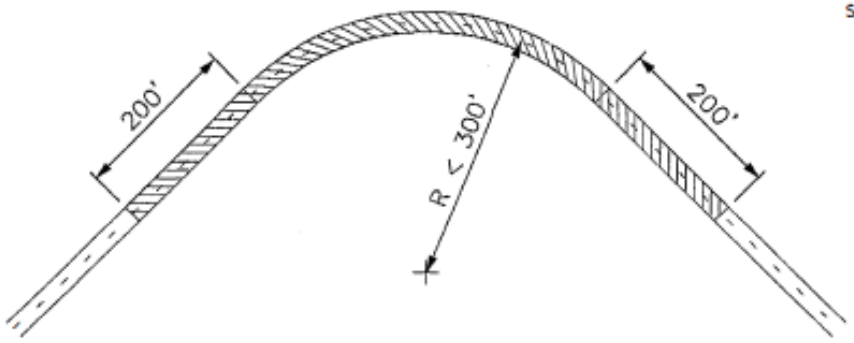
- Roadway grade shall not exceed 10% longitudinally, if roadway exceeds 6% longitudinal grade, then approval of the Traffic Engineer of the City of El Paso is required.

Proximity to Curves

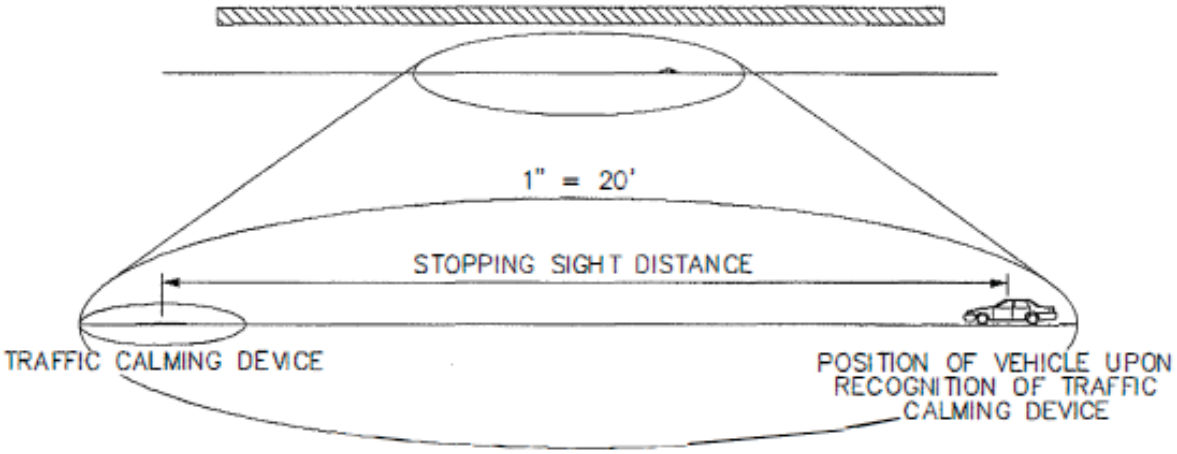
- Speed tables and cushions shall not be placed within horizontal curves where centerline radii are less than 300 feet and within 200 feet of beginning or end of a horizontal curve unless it can be proven that sufficient sight distance is provided for a complete stop upon identification of the upcoming device.
- For crest vertical curves a device must be located to allow for sufficient stopping distance upon identification of the upcoming device.
- See Figure 1.1 for further clarification for placement of devices along curvature.

HORIZONTAL CURVATURE

0 100 200
SCALE: 1" = 200'

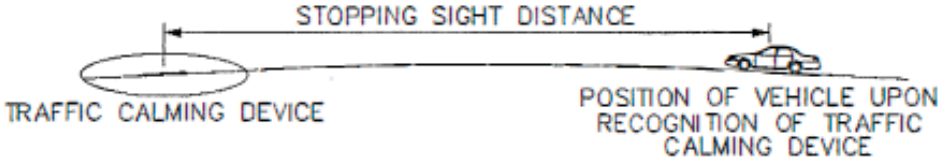


MINIMUM STOPPING SIGHT DISTANCE MUST BE MET IN ORDER TO PLACE TRAFFIC CALMING DEVICE WITHIN THIS AREA



VERTICAL CURVATURE

* VERTICAL CURVATURE DETAIL NOT TO SCALE



NOTES:

1. DETAILS SHOULD NOT BE USED FOR ROADWAY DESIGN PURPOSES.
2. IF SUFFICIENT STOPPING SIGHT DISTANCE CANNOT BE OBTAINED THEN TRAFFIC CALMING DEVICES ARE NOT APPLICABLE.
3. TYPICAL STOPPING SIGHT DISTANCES CAN BE FOUND IN THE AASHTO "GEOMETRIC DESIGN OF HIGHWAYS AND STREETS - 2004."

Kimley-Horn and Associates, Inc.

CURVATURE REQUIREMENTS

THE CITY OF EL PASO TEXAS

R 3/8/2010 FIGURE 1.1

Additional Placement Guidelines for Speed Tables and Speed Cushions

Street Condition

- The City of El Paso will inspect all streets prior to construction to ensure existing pavement material is adequate to support the installation of speed tables or cushions. If repair is needed it must be completed before any permanent devices can be installed.
- Devices shall be designed to standards set forth in the City of El Paso Design Standards for Construction.
- If drainage impact is too great, the device will be removed or replaced with another applicable device.

Substandard Street

- Placement should avoid a negative impact to roadway drainage.
- Devices should be placed when possible in line with large trees, utility poles, etc. or should have delineators installed adjacent to the device to deter driver's from maneuvering around the device.

Travel Lane Restrictions

- Devices will not be installed on roadways with more than one traveling lane in each direction.
- Turn lanes, bike lanes and parking lanes shall not be counted as travel lanes.

Spacing

- Devices will not be considered for roadways with less than 600 feet between consecutive traffic control devices (traffic signals or stop signs).
- Minimum distance between devices is 300 feet apart. Typical spacing is 400 - 600 feet; spacing further than this has proven ineffective in considerable reduction of vehicle speeds.
- Devices must be installed in series (minimum of two).
- Devices will be installed according to an evaluation of traffic data and the physical street section. Ideal positioning is along property lines when possible.
- Greater speed reduction is feasible with a reduction in spacing between consecutive devices.

Proximity to Driveways

- Devices will not block access to any driveway. As feasibly possible, no device will be placed within 5 feet of a driveway throat.

Parking Removal

- Removal of on-street parking may be necessary with offset speed tables.

Additional Placement Guidelines for Speed Tables and Speed Cushions

Diversion Potential

- Studies will be conducted before and after the construction of the speed tables and cushions to determine traffic volumes along the proposed route and potential diversion routes. If parallel roadways are determined to be potential diversion routes these routes will be monitored for volume increase. If such an increase occurs, measures to mitigate the diversion route may be necessary.

Bus Stops, Routes and Zones

- Devices should avoid bus stops entirely. Speed cushions should be placed at a minimum distance of 20 feet from the end of the bus stop. Speed tables are not allowed along bus routes.

Emergency Vehicle Routes

- Speed cushions are the only acceptable device along designated emergency vehicle routes.
- No device shall be installed within 20 feet of a fire hydrant.

Utilities

The following guidelines pertain specifically to permanent asphalt or concrete installations only:

- Traffic calming devices should not be placed within 20 feet of underground utility connection points.
- Devices should avoid placement directly above utilities crossing beneath the roadway or require approval from the City of El Paso to proceed.
- Once traffic calming devices are proposed, local utility companies should review the proposed project for any pending utility construction. If such construction is planned it should be undertaken prior to the construction of the traffic calming devices.
- If construction is required beneath existing devices, permanent devices will be repaired by the responsible party.

Chapter 4

Toolbox of Tier 2 Traffic Calming Measures

This chapter begins with an explanation of traffic devices that are not considered as part of the toolbox of traffic calming measures. Then an explanation of the traffic calming measures that constitute the standard toolbox of devices available to citizens and Traffic Engineering staff when developing traffic calming plans. The devices are divided into the following types:

- Non-Physical Measures;
- Physical Measures:
  - Vertical Devices;
  - Narrowing Measures;
  - Horizontal Deflection Measures;
- Alternative Diversion Measures;
- Alternative Traffic Calming Devices

For each non-physical and physical measure in the toolbox, a description, photograph, and list of advantages and disadvantages are provided. In addition, all physical traffic calming measures include an overhead schematic and detailed standard designs which are located in Appendix C.

Non-Physical Measures

Description

Non-physical measures include any measures that do not require the construction of physical modifications to the roadway. This category includes signing and striping modifications, as well as temporary use of certain enforcement strategies.

- Education Programs
- Targeted Speed Enforcement
- Radar Trailers
- Speed Feedback Signs
- Lane Striping
- Optical Bars
- Signage
- Speed Legend
- Raised Pavement Markers
- Delineator
- High Visibility Crosswalk
- Angled Parking

Toolbox

Education

Activities that change people's perceptions and help alter driver behavior are most preferred. Meetings and workshops with neighbors and City staff can help implement and direct NTMP applications. Most traffic problems are a result of human behavior. Through outreach programs and neighborhood watch programs, all residents can play a big part in spreading the information.

Advantages

- Education can be flexible in duration
- Everyone can afford it

Disadvantages

- May be difficult to measure its effectiveness
- May take time to be effective

Targeted Speed Enforcement

The Traffic Division identifies locations for temporary targeted enforcement enhancements, based on personal observations and survey comments. A request is then submitted to the Police Department for the desired enforcement. Because of limited citywide resources, the targeted enforcement will not be continued indefinitely. Targeted enforcement may also be used in conjunction with new traffic calming devices to help drivers become aware of the new restrictions.

Advantages

- Inexpensive if used temporarily
- Does not require time for design
- Does not slow trucks, buses, and emergency vehicles
- Effective in reducing speeds in a short time frame

Disadvantages

- Expensive to maintain an increased level of enforcement
- Effectiveness may be Temporary

Toolbox

Radar Trailer

A radar trailer is a device that measures each approaching vehicle's speed and displays it next to the legal speed limit in clear view of the driver, reminding speeding drivers to slow to the speed limit. They can be easily placed on a street for a limited amount of time then relocated to another street, allowing a single device to be effective in many locations.

Advantages

- Inexpensive if used temporarily
- Does not require time for design
- Does not slow emergency vehicles
- Effective in reducing speeds in the short-run

Disadvantages

- Effectiveness may be temporary
- Aesthetics
- Only effective for one direction of travel
- Subject to vandalism

Speed Feedback Signs

Speed feedback signs perform the same functions as radar trailers but are permanent. Real-time speeds are relayed to drivers and flash when speeds exceed the limit. Speed feedback signs are typically mounted on or near speed limit signs and can also be mobile units. They are especially effective near schools and parks.

Advantages

- Inexpensive
- Does not require time for design
- Does not slow emergency vehicles
- Effective in reducing speeds in a short time frame

Disadvantages

- Requires power source
- Only effective for one direction of travel
- Long-term effectiveness uncertain
- Subject to vandalism

Toolbox

Lane Striping

Lane striping can be used to create formal bicycle lanes, parking lanes, or simple edge lines. As a traffic calming measure, they are used to narrow the travel lanes for vehicles to encourage drivers to lower their speeds. The past evidence on speed reductions is, however, inconclusive.

Advantages

- Inexpensive
- Can be used to create bicycle lanes or delineate on-street parking
- Does not require time for design
- Does not slow emergency vehicles

Disadvantages

- Has not been shown to significantly reduce speeds
- Increased regular maintenance

Optical Speed Bars

Optical speed bars are a series of pavement markings spaced at decreasing distances. They have typically been used in construction areas to provide drivers with the impression of increased speed.

Advantages

- Inexpensive
- Reduction in 85th percentile speed
- Does not slow bus and emergency vehicles
- Does not require time for design

Disadvantages

- Effectiveness diminishes after repeated use
- Aesthetics

Toolbox

Signage

Signage can be an effective tool for advising drivers of:

- speed limits,
- truck restrictions, and
- cross traffic that does not stop

Advantages

- Inexpensive
- Does not require time for design
- Turn restrictions can reduce cut-through traffic
- Does not significantly slow emergency vehicles

Disadvantages

- Speed limit signs are ineffective if unaccompanied by increased police enforcement
- If speed limit is set unreasonably low, drivers are more likely to exceed it

Speed Legends

Speed legends are numerals painted on the roadway, indicating the current speed limit in miles per hour. They are usually placed near speed limit signposts. Speed legends can be useful in reinforcing a reduction in speed limit between one segment of a roadway and another segment. They may also be placed at major entry points into a residential area.

Advantages

- Inexpensive
- Helps reinforce a change in speed limit
- Does not require time for design
- Does not slow emergency vehicles

Disadvantages

- Has not been shown to significantly reduce travel speeds

Toolbox

Raised Pavement Markers

Raised reflectors lining the centerline and/or edgeline of a roadway add a visual queue to the driver to not deviate outside of the proper lane. Raised reflectors also improve the nighttime visibility of roadways.

Raised pavement markers can also be arranged in a rectangular array across the roadway, creating a rumble strip. These can be effective in reducing travel speeds but also increase roadway noise considerably. Consequently, rumble strips are only recommended for placement in very low density areas.

Advantages

- Inexpensive
- Does not slow trucks, buses, and emergency vehicles
- Cues drivers to respect lanes on curves and under low visibility conditions

Disadvantages

- Increased noise
- Increased maintenance

Delineator

Much like raised pavement markers, delineators may be used to further define a centerline and/or edgeline of a roadway. Moreover, delineators add a vertical element to the roadway. Delineators can also be used with physical measures to further improve their traffic calming effectiveness.

Advantages

- Inexpensive
- Reduction in 85th percentile speed
- Does not slow buses and emergency vehicles
- Does not require time for design

Disadvantages

- Increased maintenance
- Decreased aesthetics

Toolbox

High Visibility Crosswalk

Using special pavement marking patterns and raised reflectors increases the visibility of a crosswalk. The "triple four" marking pattern is an effective manner to increase the visibility of a crosswalk with typical painting materials. The unpainted space along the center of the crosswalk allows pedestrians and those in wheelchairs to cross in the rain without the sliding problems found on typical crosswalks that encompass the entire crossing area.

Advantages

- Inexpensive
- Does not slow buses and emergency vehicles

Disadvantages

- Effectiveness diminishes after repeated use

Angled Parking

Angled parking reorients on-street parking spaces to a 45–degree angle, increasing the number of parking spaces and reducing the width of the roadway available for travel lanes. Angled parking is also easier for vehicles to maneuver into and out of than parallel parking. Consequently, it works well in locations with high parking demand, such as multifamily, commercial, and mixed-use areas.

Advantages

- Reduces speeds by narrowing the travel lanes
- Increases the number of parking spaces
- Makes parking maneuvers easier and takes less time than with parallel parking
- Favored by businesses and multifamily residences

Disadvantages

- Precludes the use of bike lanes (unless roadway is wider than 58 feet)
- Ineffective on streets with frequent driveways
- May be incompatible with one-way streets approaching a two-way segment

Physical Measures: Vertical Devices

Description

Vertical devices use a vertical change to the travel path to deter speeding by motorists. Such devices in the toolbox include:

- Speed Cushions
- Speed Tables

Toolbox

Speed Cushions

Speed cushions are two or more raised areas placed laterally across a roadway with gaps between the raised areas. The gaps allow emergency vehicles to pass through at higher speeds. For other vehicles, speed cushions introduce a navigable vertical element that is designed to be traversed at slower speeds without causing discomfort to the driver. Discomfort increases as the speed over the cushions increase.

Measured and Potential Impacts

Speed Impacts – Average reduction in 85th percentile speeds between slow points = 20% - 25%

Volume Impacts – Average reduction in vehicles per day = ~20%

Collision Impacts - Average collision rates reduced by 13%.

Source: ITE Traffic Calming Fact Sheets (May 2018)

Advantages

- Slows traffic immediately, self-enforcing
- Inexpensive
- Does not slow emergency vehicles

Disadvantages

- Motorists tend to speed up between cushions
- Increases noise and pollution in neighborhood
- Motorcycles not impacted

Speed Table

Speed tables are flat-topped speed humps often constructed with brick or other textured materials on the flat section. Speed tables are typically long enough for the entire wheelbase of a passenger car to rest on the flat section. Their long flat fields give speed tables higher design speeds than speed cushions. The brick or other textured materials improve the appearance of speed tables, draw attention to them, and may enhance safety and speed-reduction.

Speed tables are good for locations where low speeds are desired but a somewhat smooth ride is needed for larger vehicles.

Measured Impacts

Speed Impacts – Reduction in 85th percentile speeds between slow points = -18%
Volume Impacts – Reduction in vehicles per day = -12%

Source: Traffic Calming: State of the Practice, 2000

Advantages

- They are effective in reducing speeds, though not to the extent of speed cushions

Disadvantages

- They have questionable aesthetics, if no textured materials are used;
- Textured materials, if used, can be expensive; and
- They may increase noise and air pollution.

Physical Measures: Narrowing Devices

Description

Narrowing devices use raised islands and curb extensions to narrow the travel lane for motorists. The narrowing devices in the toolbox include:

- Bulbouts
- Two-Lane Chokers
- Center Island Narrowings/Pedestrian Refuge Islands

Bulbouts

Bulbouts (neckdowns, intersection narrowings, safe crosses, etc.) are curb extensions that reduce roadway width curb to curb at either midblock or intersection locations. Midblock treatments narrow the travel lane but do not provide additional sidewalk width. Intersection treatments reduce vehicle travel speeds by tightening curb radii and improve pedestrian safety by shortening crossing distance.

Intersection treatments can be retrofited into an existing intersection without modifying the existing drainage, or they can be designed to provide additional sidewalk width for increased pedestrian use or street furniture. The effects are increased pedestrian comfort and safety at the intersection.

Measured Impacts

Speed Impacts – Reduction in 85th percentile speeds between slow points = -7%Volume Impacts – Reduction in vehicles per day = -10%

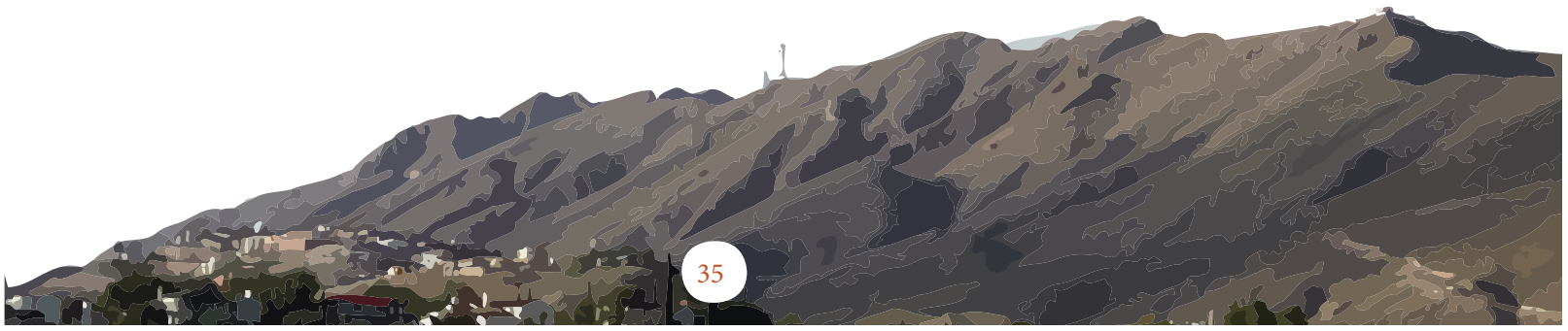
Source: Traffic Calming: State of the Practice, 2000

Advantages

- Improves pedestrian circulation and standing space on sidewalk area
- Through and left-turn movements are easily negotiable by large vehicles
- Creates protected on-street parking bays
- Reduces speeds (especially right-turning vehicles) and traffic volumes
- Provides opportunity for landscaping and street furniture

Disadvantages

- Effectiveness is limited by the absence of vertical or horizontal deflection
- May slow right-turning emergency vehicles
- Potential loss of on-street parking
- May require bicyclists to briefly merge with vehicular traffic



Toolbox

Two-Lane Choker

Chokers are curb extensions at mid-block that narrow a street by widening the sidewalk or planting strip. If marked as crosswalks, they are also called safe crosses.

Chokers leave the street cross section with two lanes that are narrower than the normal cross section.

Measured Impacts

Speed Impacts – Reduction in 85th percentile speeds between slow points = -7%Volume Impacts – Reduction in vehicles per day = -10%

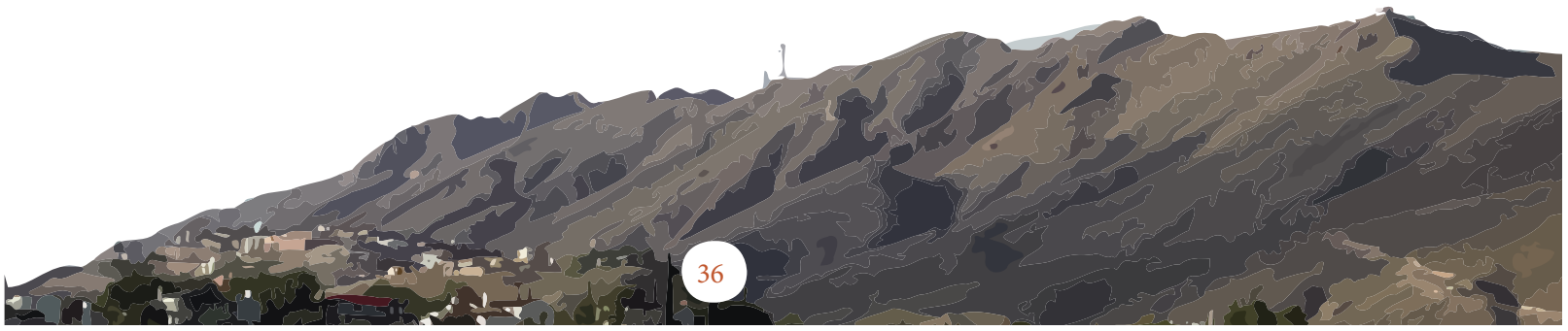
Source: Traffic Calming: State of the Practice, 2000

Advantages

- Easily negotiable by large vehicles (such as fire trucks)
- If designed well, can have positive aesthetic value
- Reduces both speeds and volumes
- Opportunity for landscaping

Disadvantages

- Effect on vehicle speeds is limited by the absence of any horizontal deflection
- May require bicyclists to briefly merge with vehicular traffic
- Potential loss of on-street parking
- Maintenance of landscaping (City vs. residents)



Center Island Narrowing/Pedestrian Refuge Island

Center island narrowings are raised islands located along the centerline of a street that narrow the travel lanes at that location. They are often landscaped to provide visual amenity. Placed at the entrance to a neighborhood and often combined with textured pavement, they are sometimes called "gateways." Fitted with a gap to allow pedestrians to walk through at a crosswalk, they are often called "pedestrian refuges".

Measured Impacts

Speed Impacts – Reduction in 85th percentile speeds between slow points = -7%Volume Impacts – Reduction in vehicles per day = -10%

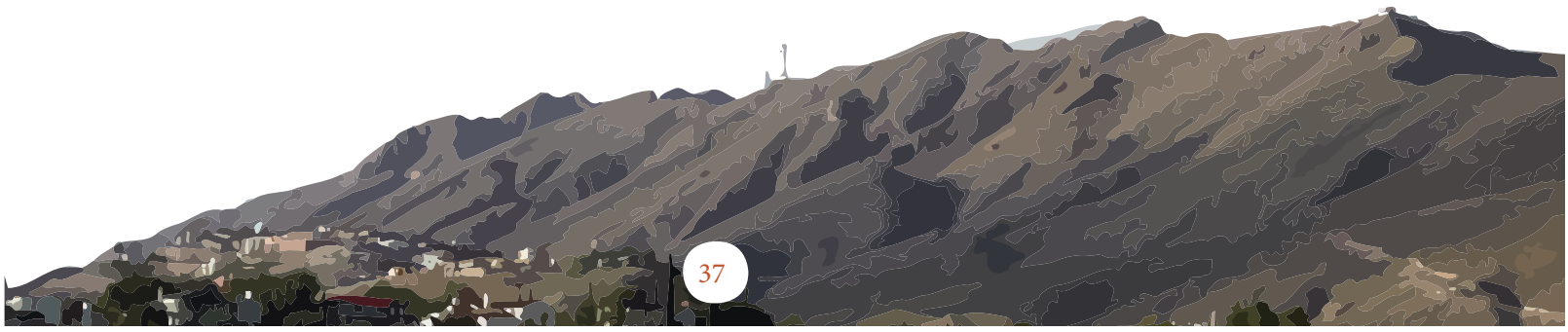
Source: Traffic Calming: State of the Practice, 2000

Advantages

- Increases pedestrian safety
- If designed well, can have positive aesthetic value
- Reduces traffic volumes
- Opportunity for landscaping

Disadvantages

- Effect on vehicle speeds is limited by the absence of any vertical or horizontal deflection
- Potential loss of on-street parking



Physical Measures: Horizontal Deflection Devices

Description

Horizontal deflection devices use raised islands and curb extensions to eliminate straight-line paths along roadways and through intersections. The horizontal deflection devices in the toolbox include:

- Traffic Circles
- Roundabouts
- Lateral Shifts
- Chicanes

Toolbox

Traffic Circle

Traffic circles are raised islands, placed in intersections, around which traffic circulates. They are usually circular in shape and landscaped in their center islands, though not always. Traffic controls at the approaches vary by location. Circles prevent drivers from speeding through intersections by impeding the straight-through movement and forcing drivers to slow down to yield. Drivers must first turn to the right, then to the left as they pass the circle, and then back to the right again after clearing the circle.

Measured Impacts

Speed Impacts – Reduction in 85th percentile speeds between slow points = -11%Volume Impacts – Reduction in vehicles per day = -5%
Safety Impacts – Reduction in average annual number of collisions = -71%

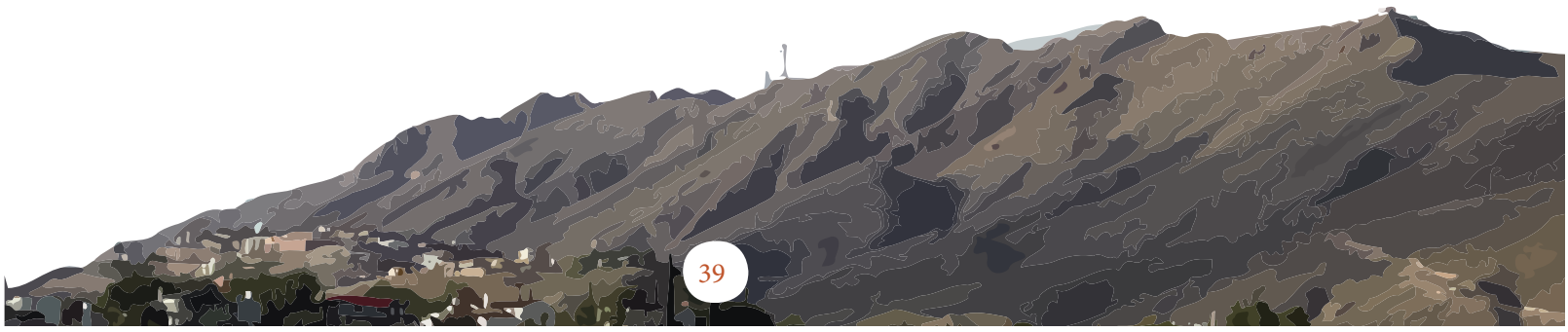
Source: Traffic Calming: State of the Practice, 2000

Advantages

- If designed well, can have positive aesthetic value
- Very effective in moderating speeds and improving safety
- Opportunity for landscaping

Disadvantages

- Must be designed so that the circulating lane does not encroach on crosswalks
- Potential loss of on-street parking



Toolbox

Roundabout

Like traffic circles, roundabouts require traffic to circulate counterclockwise around a center island. But unlike circles, roundabouts are used on higher volume streets to allocate rights-of-way among competing movements. They are found primarily on arterial and collector streets, often substituting for traffic signals or all-way stop signs. They are larger than neighborhood traffic circles and typically have raised splitter islands to channel approaching traffic to the right.

Measured Impacts

Speed Impacts – Reduction in 85th percentile speeds between slow points = I/D Volume Impacts – Reduction in vehicles per day = I/D
Safety Impacts – Reduction in average annual number of collisions = -15% to 33%Notes: I/D = Insufficient Data

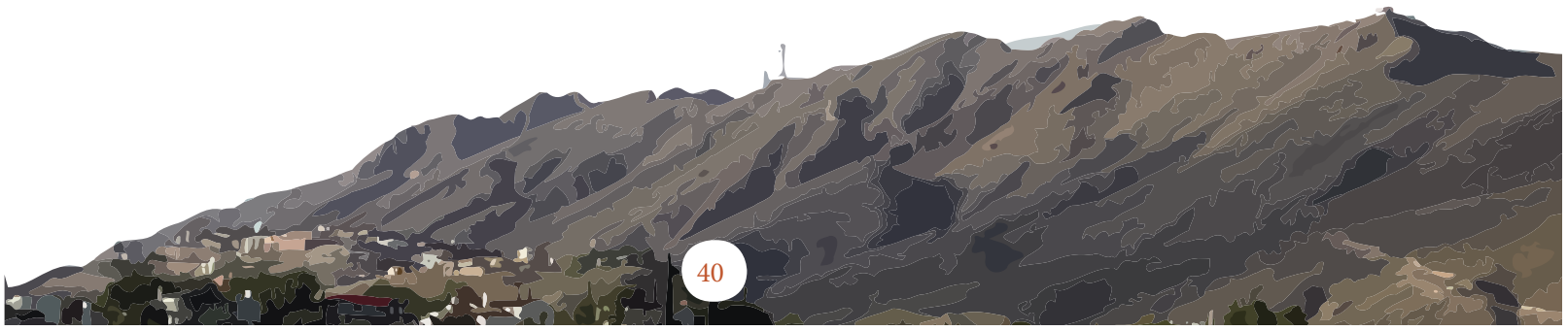
Source: Traffic Calming: State of the Practice, 2000

Advantages

- Moderates traffic speed on an arterial
- Enhanced safety compared to a traffic signal
- Minimizes queuing at approaches to the intersection
- Less expensive to operate than traffic signals
- Provides opportunity for landscaping and street furniture

Disadvantages

- May require major reconstruction of an existing intersection
- Loss of on-street parking
- Increases pedestrian distance from one crosswalk to the next
- Difficult for visually impaired pedestrians to navigate



Lateral Shift

Lateral shifts are curb extensions on otherwise straight streets that cause travel lanes to bend one way and then bend back the other way to the original direction of travel. Lateral shifts, with just the right degree of deflection, are one of the few measures that have been used on collectors or even arterials, where high traffic volumes and high posted speeds preclude more abrupt measures.

Advantages

- Can accommodate higher traffic volumes than many other traffic calming measures
- Easily negotiable by large vehicles (such as fire trucks)
- Opportunity for landscaping and street furniture

Disadvantages

- Potential loss of on-street parking
- Must be designed carefully to discourage drivers from deviating out of the appropriate lane
- Maintenance of Landscaping

Chicane

Chicanes are curb extensions that alternate from one side of the street to the other, forming S-shaped curves. Chicanes can also be created by alternating on-street parking, either diagonal or parallel, between one side of the road and the other. Each parking bay can be created either by restriping the roadway or by installing raised landscaped islands at each end, creating a protected parking area.

Measured Impacts

Speed Impacts – Reduction in 85th percentile speeds between slow points = I/D
Volume Impacts – Reduction in vehicles per day = I/D
Safety Impacts – Reduction in average annual number of collisions = I/D
Notes: I/D = Insufficient Data

Source: Traffic Calming: State of the Practice, 2000

Advantages

- Discourages high speeds by forcing horizontal deflection
- Easily negotiable by large vehicles (such as fire trucks) except under heavy traffic conditions
- Provides opportunity for landscaping and street furniture

Disadvantages

- Must be designed carefully to discourage drivers from deviating out of the appropriate lane
- Curb realignment and landscaping can be costly, especially if there are drainage issues
- Potential loss of on-street parking
- Maintenance of landscaping (City vs. residents)

Diversion Devices

Description

Diversion devices use raised islands and curb extensions to preclude particular vehicle movements, such as left-turn or through movements, usually at an intersection. These devices can only be considered after other measures have been attempted and fail to resolve the traffic problem. The diversion devices in the toolbox include:

- Full Closures
- Half Closures
- Diagonal Diverters
- Median Barriers
- Forced Turn Islands

Full Closure

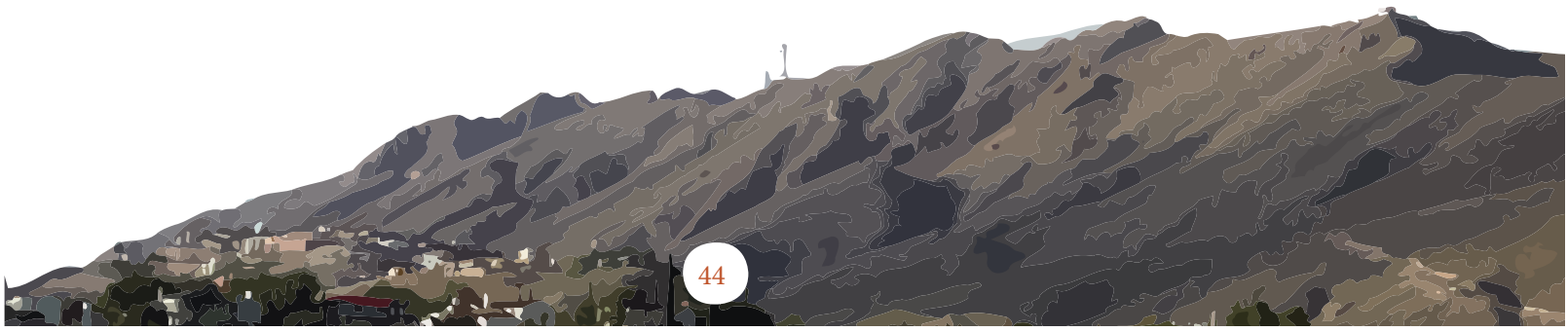
Full street closures are barriers placed across a street to close the street completely to through traffic, usually leaving only sidewalks or bicycle paths open. The barriers may consist of landscaped islands, walls, gates, side-by-side bollards, or any other obstructions that leave an opening smaller than the width of a passenger car.

Advantages

- Able to maintain pedestrian and bicycle access
- Very effective in reducing traffic volumes
- Opportunity for landscaping

Disadvantages

- Requires legal procedures for public street closures
- Causes circuitous routes for local residents and emergency services
- May be expensive
- May limit access to businesses



Half Closure

Half street closures are barriers that block travel in one direction for a short distance on otherwise two-way streets. Half closures are the most common volume control measure after full street closures. Half closures are often used in sets to make travel through neighborhoods with gridded streets circuitous rather than direct. That is, half closures are not lined up along a border, which would preclude through movement, but instead are staggered, leaving through movement possible but less attractive than alternative routes.

Measured Impacts

Speed Impacts – Reduction in 85th percentile speeds between slow points = -19%Volume Impacts – Reduction in vehicles per day = -42%

Source: Traffic Calming: State of the Practice, 2000

Advantages

- Able to maintain two–way bicycle access
- Effective in reducing traffic volumes

Disadvantages

- Causes circuitous routes for local residents and emergency services
- May limit access to businesses
- Drivers can circumvent the barrier

Diagonal Diverter

Diagonal diverters are barriers placed diagonally across an intersection, blocking through movement. Like half closures, diagonal diverters are usually staggered to create circuitous routes through neighborhoods.

Measured Impacts

Speed Impacts – Reduction in 85th percentile speeds between slow points = -4%

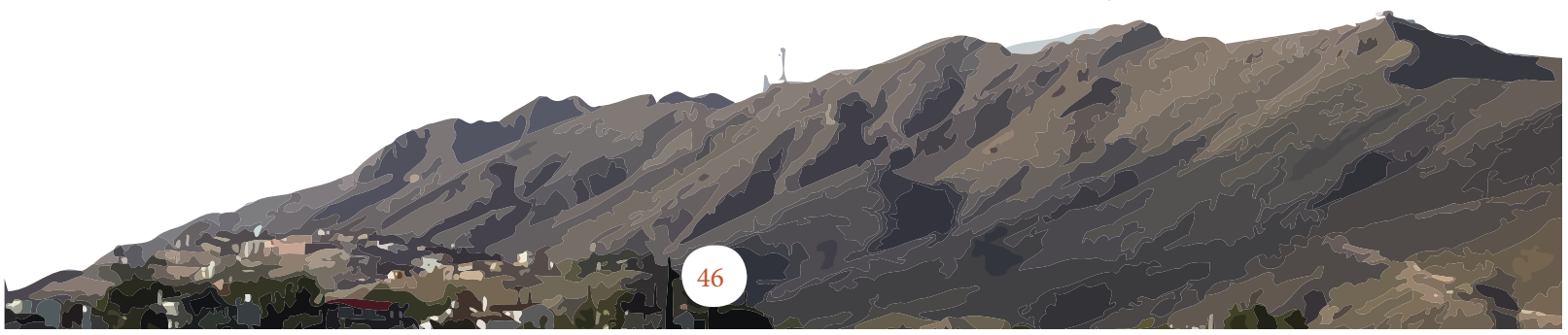
Source: Traffic Calming: State of the Practice, 2000

Advantages

- Does not require a closure per se, only a redirection of existing streets
- Able to maintain full pedestrian and bicycle access
- Reduces traffic volumes

Disadvantages

- Causes circuitous routes for local residents and emergency services
- May be expensive
- May require reconstruction of corner curbs



Median Barrier

Median barriers are raised islands that are located along the centerline of a street and continue through an intersection so as to block through movement at a cross street.

Measured Impacts

Volume Impacts – Reduction in vehicles per day = -31%

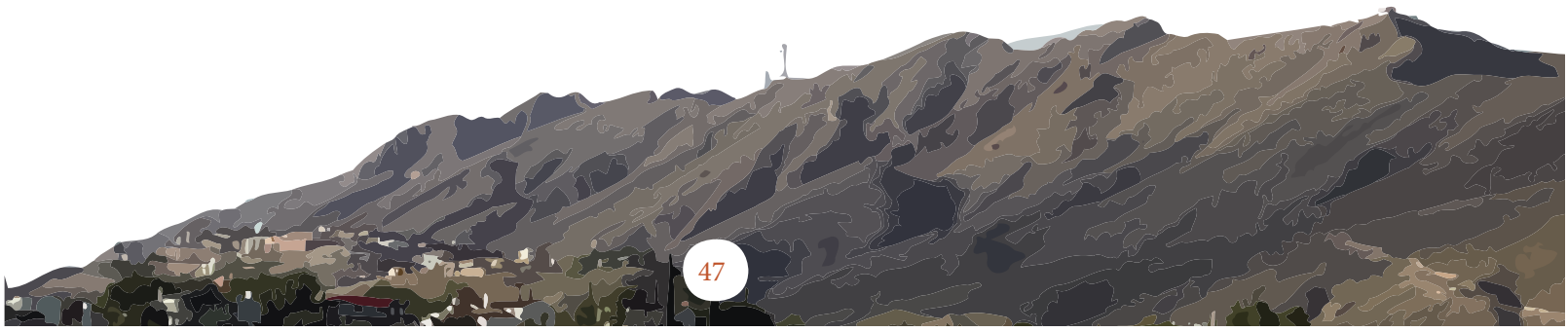
Source: Traffic Calming: State of the Practice, 2000

Advantages

- Can improve safety at an intersection of a local street and a major street by prohibiting dangerous turning movements
- Can reduce traffic volumes on a cut–through route that crosses a major street

Disadvantages

- Requires available street width on the major street
- Limits turns to and from the side street for local residents and emergency services



Forced-Turn Island

Forced–turn islands are raised islands that block certain movements on approaches to an intersection.

Measured Impacts

Volume Impacts – Reduction in vehicles per day = -31%

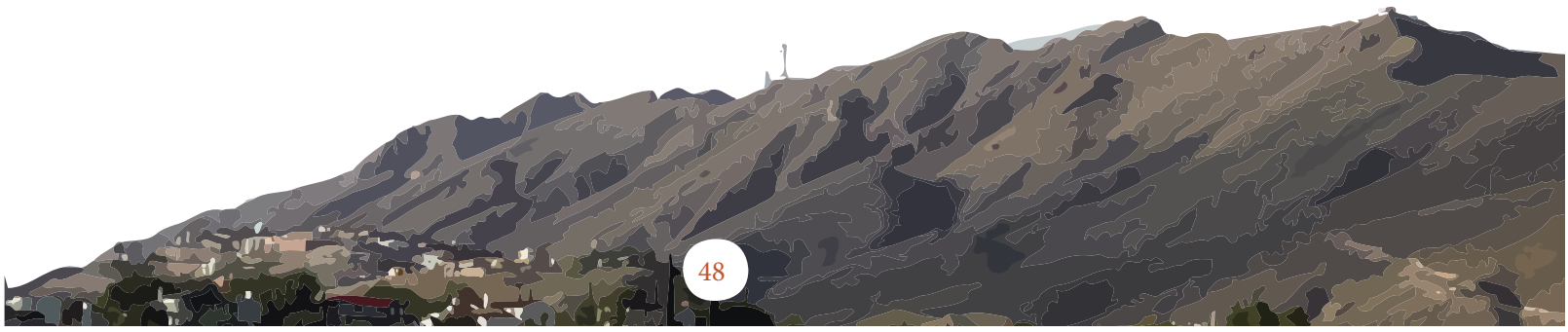
Source: Traffic Calming: State of the Practice, 2000

Advantages

- Can improve safety at an intersection of a local street and a major street by prohibiting dangerous turning movements
- Reduces traffic volumes

Disadvantages

- If designed improperly, drivers can maneuver around the island to make an illegal movement
- May simply divert a traffic problem to a different street



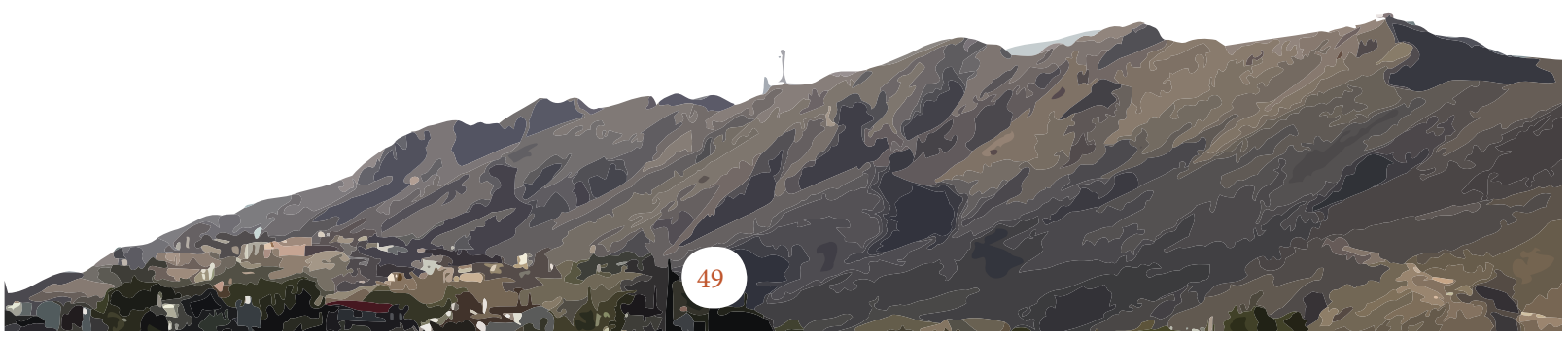
Effectiveness Comparison

Table 4 summarizes the effectiveness data that has been compiled for each of the traffic calming measures in the toolbox. Note that these data are averages. Actual effectiveness can vary based on site specific circumstances, such as proximity to major roads and the availability of alternate routes.

Table 4 – Quantitative Impacts of Traffic Calming Measures

Types of Measures	Effectiveness									
	85th Percentile Speeds				Vehicles Per Day		Average Annual Collisions			
	Before	After	Change	Percent Change	Change	Percent Change	Before	After	Change	Percent Change
Non-Physical Measures				***I/D***						
Narrowing Measures										
Bulbouts										
Two-Lane Chokers										
Center Island Narrowings / Pedestrian Refuges	34.9	32.3	-2.6	-7%	-293	-10%	I/D			
Horizontal Measures										
Traffic Circles	34.2	30.3	-3.9	-11%	-293	-5%	2.19	64%	-1.55	-71%
Roundabouts (Single-Lane)	Insignificant Speed Effects				Insignificant Volume Effects		Not Recorded			-15% to -33%
Lateral Shifts	I/D				I/D		I/D			
Chicanes	I/D				I/D		I/D			
Diversion Measures										
Full Closures	I/D	I/D	I/D	I/D	-671	-44%	I/D			
Half Closures	32.3	26.3	-6	-19%	-1611	-42%	I/D			
Diagonal Diverters	29.3	27.9	-1.4	-4%	-501	-35%	I/D			
Median Barriers										
Forced Turn Islands	I/D	I/D	I/D	I/D	-1167	-31%	I/D			

Notes: I/D = Insufficient Data
Source: Traffic Calming: State of the Practice (Ewing, 1999)



Alternative Traffic Calming Devices

The following applications are available as alternative traffic calming devices:

Pavement Modification Measures

Pavement Texturing

- Different materials such as brick, cobbles, concrete pavers, or others used as paving material can provide a roughening effect to the roadway. This effect can cause a driver to reduce speed to increase perceived roadway drivability.

Pavement Coloring

- Variations in pavement color can reinforce the identity of an area as a traffic-restricted/speed reduction zone.

Street Print

- Asphalt paving that integrates texture, color and reflectivity into the pavement surface. This technology can be used in a variety of applications and can replicate more expensive alternatives such as brick or cobblestone paving. Application for asphalt surfaces only.
- This technique can be used for optical traffic calming devices such as optical speed humps or lane sides and narrowing.

Chapter 5

NTMP Device Removal Process

In some cases, after a street has petitioned for and been the recipient of traffic calming measures, there may be interest to remove these devices.

This chapter defines the process for NTMP device removal.

Note: Devices installed to address a safety issue will not be eligible for removal.

Tier 1 Removal

Tier 1 installations - speed cushions, speed feedback signage, and related signage and markings - may be eligible for removal if they meet the following criteria:

- Not installed to address a safety issue as determined by the City Traffic Engineer
- A petition is submitted with signatures from two-thirds of property owners immediately affected - within 100 yards - by the device (Petition form in Appendix B)
- It has been at least 6 months since installation (to allow for traffic review and analysis)

If the petition for removal is submitted within the first year after installation, the resident(s) requesting removal will pay for all removal costs. If a petition for removal is submitted after the first year of installation, the City will cover removal costs.

Devices removed from a location under this process will not be eligible for re-installation for three years from the date that the devices are removed.

Tier 2 Removal

Tier 2 installations - as defined in Chapter 4 - may be eligible for removal if they meet the following criteria:

- Not installed to address a safety issue as determined by the City Traffic Engineer
- A petition is submitted with signatures from two-thirds of property owners immediately affected - within 100 yards - by the device (Petition form in Appendix B)
- It has been at least 6 months since installation (to allow for traffic review and analysis)
- Request is approved by City Council

If the petition for removal is submitted within the first year after installation, the resident(s) requesting removal will pay for all removal costs. If a petition for removal is submitted after the first year of installation, the City will cover removal costs.

Devices removed from a location under this process will not be eligible for re-installation for three years from the date that the devices are removed.

Appendix A - Summary of Existing Policies

Existing Neighborhood Traffic Management Program

The Neighborhood Traffic Management Program (NTMP) is a program that was developed to address ever-increasing concerns regarding the safety and livability of neighborhoods. This information brochure was developed by the City of El Paso, Traffic Engineering Division to briefly describe the NTMP.

What is the purpose of the existing NTMP?

The purpose of the existing NTMP is to address speeding and accident trends on local residential streets. The goal of this program is to create an environment within neighborhoods that promotes safety for both the driver and neighborhood residents.

How can the existing NTMP slow down traffic on residential streets?

The existing NTMP seeks to improve safety for pedestrians, bicyclists, motorists, and all other road users by implementing calming measures in a timely and responsive manner. The primary steps include education (through public outreach of the issue), enhanced enforcement (if deemed necessary), and, in most cases, quickly implementable solutions, such as speed cushions and speed feedback signage. As a safety program, these solutions represent efficient methods to address documented issues. If residents of a street want more robust, aesthetic calming techniques, such as: installing certain types of landscaping, traffic circles, chicanes, diverters, bulbouts, neck downs, and medians, these may be considered after any safety issues have been addressed, but must be vetted through the City Council, and funded separately.

How can neighborhoods qualify for the existing program?

The existing NTMP is designed to work with organized, citizen-intiated concerns. If a citizen contacts staff about an alleged residential speeding or accident concern, staff will make an immediate assessment of whether the NTMP is an available tool to address concerns on that street, and then provide the subject citizen - now considered the point of contact - with a NTMP application to begin the process. Once a completed application is received by staff, a study and analysis can be undertaken to determine whether the street meets criteria to be eligible for the program.

What factors does the Traffic Engineering Division consider when qualifying a street for the existing NTMP?

A. Speeding: The Traffic Engineering Division will consider implementing traffic calming measures through the NTMP when a speed study shows that 15% of the traffic is traveling 5 MPH or more over the posted speed limit.
B. Cut-Through Traffic: Cut-through traffic should represent at least as much as the study area's self-generated total average daily traffic to initiate NTMP efforts.
C. Accidents: Pedestrians ,bicycle, and auto accident history may be considered when a crash analysis reveals abnormal rates or trends on the subject street.
D. Street Grades and Alignment: Some physical traffic management devices cannot be installed on streets with large grades or poor visibility.

Who provides the funding for existing NTMP projects?

In most cases, funding will be provided by the City. For Tier 1 projects, administrative approval is needed to authorize implementation. For Tier 2 projects, City Council approval and a designated funding source will be required. For both tiers, if funding is not available, the street will remain on a list and, as funding becomes available, will be addressed in the order it was submitted to the NTMP. If funding is not available and a street does not wish to wait, the residents may organize and donate the funds - for any design, installation/construction, material, and labor costs - to the City.

Appendix A - Summary of Existing Policies

Existing NTMP Guiding Policies and Definitions

1) This program applies to existing residential streets that serve single-family residential neighborhoods. The neighborhood must be entirely within the City of El Paso.

2) Cut-through traffic is defined as: traffic having no immediate starting point or ending point in the residential neighborhood being evaluated. This traffic traditionally flows on major roadways, but may be finding its way into residential streets seeking short cuts.

3) The amount of re-routed traffic that is acceptable as a result of a traffic management project should be defined on a project-by-project basis. It is not the intent of this program to simply relocate traffic or traffic concerns to other residential streets, although it may be desirable to balance traffic across a network of residential streets.

4) Emergency vehicle access within and through neighborhoods will be carefully considered in the evaluation of traffic management and must be preserved in a reasonable fashion.

5) The Traffic Engineering Division shall employ a variety of traffic management strategies and techniques to achieve safety and NTMP objectives. Techniques that have less of an impact will be utilized before harsher or more substantial techniques are considered.

6) Traffic management strategies and techniques shall be planned and designed in conformance with sound engineering practices. All plans will be reviewed and approved by the Traffic Engineering Division staff before the implementation to ensure that proper engineering guidelines have been followed. The Traffic Engineering Division staff will make changes as necessary to ensure safe, sound engineering principles are implemented.

Appendix B - NTMP Applications

The following applications are attached:

1. Neighborhood Traffic Management Program (NTMP) Application
2. Petition for Neighborhood Traffic Management Program (NTMP) Traffic Calming Device Removal

For Office Use Only:
NTMP ____ - _____

CITY OF EL PASO

Neighborhood Traffic Management Program (NTMP) Application

Complete and submit to:

City of El Paso
Streets and Maintenance Department
7968 San Paulo Drive
El Paso, Texas 79907

Tracking No: _____
(If the request was initially processed thru the 3-1-1 phone or web system)

Or email to:

NTMP@elpasotexas.gov

Contact Us:

3-1-1

Date_____

Contact person_____

Address_____

Daytime phone(s)_____

Email Address_____

Application Type: ☐ **Tier 1** (speed cushions and speed feedback signs)
☐ **Tier 2** (traffic circles, medians, bulb outs, etc.)

Street/location of traffic concern (*one street permitted per application*)

_____

Limits/boundaries of street listed above (to determine limits of traffic study)
from _____ to _____

Days/Times When Issue Exists _____

Specific type of concern (i.e. speeding, cut-through traffic, accidents, etc). Please describe in detail (use extra paper, if needed).

_____

_____

_____

_____

Note: Program decisions are made at the discretion of the City of El Paso's Streets and Maintenance Department, in accordance with established criteria, applicable engineering standards, and the availability of funding.

CITY OF EL PASO

Neighborhood Traffic Management Program (NTMP) Application

In the box below (or an attached map), draw the street and/or intersection(s) where the concern exists. The drawing/map may also include any notes related to existing conditions, suggestions for specific areas to study, and potential locations for traffic calming improvements.

CITY OF EL PASO

Neighborhood Traffic Management Program (NTMP) Application

Requests for traffic calming measures require the submittal of the attached petition, with signatures, from 66% of the households abutting the affected street (within the limits identified in the application). **Submittal of a completed petition does not guaranty program eligibility; eligibility is based on program criteria (see next page of application).** *Only one signature per household will be counted.*

Although the City will coordinate with your neighborhood to create a plan that works for everyone, please be advised that the implementation of the NTMP may result in a traffic calming device being placed directly in front of, or adjacent to, your property.

Traffic calming installed through the NTMP may not be eligible for removal if the installation(s) are deemed necessary to address a safety issue (as determined by the City Traffic Engineer).

NAME	ADDRESS	PHONE NUMBER	SIGNATURE

Signature page may be duplicated if additional signatures are needed.

CITY OF EL PASO

Neighborhood Traffic Management Program (NTMP) Application

All of the following criteria must be satisfied for a street to be considered eligible for Physical Measure installations.

1. Petition

A petition that documents that 66% of the residential households abutting the street support traffic calming installations.

2. Uses of Street

The uses on the street where the physical measure is proposed must be composed primarily of low density residential dwellings.

3. Operational Characteristics of the Street

a. The street must be used to provide access to abutting residential properties (local residential street) and/or to collect traffic for such streets (residential collector).
b. There must be no more than one moving lane of traffic in each direction.
c. Traffic volumes must be more than 500 vehicles per day but less than 7,500 vehicles per day.
d. Fifteen percent (15%) of traffic meets or exceeds five miles per hour (MPH) over the posted speed limit
e. The street must have a speed limit of 20-35 MPH as determined in accordance with State Law.
f. A crash rate that is at least 25% above baseline rate (may substitute for Criteria 3d)*

4. Geometric Characteristics of the Street

a. The street must have adequate sight distances to safely accommodate the traffic calming device.
b. The street must not have curves or grades that prevent safe placement of devices. Traffic calming devices may be located on streets that contain curves and/or grades, but the device itself must not be located within a horizontal curve, on a vertical grade greater that 8% or on their immediate approaches.
c. The street must be paved. It there are no curbs, a special design must be used to prevent vehicle runarounds.
d. The elevation of property adjacent to a physical measure location must be above top of curb to minimize potential flooding due to the presence of the traffic calming device in the roadway.

** **Based on collision patterns, speed cushions may not be the appropriate option to address the issue. Other safety solutions, outside of the NTMP, may be considered and implemented by the City Traffic Engineer.***

CITY OF EL PASO

Neighborhood Traffic Management Program (NTMP) Application

The NTMP is a safety program designed to address neighborhood problems of:

- Speeding Trends
- Cut-Through Traffic

Eligible improvements considered through the NTMP include:

Tier 1 – Primary Process (Initial Improvement for Most Eligible Streets)

- Speed Cushions
- Speed Feedback Signs

Tier 2 – Capital Project Improvements (Require Separate Funding)

- Chokers
- Bulbouts
- Chicanes
- Traffic Circles/Roundabouts
- Center Islands/Pedestrian Refuge Islands

Ineligible improvements* that cannot be considered or funded through the NTMP include, but are not limited to:

- Stop Signs/Traffic Signals
- Street Illumination
- Street Resurfacing
- Guardrails/Barricades
- Changes in the Speed Limit
- Traffic Calming Improvements on Arterial Streets

**Many of these improvements do not require a neighborhood petition. Please contact 3-1-1 for assistance.*

Other important information:

- Traffic studies are typically performed during a regular workweek – when school is in session – to give each application the best opportunity at meeting the eligibility criteria.
- Improvements are vetted with the street/neighborhood prior to installation. The City will determine the appropriate devices and locations for installation based on best practices and engineering standards.
- Improvements are contingent on available funding.
- The applicant will be notified by mail of program eligibly status after staff has completed a traffic study and street evaluation.
- For more information, please visit: http://www.elpasotexas.gov/streets/transportation-management

CITY OF EL PASO

Petition for Neighborhood Traffic Management Program (NTMP) Traffic Calming Device Removal

Complete and submit to:

City of El Paso
Streets and Maintenance Department
7968 San Paulo Drive
El Paso, Texas 79907

Tracking No: _____
(If the request was initially processed thru the 3-1-1 phone or web system)

Or email to:

NTMP@elpasotexas.gov

Contact Us:

3-1-1

Date_____

Contact person_____

Address_____

Daytime phone(s)_____

Email Address_____

Street/location of traffic calming device(s) requested to be removed:

_____

Type of traffic calming device(s) requested to be removed:

_____

Describe reason for removal request:

_____

_____

_____

_____

Note: Type of device(s) will determine removal process.

Tier 1 Installations (speed cushions and speed feedback signage):

- *Signatures from 2/3 of property owners immediately affected by the installation, within 100 yards of the installation*

Tier 2 Installations (Capital Improvements):

- *Signatures from 2/3 of property owners immediately affected by the installation, within 100 yards of the installation*
- *Requires City Council approval*

CITY OF EL PASO

Petition for Neighborhood Traffic Management Program (NTMP) Traffic Calming Device Removal

Traffic calming devices installed pursuant to the policies of the NTMP may be removed by the City upon a determination that the removal is required for public safety reasons, or by resident petition requesting removal.

Removal petition forms can be requested from the city after the device has been in place at least 6 months to allow for traffic review and analysis in the area. The petition must be signed by 2/3 of the property owners immediately affected by the traffic calming device(s) (within 100 yards of the installation). If not enough signatures are included on the petition, the request will be denied. If a petition for a removal is submitted within the first year after installation, the resident(s) requesting removal will pay for all removal/relocation costs. If the petition for removal is submitted after the first year, the city will cover removal/relocation costs. Traffic calming devices removed from a location under this process will not be eligible for re-installation for three years from the date that the devices are removed.

Traffic calming installed through the NTMP may not be eligible for removal if the installation(s) are deemed necessary to address a safety issue (as determined by the City Traffic Engineer).

NAME	ADDRESS	PHONE NUMBER	SIGNATURE

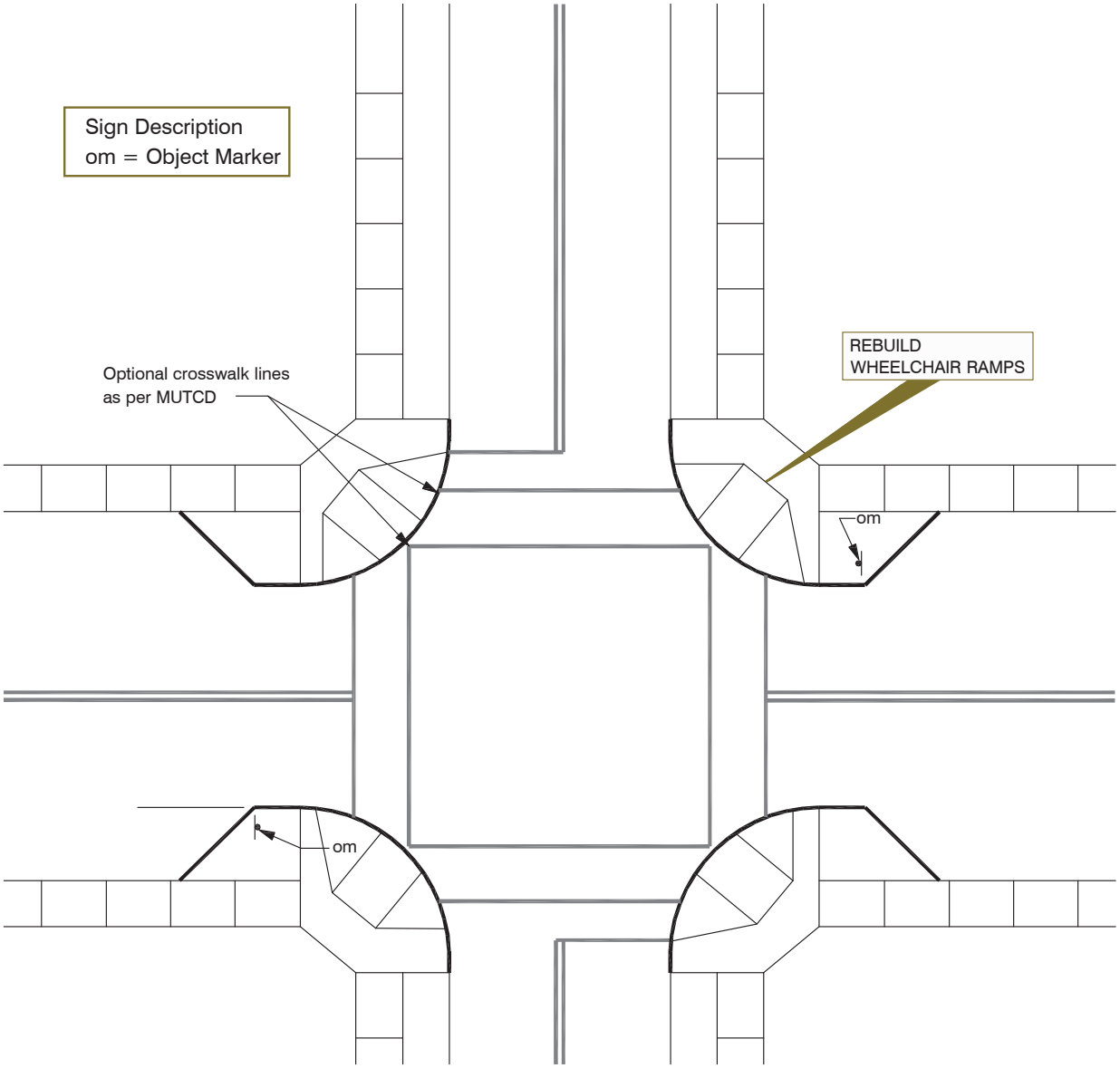
Signature page may be duplicated if additional signatures are needed.

Appendix C - Design Standards

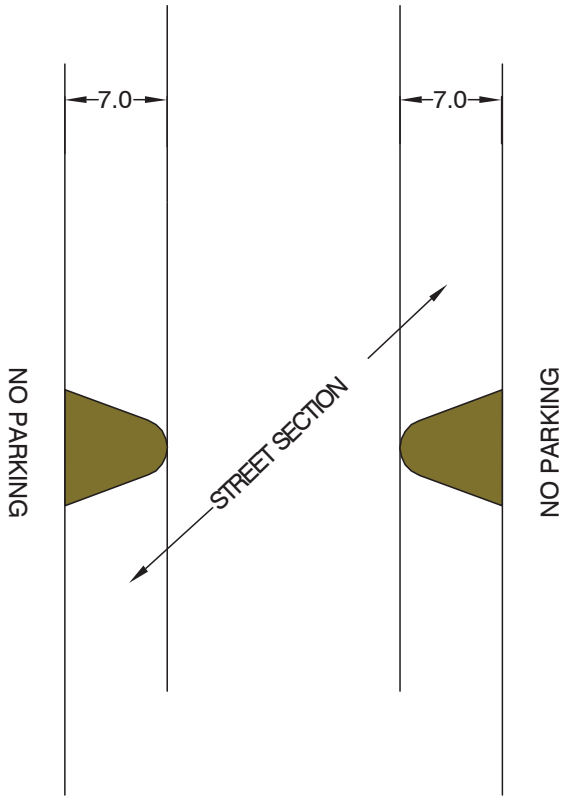
The following pages include conceptual design standards for many of the improvements offered through the NTMP. Given that each street may have varying conditions, final measurements and layouts should take into consideration the City's Design Standards for Construction (DSC), other adopted design standards, best practices in engineering and planning design, and past City projects.

Appendix C - Design Standards

Bulbout
(Intersection Treatment)

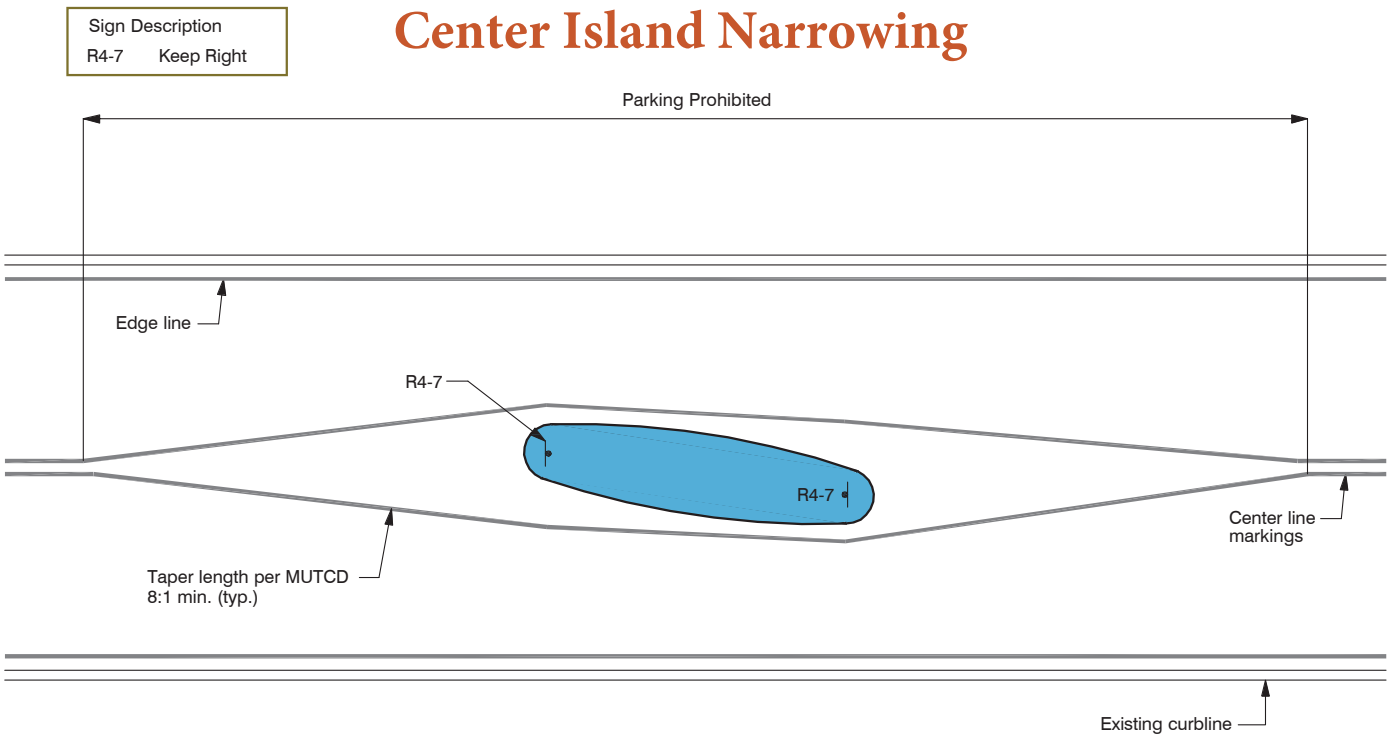


Bulbout
(Midblock Treatment)

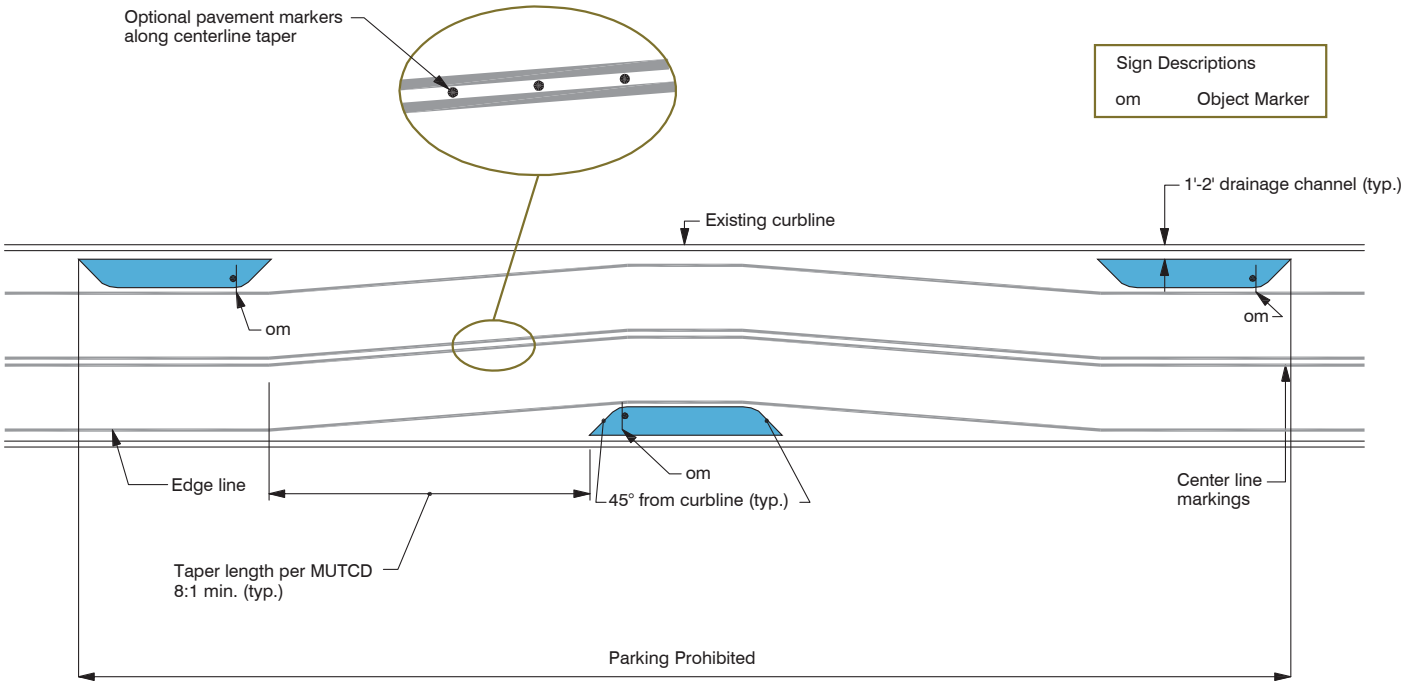


Appendix C - Design Standards

Center Island Narrowing

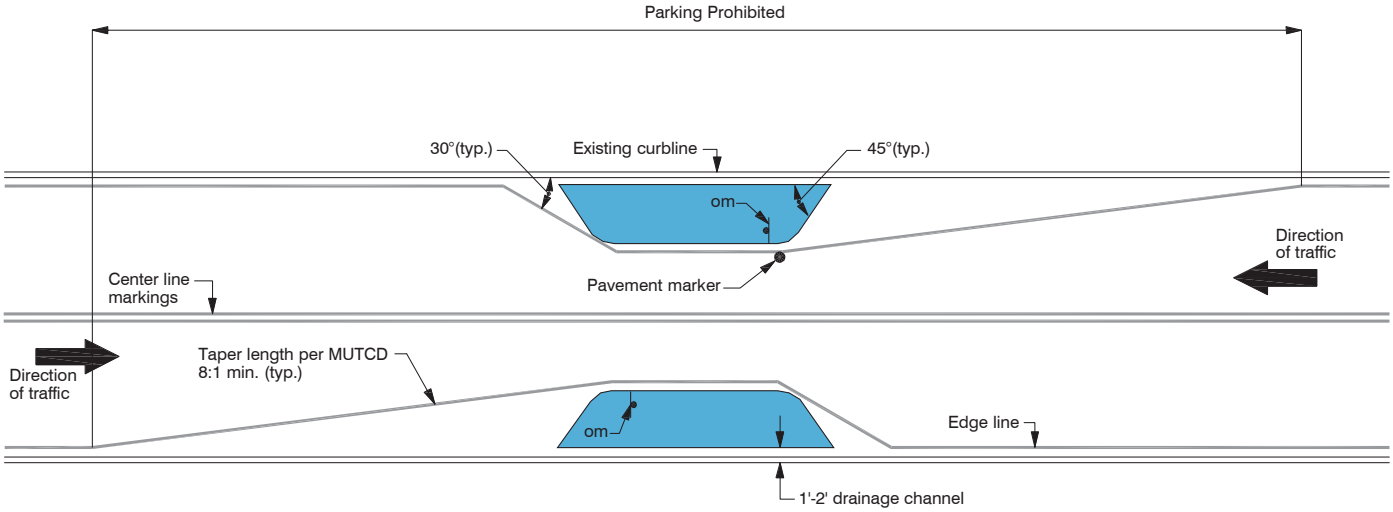


Chicane



Appendix C - Design Standards

CHOKER

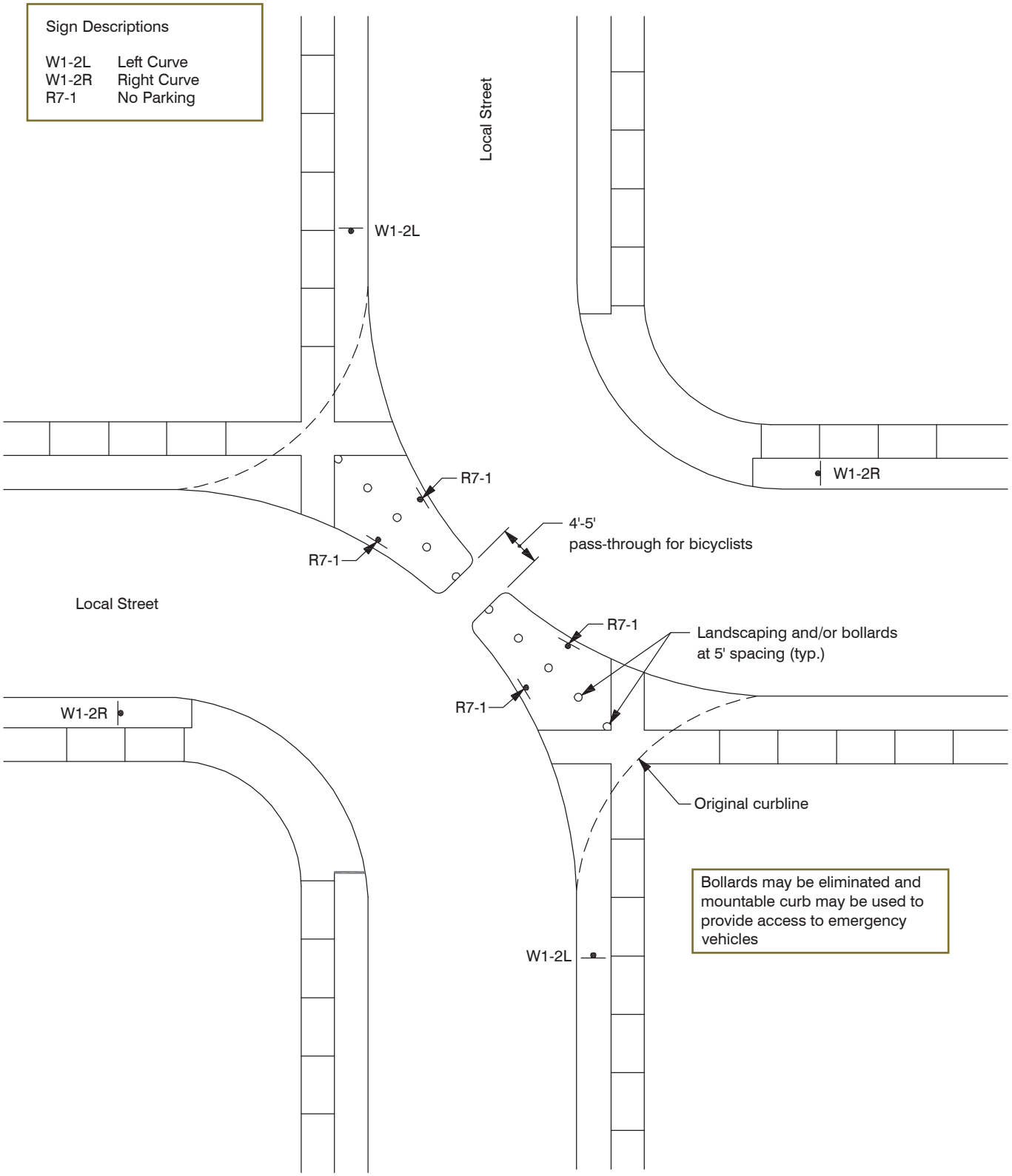


Sign Descriptions

om = Object Marker

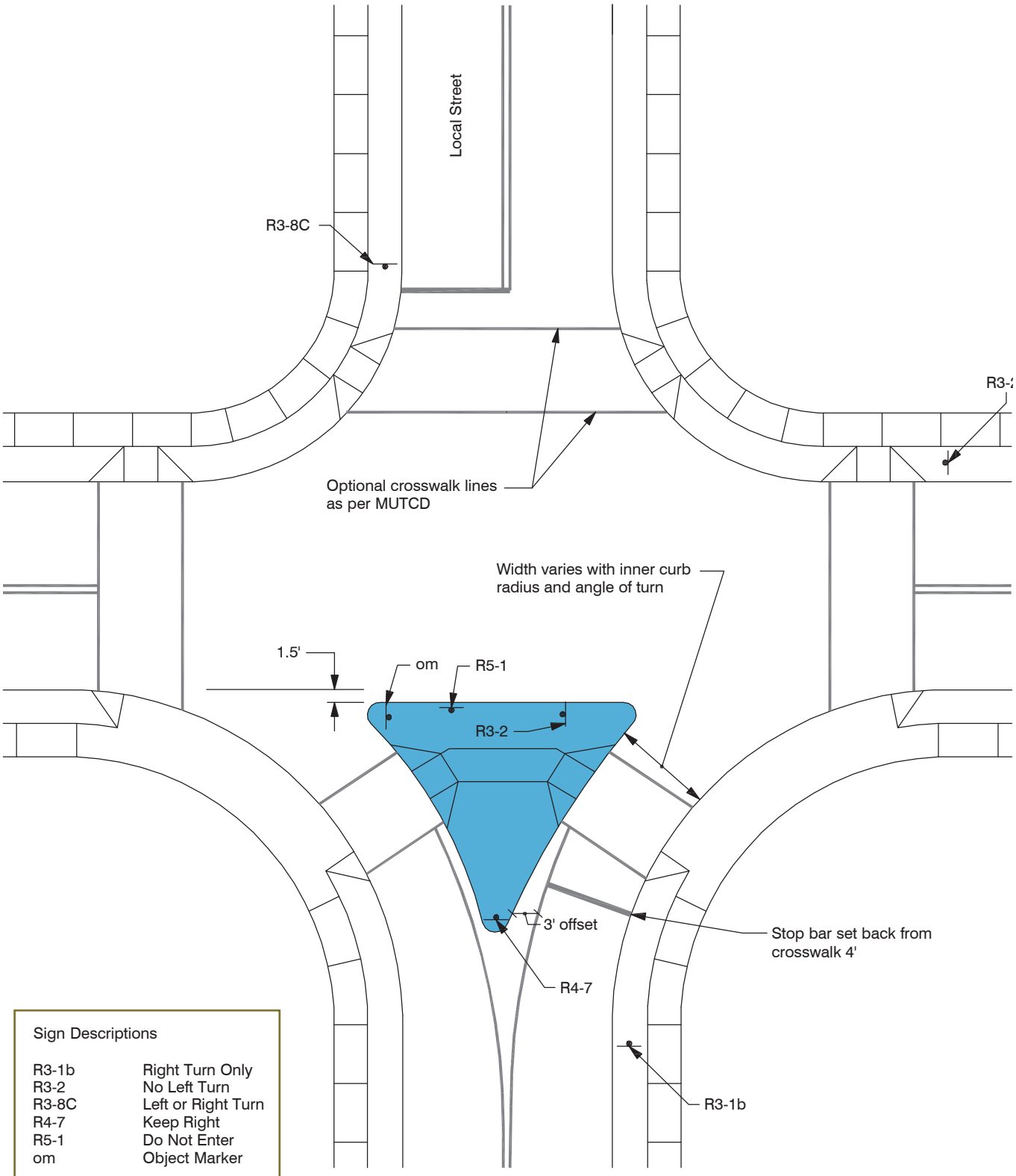
Appendix C - Design Standards

Diagonal Diverter



Appendix C - Design Standards

Forced Turn Island

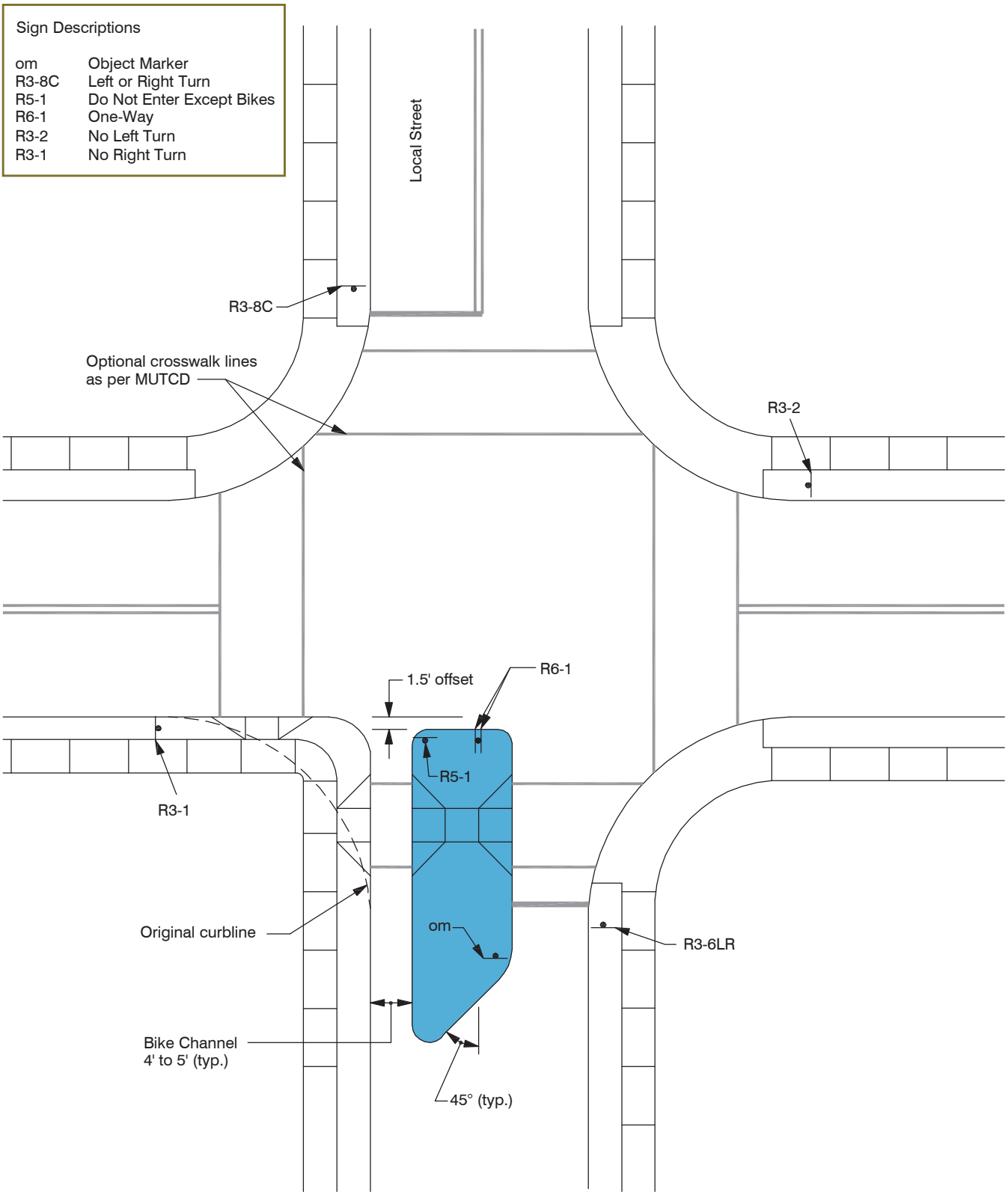


Sign Descriptions

R3-1b	Right Turn Only
R3-2	No Left Turn
R3-8C	Left or Right Turn
R4-7	Keep Right
R5-1	Do Not Enter
om	Object Marker

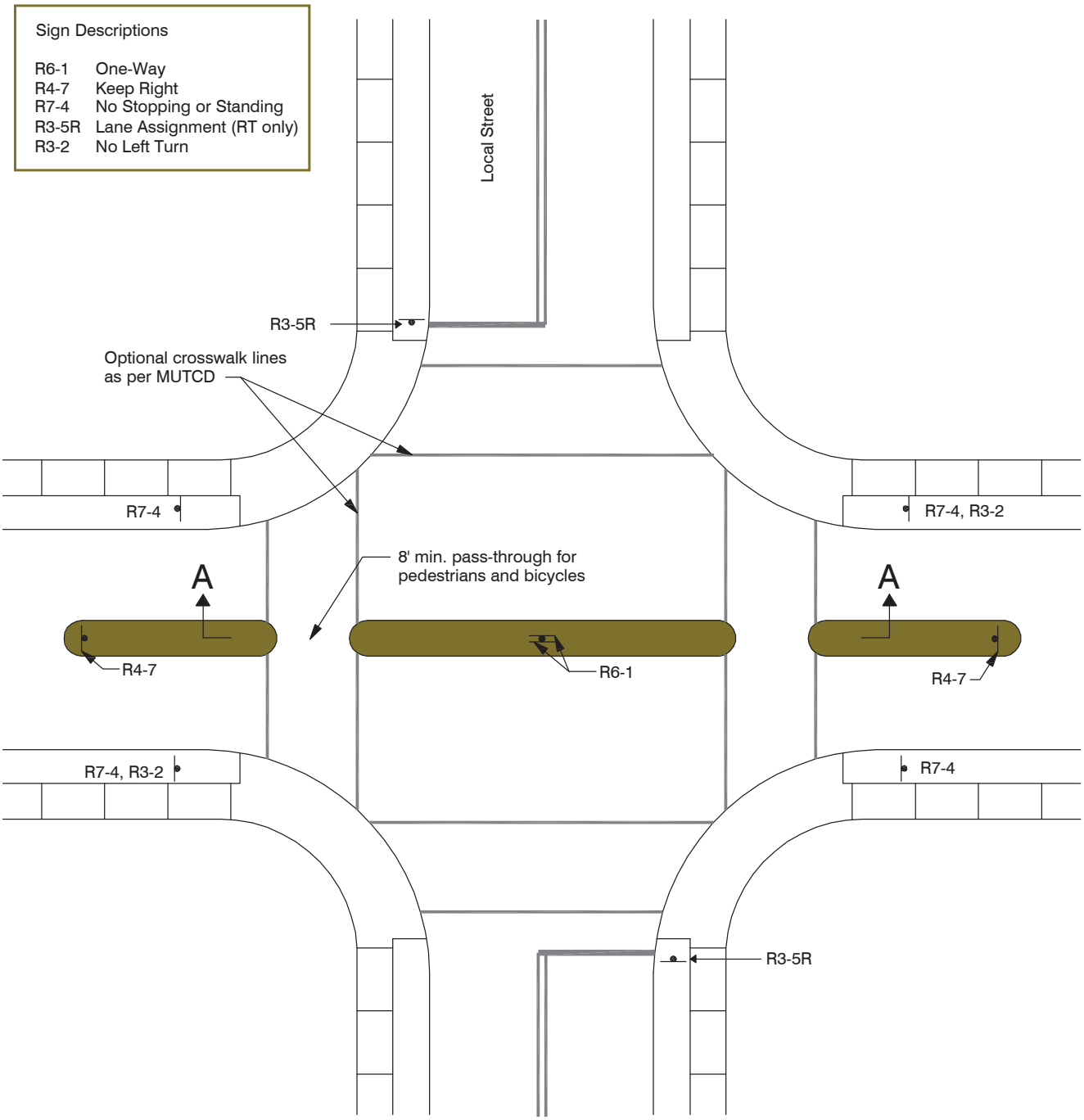
Appendix C - Design Standards

Half Closure



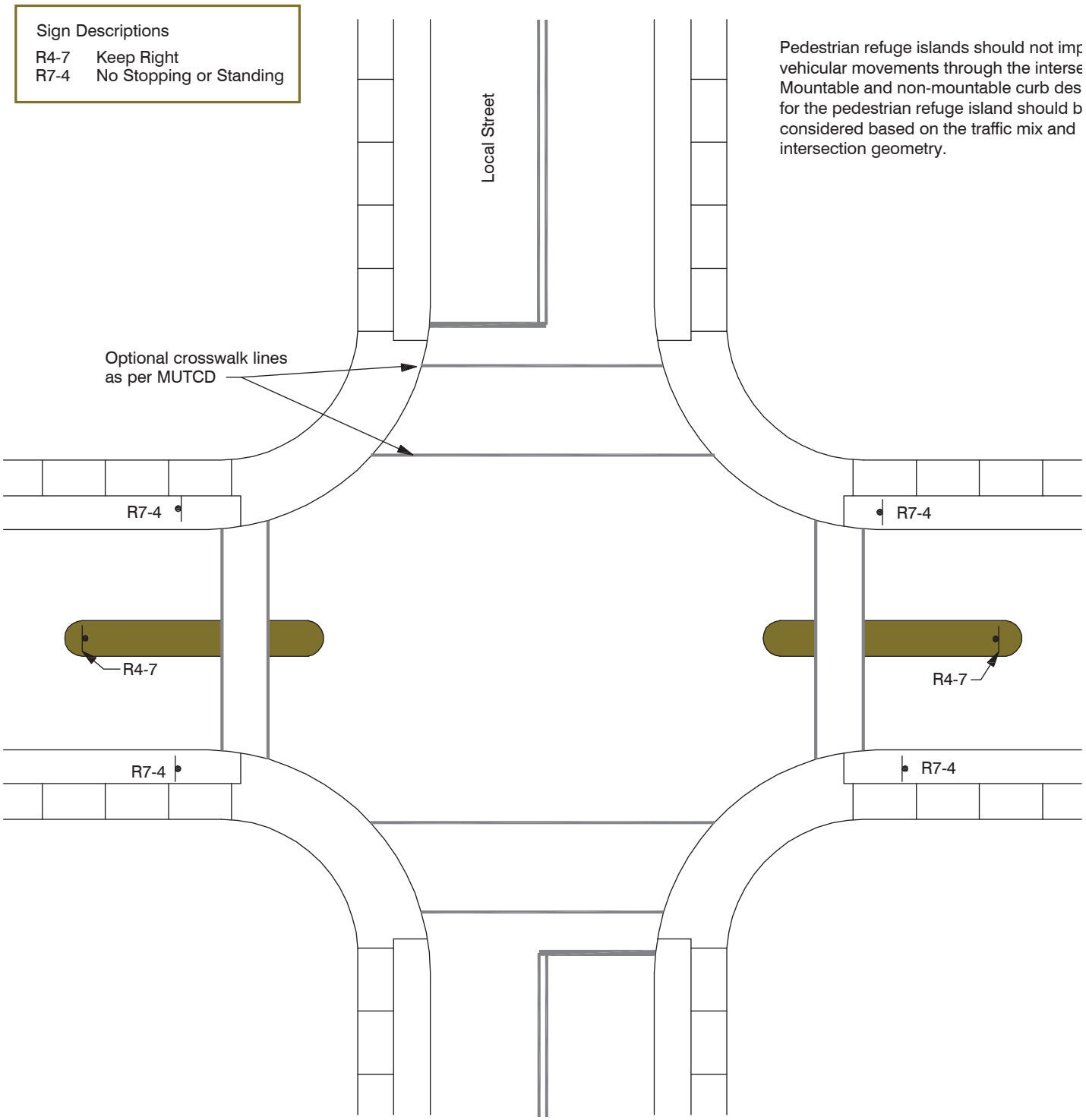
Appendix C - Design Standards

Median Barrier



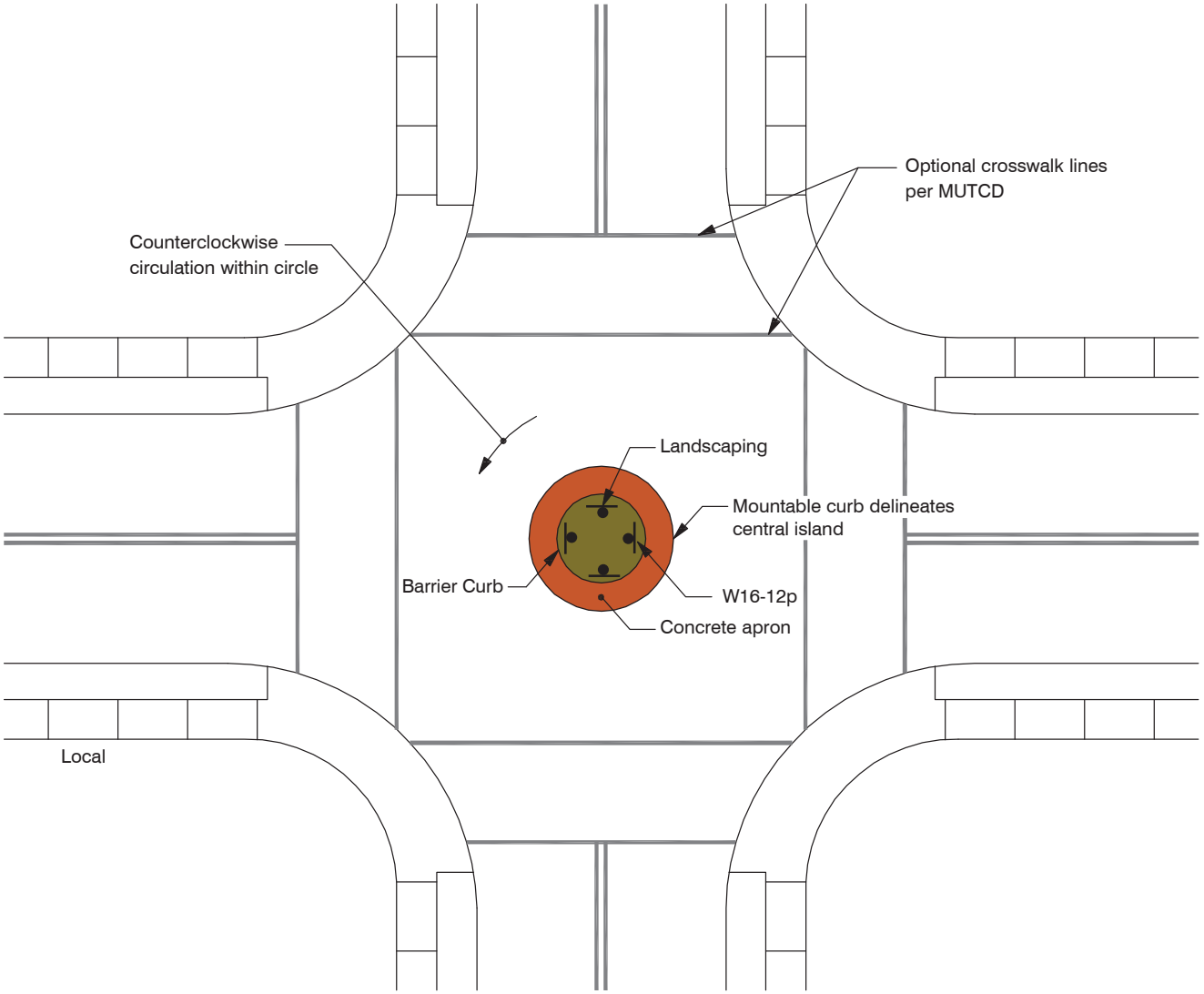
Appendix C - Design Standards

Pedestrian Refuge Island



Appendix C - Design Standards

Traffic Circle

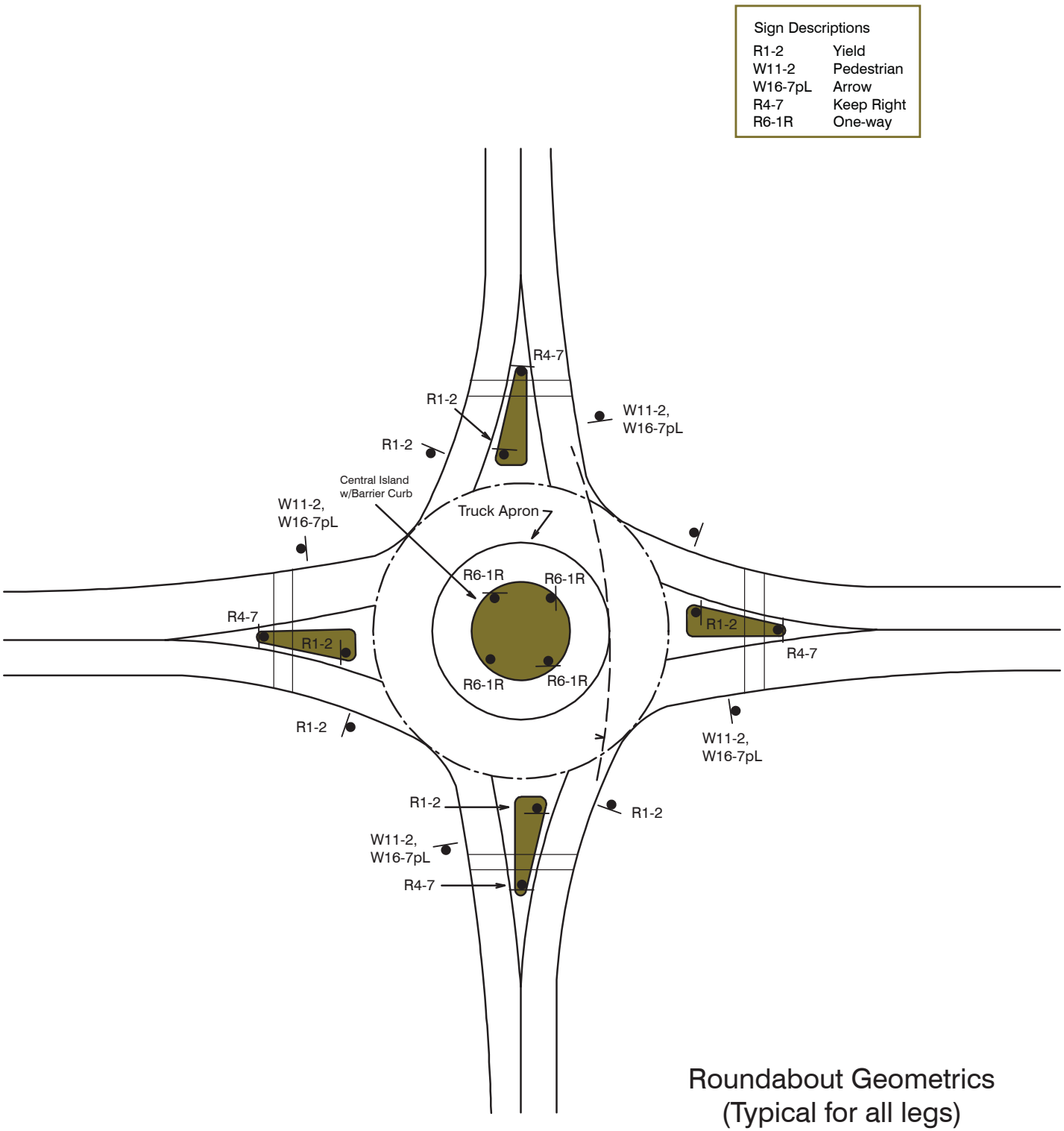


Sign Descriptions

W16-12p Traffic Circle

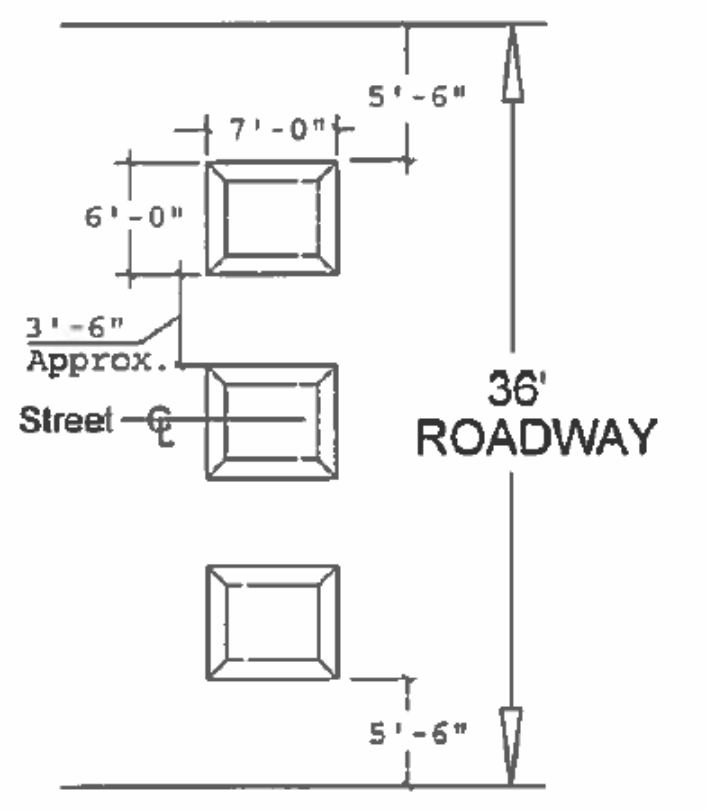
Appendix C - Design Standards

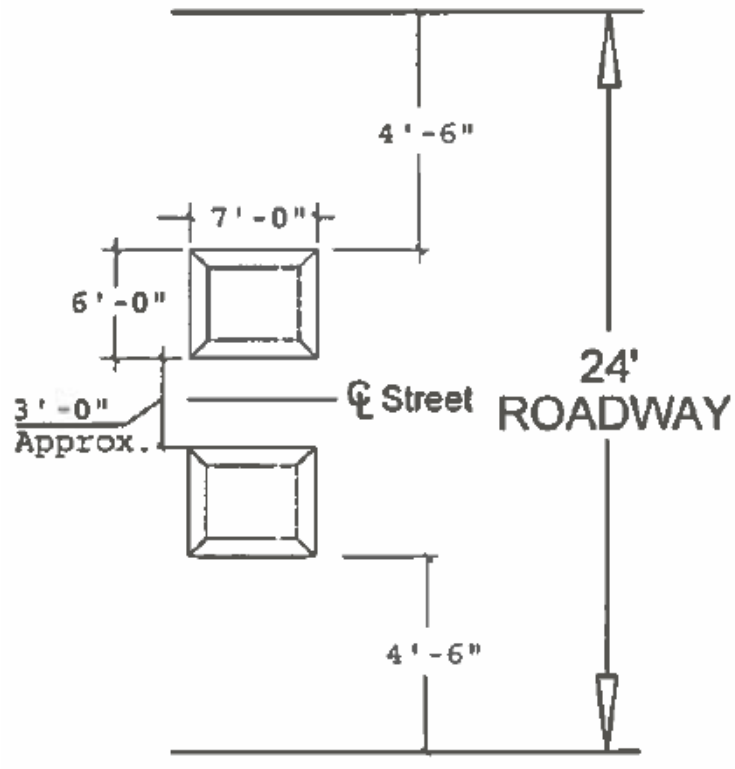
Roundabout



Roundabout Geometrics
(Typical for all legs)

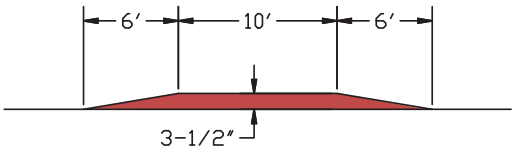
Speed Cushion Typical Detail



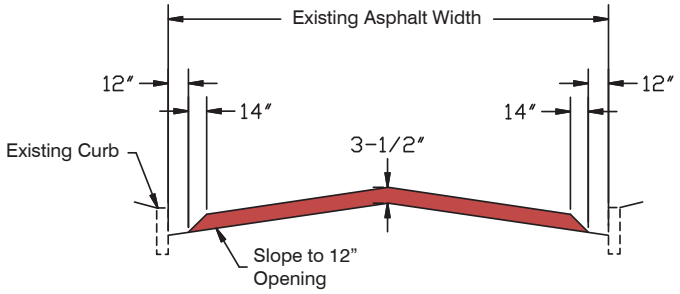


Appendix C - Design Standards

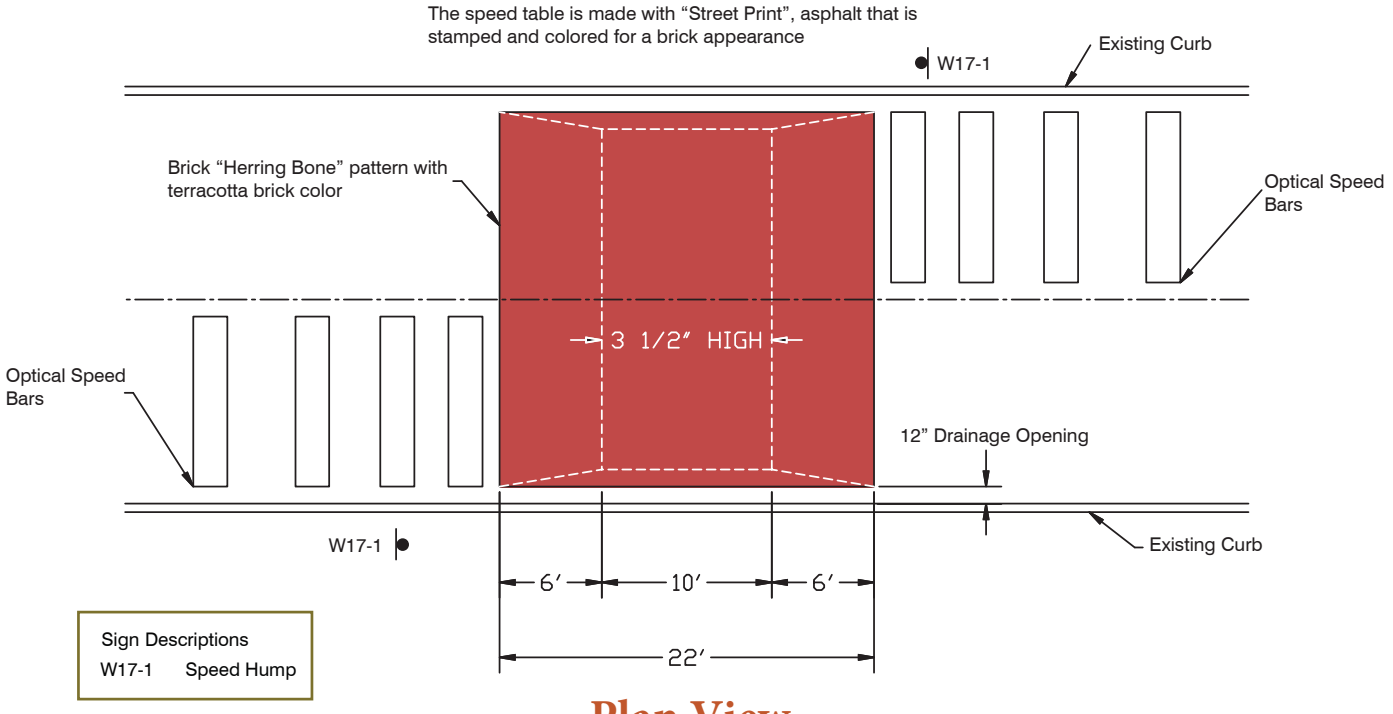
Speed Table



Driving Profile



Typical Section



Plan View