CITY OF ST. LOUIS

Traffic Calming Engineering Guidelines

December 2023



THE COMMON SEAL OF THE CITY OF ST. LOUIS

CBB TRANSPORTATION ENGINEERS+PLANNERS

BUILDING STRONGER CDI COMMUNITIES

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[a] https://www.stlouis-mo.gov/pda/community-mobility/index.cfm

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CONTENTS

01

INTRODUCTION

PAGES 7-16
What is Traffic Calming?
Why is Traffic Calming Needed?
What can Traffic Calming Achieve?
Traffic Calming as a Placemaking Tool

02

PROCESS AND FUNDING

PAGES 17-20
How to Get Traffic Calming on Your Street
How Traffic Calming is Funded
St. Louis Traffic Calming Policy

03

TOOLBOX

PAGES 21-58
Speed Control Vertical Deflection
Speed Control Horizontal Alignment
Volume Management
Traffic Calming Materials
Complementary Tools

04

DECISION SUPPORT TOOL

PAGES 59-62
Description
Decision Support Tool

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INTRODUCTION

Purpose of this Guidebook

In recent years, many communities in the United States have renewed their focus on making streets safer for all users. Residents, visitors, workers, business owners, tourists, and decision makers alike are recognizing the need to calm traffic and create a more welcoming environment for all transportation users. However, this renewed focus does not define the beginning of this practice. Traffic calming techniques have been used in the United States and in other countries since the 1970's. Modern traffic calming techniques, however, have improved upon early techniques through data-driven research and decades of use in neighborhoods across the country.



Figure 1: Over time, traffic calming guides and techniques have evolved significantly (Source: FHWA, NACTO) [a,b,c]

[a] https://highways.dot.gov/safety/pedestrian-bicyclist/safety-tools/selected-reports-state-art-residential-traffic-management

[b] https://highways.dot.gov/safety/speed-management/traffic-calming-eprimer

[c] https://nacto.org/publication/urban-street-design-guide/street-design-elements/vertical-speed-control-elements/

With the recent focus on making streets safer for all users, there is a heightened need for greater consistency in the application of traffic calming treatments throughout the City of St. Louis. A data-driven approach guiding where and how to apply traffic calming is key to maximizing the impact of traffic calming investments made by the city.

This guide is not an all encompassing guidebook for inclusive roadway design and does not account for the the full range of safety features, accessibility design, multimodal design, placemaking design, etc. that is available on projects. It is intended to educate users about specific traffic calming devices and some complementary tools which can be used to retrofit a street or in reconstruction projects and have been proven to be effective on City streets.

The purpose of this guide is to provide community members and leaders with a resource to understand what traffic calming tools are available, their benefits, and their limitations. This material is intended to be empowering. With an intentional deployment of traffic calming measures across the City of St. Louis, our streets can be safer for all by lessening or preventing speeding, crashes, and traffic deaths.

The information in this guide is based on the City's Traffic Calming Engineering Guidelines Design Criteria and Specifications document, which details more specifically where and how to apply traffic calming measures on City streets. Refer to the Design Criteria and Specifications document for more information on the devices presented in this guide.



Figure 2. Community Participation in a St. Louis Traffic Calming Project (Source: MU Extension) [a]

[a] https://extension.missouri.edu/news/leadership-in-action-calming-traffic-building-community-5636

What Is Traffic Calming?

"Traffic Calming is the combination of mainly physical measures that reduce the negative effects of motor vehicle use, alter driver behavior, and improve conditions for non-motorized street users." [a]

The overarching goals of traffic calming are to improve safety for all users of the street, to promote community livability, and to increase the quality of life for all street users. While there are many ways to influence driver behavior for safer streets (community awareness programs, law enforcement, etc.), traffic calming strategies employ physical changes to the roadway to influence driver behavior.

The objectives of traffic calming include:

- To reduce the frequency and severity of collisions
- To increase safety for non-motorized street users
- To reduce cut-through motor vehicle travel patterns
- To slow vehicular travel speeds
- To design streets that are self-enforcing of traffic laws
- To enhance the street environment
- To increase access for all modes, including bicycling, walking, and transit

[a] Lockwood, Ian. ITE Traffic Calming Definition. ITE Journal, July 1997, pg. 22.

Traffic calming tools physically change the street with the intent to encourage or force motorists to change their behavior in such a way that improves the conditions for all street users. By design, traffic calming is a self-enforcing traffic management approach that forces motorists to alter their speed or influences which streets motorists travel on. This, in turn, improves safety and comfort, especially for pedestrians and bicyclists, while increasing the "livability" of streets for both residents and visitors. By decreasing volume and/or reducing speed, the number and severity of crashes can be diminished.



Figure 3: "Chicanes" used in the Central West End of St. Louis to calm traffic (Source: CBB)

Many streets around the country, and in the City of St. Louis, have been built based on principles used in highway design rather than urban street design. One element in highway design is the elimination of obstacles that present hazards to motorists, with the intent to improve motorist safety. The elimination of "roadway friction" tends to increase roadway speeds. Speed limits in the United States have been historically set based upon the prevailing speeds that people are driving rather than the speeds that are safe for all users given the context of a given area. Over time, this motorist-centered approach has resulted in high motorist speeds that are unsafe for bicyclists and pedestrians who share the roadway.



Figure 4: Using traffic calming techniques, Louisiana Ave in St. Louis has become a "Calm Street" (Source: CBB)

This guide primarily focuses on physical measures that can be taken to change traffic behavior recommended by the Federal Highway Administration (FHWA), the Institute of Transportation Engineers (ITE), the National Association of City Transportation Officials (NACTO), and other similar entities concerned with transportation safety that are referenced throughout the document.

Why Is Traffic Calming Needed?

30,795 people have been injured and 343 people have been killed in the City of St. Louis from traffic crashes in the past 5 years (2018-2022). A quarter of those killed were pedestrians or bicyclists, even though these vulnerable road users were involved in only 7.5% of these crashes.[a] These statistics are a result of the fact that people will inevitably make mistakes that lead to or contribute to crashes.

Speeding, red light running, and distracted/inattentive driving are just a few of the circumstances reported as causes for crashes in the City in 2022. Unsafe speeds are continuously at the center of discussion when communities are calling for change on their roadways. Speed is the leading determinant factor in seriousness or lethality of a crash -- even 5 mph can make a big impact when a person walking is hit by a person driving. The vast difference can be seen below in Figure 5. Creating safer streets that will self-enforce lower speeds and encourage responsible driving habits could be the difference between a crash resulting in an injury versus a fatality.

343 people have been killed and **30,795** have been injured by traffic crashes in the City of St. Louis in the past 5 years.

25% of those killed were pedestrians or bicyclists.

All people using streets (drivers, pedestrians, bicyclists, disabled, etc.) have the right to do so safely.

We all share the responsibility to provide a safe transportation environment for every type of road user.

As stated previously, traffic calming is proven to reduce speeds, lessen crash severity, and provide a safer roadway experience for all users. As transportation trends evolve toward more sustainable modes like walking, biking, scooters, etc., the need to create safer streets where each of these uses can co-exist is essential for the health and well-being of our communities.

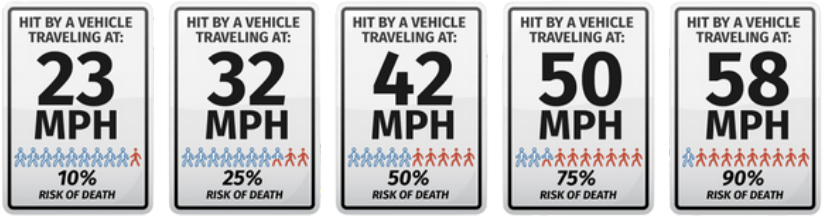


Figure 5. Risk of Death based on Vehicle Speeds (Source: U.S. Department of Transportation National Roadway Safety Strategy)

[a] https://www.mshp.dps.missouri.gov/TR15Map/Search

What Can Traffic Calming Achieve?

Traffic calming measures have immense potential to enhance safety, improve accessibility, and create positive economic impacts. They also have the power to elevate livability and to promote a sense of community by improving neighborhood aesthetics. Overall, implementing traffic calming measures can contribute to an improved street experience, creating an environment where all people can feel confident and secure when navigating city streets.

Examples of traffic calming achievements include:

- Enhancing the street environment: Vehicle speed and volume reduction allows for people biking, walking, and rolling to feel safe and comfortable using the street. Lower speeds and volumes from traffic calming also creates less noise.



Figure 6: A shared street in Montreal (Source: Dylan Passmore, NACTO)



Figure 7: Cargo bikes allow cyclists to transport things like groceries (Source: Bike Portland)

- Decreasing Fuel Consumption: Offering safe and reliable pedestrian and bicycle accommodations cuts down on automobile usage and, in turn, cuts down fuel consumption.

- Healthy Communities: Safe and reliable pedestrian and bicycle infrastructure can encourage people to choose more active modes of transportation, promoting physical and mental health.



Figure 8: A protected shared-use path (Source: Rails-To-Trails)

- Improved Accessibility: Intersections, mid-block crossings, and sidewalks will all be updated to comply with ADA regulations as well as provide shorter crossings and increased visibility to pedestrians.



Figure 9: ADA Accessible Pedestrian Refuge (Source: University of Washington)[b]



Figure 10: Center Median Paired With RRFB (Source: NACTO)[c]

- Enhanced Safety: Complementary tools can be implemented along with traffic calming strategies to further enhance safety and visibility for all roadway users.

- Positive Economic Impacts: Safe and livable spaces designed into the operation of streets may lead to[a] :
  - "Household savings associated with lower vehicles ownership and usage resulting from transit-friendly and walkable communities"
  - "Higher property values associated with a higher quality public realm"
  - Active street design leading to savings in public health costs
  - A lessening in the human costs associated with traffic crashes

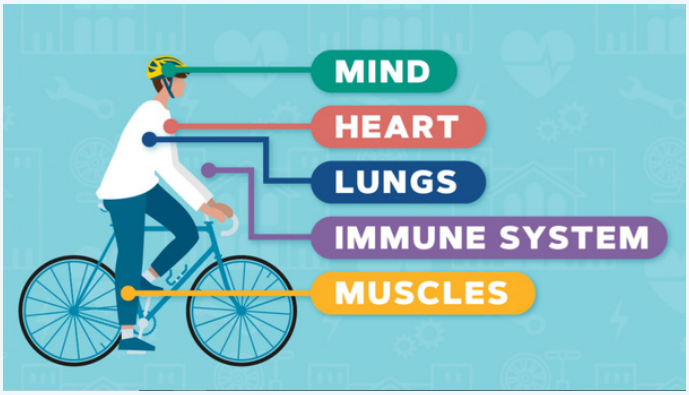


Figure 11: Health Benefits of Active Transportation (Source: UCLA Transportation)

[a] https://www.nyc.gov/html/dot/downloads/pdf/dot-economic-benefits-of-sustainable-streets.pdf

[b] https://www.engr.washington.edu/news/article/2022-03-07/sidewalk-equity

[c] https://nacto.org/publication/urban-street-design-guide/intersection-design-elements/crosswalks-and-crossings/midblock-crosswalks/

Traffic Calming as a Placemaking Tool

"Placemaking is a multi-faceted approach to the planning, design, and management of public spaces. Put simply, it involves looking at, listening to, and asking questions of the people who live, work, and play in a particular space, to discover their needs and aspirations. This information is then used to create a common vision for that place. The vision can evolve quickly into an implementation strategy." [a]

Placemaking is about designing cities and communities with a focus on people and their needs. Great places should focus on the needs of all and should serve the people that occupy the area. The diagram shown in **Figure 12** displays some of the dimensions that go into making a public space great, with one of them being streets and transportation. Our streets and transportation systems connect our cities to places people want to be. A key to maintaining a great place is by providing space where people can cross the street, ride their bikes, or visit with friends and family safely.



Figure 12: The Place Diagram (Source: Project for Public Spaces)

Traffic calming can be supplemented with placemaking tactics to enhance the visual appearance of public places. Implementing measures such as curb extensions/bump-outs, for example, creates spaces for potential supplements to the tools such as landscaping, sidewalk dining, or other programming that are a component of vibrant and inviting communities- the sort of communities where people want to be and spend time in. An example of an existing bump-out in St. Louis that has been enhanced with placemaking components, including landscaping and outdoor dining, can be seen in **Figures 13 and 14**.

[a] https://www.pps.org/article/what-is-placemaking



Figure 13: Placemaking in the Grove in St. Louis (Source: CBB)



Figure 14: Placemaking in the Cortex in St. Louis (Source: CBB)

Maintenance Needs

While placemaking can serve as a positive supplement to traffic calming and provide a sense of place for communities, it is also important to note the ongoing maintenance that may need to occur in order to maintain the sense of place. In many cases, business owners or neighborhood associations may volunteer to maintain certain parts of implemented placemaking objects (see **Figure 15** for the South Grand volunteers). If this is the case, coordination must occur between the city and the agreed upon maintenance entity, and an agreement must be kept. Some examples of placemaking include landscaping, artwork, and sidewalk furniture. Maintenance costs may include regular plant care (watering, weeding, etc.), paint replacement on artwork, and object replacement for damaged items. When advocating for supplemental placemaking within a traffic calming project, these maintenance costs and coordination practices must be taken into account.



Figure 15: South Grand EcoCrew Volunteers in St. Louis (Source: South Grand Community Improvement District)

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PROCESS & FUNDING



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How Can You Get Traffic Calming on Your Street?

Traffic calming projects can be initiated by citizen request or as a part of a roadway improvement project. For example, street resurfacing and reconstruction projects are an opportune time for the City to evaluate traffic conditions and consider including traffic calming into the project.

Residents may submit requests to the Street Department or their Alderperson expressing interest in improving traffic conditions in their neighborhood. The request should describe the location and detail the types of traffic problems perceived. Once the request has been received, the process outlined in Saint Louis' Traffic Calming Policy, outlined on the next page, will commence.

Traffic calming projects can also be initiated by developers, community improvement districts, or private entities. These projects are often encouraged by the City and would be designed independently and approved by the City in the form of obtaining a public improvement permit.

How is Traffic Calming Funded in the City of St. Louis?

Most traffic calming projects are funded through revenue from a local sales tax, often known as ward capital, that funds a wide variety of public improvements to streets and parks. The City may implement traffic calming through its own assessment if funding is available. Other traffic calming projects may be funded by entities like community improvement districts, businesses, institutions, or as a component of development activity. Traffic calming features may be incorporated into larger projects funded with external transportation grants administered by East-West Gateway or the U.S. Department of Transportation, or through partnerships with local taxing districts like Great Rivers Greenway. The City works with MoDOT and other agencies to assess the need for traffic calming on these larger roadway projects.

It is important to consider maintenance as part of the funding for these projects. Maintaining traffic calming infrastructure ensures that the infrastructure is effective, improves the safety for all users of the corridor, and enhances the sense of place for a community.

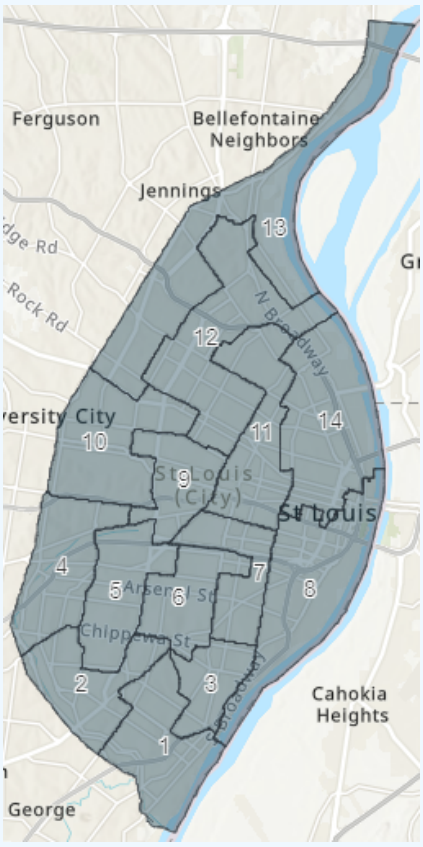


Figure 16: 2023 St. Louis City Wards [a]

[a] https://www.stlouis-mo.gov/government/wards/index.cfm

City of Saint Louis Traffic Calming Policy (2016)

1. Request from Resident(s) to Alderman or Street Department for Traffic Calming
2. Alderman and Streets Department Meet to Discuss Issue
   - Assess existing conditions and brainstorm potential solutions and order of magnitude costs

If traffic calming measures are agreed upon with Alderman and Streets Department:

3. Streets Department Coordinates with Board of Public Service (BPS) to determine if funding is available and collaborate on the scope of the project

If the Street Department or BPS requests further analysis (optional):

4. BPS On-Call Engineering Consultant performs an evaluation of the study area to verify the need for the project
   - The study may include field investigation, speed study, traffic volume study, and/or peak hour observations
   - A brief letter report is prepared summarizing the findings and engineering recommendations
5. BPS, Alderman, & Street Department meet to discuss results of the traffic engineering evaluation
   - The Traffic Commissioner decides if the project should move forward

If the answer is yes:
- Move to Step 6

If the answer is no:
- The Alderman provides feedback and the report to the requester(s)

Once the need as been agreed upon by BPS and funding is available:

6. Design of the traffic calming project through BPS (either through internal staff or on-call traffic consultant)
   - Coordinate the traffic calming project with Street Department, Fire and Police Departments, Office of the Disabled, and nearby property owners as appropriate
   - Depending on the project scope, communicate proposed improvements to community for input

Once design is approved by City Departments:

7. Construction of the traffic calming measures through BPS
8. If needed, the Alderman or Street Department conducts outreach to educate the public on the project
9. Street Department monitors effectiveness and, if needed, seeks enforcement (in the form of additional signage/striping or police attention)

TRAFFIC CALMING TOOLBOX



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TRAFFIC CALMING TOOLBOX

Traffic calming measures can generally be separated into four groups based on the goal they are trying to achieve: vertical deflection, horizontal alignment, volume management, and complementary tools. These categories are not mutually exclusive – for example, speed reduction measures may divert traffic to other streets (reducing volume) and efforts to control cut-through traffic may also decrease the speeds of the traffic using the street.

The list of traffic calming tools are as follows:

Vertical Deflection:

- Speed Humps
- Speed Cushions
- Speed Table
- Raised Crosswalk
- Raised Intersection
- Prefabricated Ally Speed Bumps

Horizontal Alignment:

- Curb Extensions
- Choker
- Chicane
- Lateral Shift
- Roundabouts
- Mini Roundabouts
- Traffic Circle
- Road Diet/Lane Diet
- On-Street Parking
- Intersection Corner Radius Reduction

Volume Management:

- Diagonal Diverters
- Full Closure
- Half Closure
- Forced Turn Island
- Median Barrier

Complementary tools are measures to enhance pedestrian safety or placemaking elements of the community and should be implemented with other traffic calming features.

The list of complementary tools are as follows:

- Pedestrian Refuge Island
- Rectangular Rapid Flashing Beacon
- Pedestrian Hybrid Beacon
- Enhanced Striping
- Enhanced Signage
- Textured Crosswalks
- Streetscaping

Effective traffic calming strategies often include using more than one tool. Traffic calming should be designed with a systematic approach (i.e, appropriate spacing of measures, and consideration for secondary effects of the installations).

Vertical Deflection Tools

This category includes all traffic-calming devices raised above pavement level, requiring drivers to slow down to navigate them comfortably. They are most often applied to neighborhood streets or low-speed streets and can be complementary to horizontal deflection treatments. Vertical deflection treatments work well where other traffic calming measures cannot accomplish desired traffic speeds on streets with speed limits of 30 MPH or under. They also work more efficiently when placed throughout a given neighborhood rather than on a single, targeted street.



Speed Humps



Speed Cushions



Speed Tables



Raised Crosswalks



Raised Intersections



Prefabricated Alley Speed Bumps

SPEED HUMP

OTHER NAMES: ROAD HUMP, UNDULATION

Speed humps are 3 to 5 inch high asphalt or concrete traffic calming devices intended to slow traffic speeds on low-volume, low-speed streets. They extend the full width of the street and are placed in the middle of local and neighborhood streets to encourage cars to slow down.



Figure 17: Speed Hump (Source: CBB)

Speed humps are primarily used for speed reduction. When crossing over a speed hump, vehicle speeds should be reduced to 15 to 20 mph. Vehicles traveling faster than the design speed experience sufficient discomfort to discourage speeding.

BIKE AND PEDESTRIAN CONSIDERATIONS:

Speed humps may be placed on bicycle routes with minimal impact to bicyclist safety. If the street has steep grades, speed cushions may be a preferable treatment.[1]

ADVANTAGES

- Reduces speeds without increasing crashes or need for enforcement
- Relatively low cost and durable
- Compatible with most roadway drainage
- No parking impacts
- No utility impacts

DISADVANTAGES

- May impact emergency response and bus travel times
- May require a series of speed humps to be effective
- May increase roadway noise
- May shift the speed problem to a parallel adjacent street
- Requires additional signing and striping

APPLICABLE ROADWAYS [1]

Speed Limit	30 mph or less
Number of lanes	Only one lane per direction
Total Vehicle Volume	Low
Truck Volume	Low
Non-eligible streets	Primary snow routes and primary industrial site access routes
Streets that require special approval	Secondary snow routes, bus routes, and primary emergency response routes
Placement	Mid-block location
Maintenance Needs	Restriping, signage maintenance, replacement when needed

COST: [2]

LOW

SPEED CUSHION

OTHER NAMES: SPEED LUMP, SPEED PILLOW, SPEED SLOT

Speed cushions are speed humps that include wheel cutouts to allow large vehicles (such as a large emergency vehicle and buses) or bikes to pass unaffected while reducing passenger car speeds.



Figure 18: Speed Cushion (Source: Jay R Jordan)

Speed cushions are used to discourage speeding. When crossing over a speed cushion, vehicle speeds should be reduced to 15 to 20 mph. Vehicles traveling faster than the design speed experience sufficient discomfort to discourage speeding. Speed cushions are designed so that a passenger vehicle cannot pass it without traveling over a portion of the raised pavement.

BIKE AND PEDESTRIAN CONSIDERATIONS:

Speed cushions may be placed on bicycle routes with minimal impact to bicyclist safety. The gaps in the speed cushions can allow bicyclists to travel between the gaps without hinderance. [1]

APPLICABLE ROADWAYS[1]

Speed Limit	30 mph or less
Number of lanes	Only one lane per direction
Total Vehicle Volume	Low
Truck Volume	Low
Non-eligible streets	Primary snow routes
Streets that require special approval	Secondary snow routes
Placement	Mid-block location
Maintenance Needs	Restriping, signage maintenance, replacement when needed

COST: [2]

LOW

ADVANTAGES

- Reduces speeds without increasing crashes or need for enforcement
- Relatively low cost and durable
- Compatible with most roadway drainage
- No parking impacts
- No utility impacts
- Provides gap for bicyclists
- Does not impact travel times for emergency responders or buses

DISADVANTAGES

- Can be more difficult to construct and maintain compared to speed humps
- May require a series of speed humps to be effective
- May increase roadway noise
- May shift the speed problem to a parallel adjacent street
- Requires additional signing and striping
- Motorcycles are not affected

SPEED TABLE

Speed tables are elongated speed humps with a flat top that raises the entire wheelbase of most passenger cars to reduce its speed. They do not require vehicles to slow as much as a speed hump and may be used on streets with steeper grades or higher speed limits.



Figure 19: Speed Table (Source: NACTO)

Speed tables are used to discourage speeding. When crossing over a speed table, vehicle speeds should be reduced to 20 to 25 mph. Vehicles traveling faster than the design speed will experience discomfort to discourage speeding.

BIKE AND PEDESTRIAN CONSIDERATIONS:

Speed tables may be placed on bicycle routes with minimal impact to bicyclist safety. If the street has steep grades, speed cushions may be a preferable treatment. See "Raised Crosswalks" for speed tables used with crosswalks.[1]

ADVANTAGES

- Reduces speeds without increasing crashes or need for enforcement although it may not reduce speeds as much as speed humps
- May be used in locations where speed and/or volume would prevent use of a speed hump
- Compatible with most roadway drainage
- No parking impacts
- No utility impacts

DISADVANTAGES

- May impact emergency response and bus travel times, although the impact is less compared to speed humps
- May require a series of speed humps to be effective
- May increase roadway noise
- May shift the speed problem to a parallel adjacent street
- Requires additional signing and striping

APPLICABLE ROADWAYS[1]

Speed Limit	30 mph or less
Number of lanes	Only one lane per direction
Total Vehicle Volume	Low
Truck Volume	Low
Non-eligible streets	Primary snow routes and primary industrial site access routes
Streets that require special approval	Secondary snow routes, bus routes, and primary emergency response routes
Placement	Mid-block location
Maintenance Needs	Restriping, signage maintenance, replacement when needed

COST:[2]

MEDIUM

RAISED CROSSWALK

A raised crosswalk is a speed hump with a 10-foot flat top and a striped crosswalk, providing a safe crossing for pedestrians. It is similar in design to a speed table, differing mainly at the edges, which are not tapered but flush with the sidewalk connections. ADA detectable warning strips and crosswalk striping and signage are also incorporated into the design. Also, unlike speed tables, it could be placed mid-block or at an intersection.



Figure 20: Raised Crosswalk (Source: CBB)

A raised crosswalk is used to improve pedestrian safety while causing motorist speed to decrease at the crossing. Raising the height increases pedestrian visibility and the line of sight for a pedestrian towards an oncoming vehicle.

BIKE AND PEDESTRIAN CONSIDERATIONS:

Raised crosswalks are well suited for locations with high pedestrian traffic. They are excellent for pedestrian crossing safety and may be placed on bicycle routes with minimal impact to bicyclist safety. [1]

APPLICABLE ROADWAYS[1]

Speed Limit	30 mph or less
Number of lanes	Only one lane per direction
Total Vehicle Volume	Low
Truck Volume	Low
Non-eligible streets	Primary snow routes and primary industrial site access routes
Streets that require special approval	Secondary snow routes, bus routes, and primary emergency response routes
Placement	Mid-block or intersection
Maintenance Needs	Restriping, signage and drainage maintenance, replacement when needed

COST: [2]

MEDIUM

ADVANTAGES

- Reduces speeds without increasing crashes or need for enforcement
- Provides a safer pedestrian crossing compared to a traditional crosswalk
- Improves placemaking and aesthetics
- Can be paired with other devices like curb extensions or rectangular rapid flashing beacons

DISADVANTAGES

- May impact emergency response and bus travel times
- Impacts drainage
- Occupies some on-street parking
- If at an intersection, may impact vehicles with large turning radii
- May increase roadway noise
- May shift the speed problem to a parallel adjacent street
- Requires additional signing and striping

RAISED INTERSECTION

OTHER NAMES: RAISED JUNCTION, INTERSECTION HUMP, PLATEAU

A raised intersection is a speed table spread over a full intersection. It raises the roadway surface to be flush with the curb across the intersection and is designed with ramps on all approaches to force vehicles to slow down approaching the intersection. They must be installed at intersections that have curbs and gutters with sidewalks provided on all parts of the intersection.



Figure 21: Colored Concrete Raised Intersection (Source: CBB)

Raised intersections reinforce slow speeds at minor intersections by changing vertically like speed humps. Raising the height of the entire intersection provides increased pedestrian visibility and the line of sight for a pedestrian towards an oncoming vehicle.

BIKE AND PEDESTRIAN CONSIDERATIONS:

Raised intersections may be placed on bicycle routes with minimal impact to bicyclist safety unless pavers or another textured surface is used. Raised intersections must be placed where crosswalks are present at all legs of an intersection. Pedestrian safety is improved through increased visibility and elevated lines of sight.[1]

ADVANTAGES

- Improves pedestrian crossing safety
- Less impact to emergency response and bus travel times
- Generally improves placemaking and aesthetics of the community
- Can be used as a gateway for treatment into a neighborhood or special district

DISADVANTAGES

- Usually requires new or relocated drainage inlets
- Can make it more difficult for vehicles with large turn radii
- Most expensive vertical deflection device to construct
- May shift the speed problem to a parallel adjacent street
- Requires additional signing and striping
- May not be comfortable for bicyclists

APPLICABLE ROADWAYS[1]

Speed Limit	30 mph or less
Number of lanes	Only one lane per direction
Total Vehicle Volume	Low
Truck Volume	Low
Non-eligible streets	Primary snow routes and primary industrial site access routes
Streets that require special approval	Secondary snow routes
Placement	At intersection; crosswalks must be provided on all legs
Maintenance Needs	Restriping, signage maintenance, resurface when needed

COST:[2]

HIGH

APPLICABLE ROADWAYS

PREFABRICATED ALLEY SPEED BUMPS

A prefabricated speed bump can be used in alleyways to reduce speeds and/or cut-through traffic using the alleys. When crossing over a speed bump, vehicle speeds should be reduced to one to five mph. They are made of rubber and are flexible to fit any alley roadway surface.

Placement

Only allowed in alleyways or to create curb extensions or chokers



Figure 22: Prefabricated Alley Speed Bump (Source: CBB)

Prefabricated speed bumps can also be used to create curb extensions or chokers. They are not allowed in the travel lanes of City Streets.

Maintenance Needs

Very minimal, Replacement when needed

BIKE AND PEDESTRIAN CONSIDERATIONS:

Prefabricated speed bumps are not bike friendly. However, since the speed bumps are only used in alleys or to create curb extensions or chokers, they should have minimal impacts to bicyclists and pedestrians.

ADVANTAGES	DISADVANTAGES
• Reduces speeds and cut-through traffic without increasing crashes or need for enforcement • Prefabricated • Compatible with most roadway drainage • Does not require additional signage or striping	• May require a series of speed bumps to be effective • May increase roadway noise • May shift the speed problem to a parallel adjacent street

COST:

LOW

Horizontal Alignment Tools

This category of traffic-calming techniques includes all techniques that reduce the area of the street designated exclusively for motor vehicle travel and/or which require the drivers to stray from the perceived path to complete their movement. “Reclaimed” space from area reductions is typically used for pedestrian or cyclist amenities, parking, and/or landscaping.

Curb Extensions





Chokers

Chicane





Lateral Shift

Roundabouts





Mini Roundabouts

Traffic Circle





Road Diet

On-Street Parking





Intersection Corner Radius Reduction

CURB EXTENSIONS

OTHER NAMES: CORNER EXTENSIONS, BUMP-OUTS, BULB-OUTS, POP-OUTS

Curb extensions visually and physically narrow the roadway at intersections, creating shorter crossings for pedestrians while increasing space for street furniture and landscaping.



Figure 23: Curb Extensions (Source: Google Street View)

A curb extension is primarily used to "pedestrianize" an intersection. Vehicles encountering a curb extension may experience slower turning speeds. If combined with a raised crosswalk, a greater reduction in vehicle speed can be achieved.

BIKE AND PEDESTRIAN CONSIDERATIONS:

Curb extensions are well suited for locations with high pedestrian traffic. They are excellent for pedestrian crossing safety because they shorten the crossing distance for pedestrians. They may also be placed on bicycle routes. Curb extensions can be designed to provide additional protection for bike lanes, but often cost more and require more roadway width.[1]

APPLICABLE ROADWAYS[1]

Speed Limit	No limit
Number of lanes	No limit
Total Vehicle Volume	No limit
Truck Volume	No limit
Non-eligible streets	None
Streets that require special approval	None
Placement	At an intersection
Maintenance Needs	Maintenance varies by material, e.g. concrete curbs require less maintenance than tubular markers

ADVANTAGES

- Shortens crossing distance for pedestrians and increases visibility of pedestrians
- When implemented at bus stops, eliminates bus maneuver to and from the curb
- Creates protection for adjacent on-street parking
- Does not require additional signage

DISADVANTAGES

- Can impact drainage
- Can impact utilities
- May impact turning radius for large trucks and buses
- Not as much effect on through traffic compared to turning vehicles
- Depending on the material used, may require frequent maintenance

COST:

VARIES

CHOKER

OTHER NAMES: MIDBLOCK CURB EXTENSION, PINCH-POINT

Chokers (also called “pinch points”) narrow the roadway mid-block to force motorists to slow down while creating a shorter pedestrian crossing distance and space for landscaping. They are highly desirable for locations with mid-block pedestrian crossings that are long distance away from stop-controlled or signalized intersections.



Figure 24: Choker (Source: CBB)

A choker is primarily used to “pedestrianize" a midblock location. Vehicles encountering a choker may feel a heightened sense to slow down. If combined with a raised crosswalk, a greater reduction in vehicle speed can be achieved.

BIKE AND PEDESTRIAN CONSIDERATIONS:

Chokers are well suited for locations with high pedestrian traffic. They are excellent for pedestrian crossing safety because they shorten the crossing distance for pedestrians. They may also be placed on bicycle routes. However, the chokers should not extend into a bike lane.[1]

ADVANTAGES

- Shortens crossing distance for pedestrians and increases visibility of pedestrians
- When implemented at bus stops, eliminates bus maneuver to and from the curb
- Creates protection for adjacent on-street parking
- Does not require additional signage

DISADVANTAGES

- Can impact drainage
- Can impact utilities
- May reduce available on-street parking
- Not as much effect on through traffic compared to turning vehicles
- Depending on the material used, may require frequent maintenance

APPLICABLE ROADWAYS[1]

Speed Limit	40 mph or less
Number of lanes	Two lanes per direction or less
Total Vehicle Volume	No limit
Truck Volume	No limit
Non-eligible streets	None
Streets that require special approval	None
Placement	Midblock locations
Maintenance Needs	Maintenance varies by material, e.g. concrete curbs require less maintenance than tubular markers

COST:[2]

HIGH TO MEDIUM

CHICANE

OTHER NAMES: REVERSING CURVE, DEVIATION, SERPENTINE, TWIST

Chicanes are a roadway configuration which consists of alternating curves or turns that force drivers to slow down and navigate carefully, promoting a safer environment for all street users.



Figure 25: Chicane (Source: CBB)

Chicanes reduce vehicular speeds due to the increased maneuvering required. They are created using concrete curbs or pinned-on concrete islands.

BIKE AND PEDESTRIAN CONSIDERATIONS:

Chicanes should consider providing enough space for bicycles to safely pass through, and they should avoid placing crosswalks within the chicane area to ensure driver attention remains focused on the main curvature of the road. [2]

APPLICABLE ROADWAYS [2]

Speed Limit	35 mph or less
Number of lanes	Only one lane per direction
Total Vehicle Volume	Low
Truck Volume	No limit if heavy trucks can be accommodated
Non-eligible streets	Primary industrial site access routes
Streets that require special approval	None
Placement	Midblock location
Maintenance Needs	Minimal maintenance required, drainage design may require maintenance

COST: [2]

HIGH TO MEDIUM

ADVANTAGES

- Provides opportunity for landscaping
- Unlikely to need utility relocation
- Does not require additional signage
- Can be used for localized problem areas
- Can be used as a gateway treatment into a neighborhood or special district
- Durable

DISADVANTAGES

- Not as effective if traffic volumes are low or not balanced in both directions
- Can create discomfort for transit passengers
- Some motorists may cross the center line while navigating the chicane
- Could impact on-street parking
- May impact drainage

LATERAL SHIFT

Lateral shifts realign an otherwise straight street by shifting the travel lanes in one direction, promoting a safer environment for all street users. They are similar to chicanes, but only shift the travel lanes in one direction, instead of two.



Figure 26: Lateral Shift (Source: CBB)

Lateral shifts reduce vehicular speeds due to the increased maneuvering required. They are created using concrete curbs or pinned-on concrete islands.

BIKE AND PEDESTRIAN CONSIDERATIONS:

Lateral shifts have minimal impact to bicycle and pedestrian safety. They should clearly define where bicyclists should travel through the shift and avoid placing crosswalks within the shift area to ensure driver attention remains focused on the main curvature of the road. [2]

ADVANTAGES

- Can be implemented on higher volume streets
- Provides opportunity for landscaping
- Unlikely to need utility relocation
- Does not require additional signage
- Can be used as a gateway treatment into a neighborhood or special district

DISADVANTAGES

- Does not reduce speeds as much as other traffic calming devices
- Can create discomfort for transit passengers
- Some motorists may cross the centerline while navigating the lateral shift if a median is not installed
- Could impact on-street parking
- May impact drainage

APPLICABLE ROADWAYS[2]

Speed Limit	35 mph or less
Number of lanes	Only one lane per direction
Total Vehicle Volume	No limit
Truck Volume	No limit
Non-eligible streets	None
Streets that require special approval	None
Placement	Midblock locations
Maintenance Needs	Minimal maintenance required, drainage design may require maintenance

COST:[2]

MEDIUM

ROUNDABOUT

Roundabouts are channelized intersections at which all traffic moves counterclockwise around a central traffic island.



Figure 27: Roundabout (Source: CBB)

Roundabouts calm traffic by reducing speeds through the intersection and increase safety by limiting the number of conflict points.

BIKE AND PEDESTRIAN CONSIDERATIONS:

Roundabouts can allow for shorter pedestrian crossings. Pedestrian crossing safety can be enhanced by incorporating rectangular rapid flashing beacons or raised crosswalks. Bicycle accommodation can be made at a roundabout by providing cyclists a safe way to use the travel lane or providing a ramp where the roundabout meets a shared use path.[4]

APPLICABLE ROADWAYS[4]

Speed Limit	No limit
Number of lanes	Two lanes per direction or less, not including turn lanes
Total Vehicle Volume	A capacity analysis is required
Truck Volume	No limit
Non-eligible streets	None
Streets that require special approval	None
Placement	At an intersection
Maintenance Needs	Resurfacing, signing and striping maintenance, landscaping upkeep (if used)

COST:[2]

HIGH

ADVANTAGES

- Reduces high injury and fatal crashes
- Can reduce vehicular and pedestrian delay compared to signal or stop-controlled intersection
- Can be used to intersect more than four roadways/approaches
- Can accommodate all vehicle types
- Center island provides for placemaking or gateway treatment

DISADVANTAGES

- May require right-of-way
- Does not provide stop-controlled pedestrian crossings that a signal or stop-controlled intersection would
- Multi-lane roundabouts can be confusing to drivers if not signed/striped properly
- Potential utility impacts

MINI ROUNDABOUT

Roundabouts are channelized intersections at which all traffic moves counterclockwise around a central traffic island. A mini roundabout has only a single circulating lane and has a fully traversable center island with a smaller inscribed diameter compared to a traditional roundabout.



Figure 28: Mini Roundabout (Source: Google Street View)

Roundabouts calm traffic by reducing speeds through the intersection and increase safety by limiting the number of conflict points.

BIKE AND PEDESTRIAN CONSIDERATIONS:

Roundabouts can accommodate for shorter pedestrian crossings. Pedestrian crossing safety can be enhanced by incorporating rectangular rapid flashing beacons or raised crosswalks. Bicycle accommodation can be made at a roundabout by providing cyclists a safe way to use the travel lane or providing a ramp where the roundabout meets a shared use path. [4]

ADVANTAGES

- Can reduce vehicular and pedestrian delay compared to signal or stop-controlled intersection
- Can be used to intersect more than four roadways/approaches
- Can accommodate all vehicle types
- Does not have as much spatial requirements compared to a traditional roundabout

DISADVANTAGES

- Does not provide stop-controlled pedestrian crossings that a signal or stop-controlled intersection would
- Does not provide space for landscaping or aesthetic treatments in the center island
- Potential utility impacts

APPLICABLE ROADWAYS [4]

Speed Limit	30 mph or less
Number of lanes	Only one lane per direction, not including turn lanes
Total Vehicle Volume	A capacity analysis is required
Truck Volume	Low
Non-eligible streets	None
Streets that require special approval	None
Placement	At an intersection
Maintenance Needs	Resurfacing, signing, and striping maintenance

COST: [2]

HIGH TO MEDIUM

TRAFFIC CIRCLE

Traffic circles are stop or yield-control intersections at which all traffic moves counterclockwise around a central island. Traffic circles require less space compared to roundabouts or mini-roundabouts.



Figure 29: Traffic Circle (Source: CBB)

Traffic circles are often used as quick build intersection treatments on residential streets to reduce speeds through the intersection.

BIKE AND PEDESTRIAN CONSIDERATIONS:

Pedestrian crossings should be well marked and the center island must not block sight lines between drivers and pedestrians across the intersection. If bicycle facilities are present, it should be designed so that bikes share the road with drivers through the intersection. [2]

APPLICABLE ROADWAYS [2]

Speed Limit	30 mph or less
Number of lanes	Only one lane per direction
Total Vehicle Volume	Medium
Truck Volume	Low
Non-eligible streets	Primary industrial site access routes, primary emergency response routes
Streets that require special approval	Primary and secondary snow routes, bus routes
Placement	At an intersection
Maintenance Needs	Signing and striping maintenance, landscaping upkeep (if used)

ADVANTAGES

- Center island provides opportunity for placemaking or gateway treatment
- Usually fits within the existing intersection curb width
- Can be easily and quickly implemented
- Minimal parking impacts
- Likely no utility impacts

DISADVANTAGES

- Landscaping or utility pots require frequent maintenance
- Requires additional signage and striping
- Impacts trucks and emergency response vehicle travel paths

COST: [2]

MEDIUM TO LOW

ROAD DIET

OTHER NAMES:ROADWAY RECONFIGURATION, LANE DIET

A road diet is a process of removing lanes or narrowing lanes to utilize the space for other uses like bike lanes, on-street parking, new or wider sidewalks, and more.



Figure 30: Road Diet (Source: CBB)

Road diets can reduce vehicle speeds and improve safety for all users of the roadway. The most common road diet reconfiguration is reducing a four-lane roadway (two travel lanes per direction) to a three-lane roadway (one travel lane per direction with a center turn lane).

BIKE AND PEDESTRIAN CONSIDERATIONS:

Road diets often include adding bike lanes or buffers for bike lanes, improving pedestrian facilities such as widening sidewalks and crosswalks, and/or creating safer and more accessible paths for cyclists and pedestrians to enhance their mobility and safety within the reconfigured roadway. [3]

ADVANTAGES

- Can improve vehicular safety by reducing speeds
- Can improve bike and pedestrian safety with new or improved accommodations
- Compatible with most roadway drainage
- Promotes complete streets and can be used to enhance neighborhood identity

DISADVANTAGES

- Can cause diversions to other routes
- Not applicable on roads with high volumes
- May increase congestion/ queuing by reducing capacity
- May require signal modifications

APPLICABLE ROADWAYS [3]

Speed Limit	No limit
Number of lanes	No limit
Total Vehicle Volume	Capacity analysis required
Truck Volume	No limit
Non-eligible streets	None
Streets that require special approval	None
Placement	Along a roadway corridor
Maintenance Needs	Resurfacing, signing and striping maintenance, landscaping upkeep (if used)

COST:

VARIES

ON-STREET PARKING

APPLICABLE ROADWAYS[3]

Speed Limit	45 mph or less
Number of lanes	No limit
Total Vehicle Volume	No limit
Truck Volume	No limit
Non-eligible streets	See Revised Code of the City Sections 17.08.470 or 17.08.480
Streets that require special approval	See Revised Code of the City Sections 17.08.470 or 17.08.480
Placement	Along a roadway corridor
Maintenance Needs	Signing and striping maintenance, street sweeping

COST:[2]

LOW

On-street parking consists of vehicles parked near the curb in areas designated by signing or striping. In-use on-street parking can reduce vehicle speeds by narrowing the travel lanes and forcing trailing vehicles to slow when cars attempt to park.



Figure 31: On-Street Parking (Source: CBB)

On-street parking can benefit nearby properties, like businesses and residences. Parking stalls may be parallel, front-in angled, or back-in angled.

BIKE AND PEDESTRIAN CONSIDERATIONS:

Where pedestrian crossings are present, curb extensions or chokers are highly desirable where on-street parking is present to improve pedestrian safety. If bicycle facilities are present, it is highly recommended to provide extra width or a buffer to protect cyclists from opening car doors. [3]

ADVANTAGES

- Can improve vehicular safety by reducing speeds
- Provides a buffer between vehicles and pedestrians on sidewalks
- Can increase revenue for the City of St. Louis by utilizing meters
- Can be easily and quickly implemented, once coordinated through the Traffic and Lighting Division
- Compatible with most roadway drainage
- Unlikely to impact utilities

DISADVANTAGES

- Only effective while parking is in use
- Opening car doors can present safety issues for bicycles if parking next to a bike lane
- Requires additional enforcement needs, like ticketing on street sweeping days
- May require additional signing or striping
- Can increase likelihood of side-swipe or rear-end crashes

INTERSECTION CORNER RADIUS REDUCTION

A corner radius reduction physically reduces the room available on the road for a vehicle to turn. Reducing the corner radius at an intersection may consist of redesigning the roadway curb or eliminating a bypass right-turn. Where trucks must be accommodated without lane encroachment, modified right-turn design can be utilized.



Figure 32: Large Corner Radius (left) vs. Reduced Corner Radius (right) (Source: Google Earth)

Vehicles must slow down to make a turn at this compact intersection adjustment. A corner radius reduction is used to minimize turning speeds and create a safer environment for pedestrians at intersections.

BIKE AND PEDESTRIAN CONSIDERATIONS:

A corner radius reduction improves pedestrian and bike safety by reducing the turning speeds of vehicles. It also can decrease the crossing distance for a pedestrian at a crosswalk.

ADVANTAGES

- Reduces speed of turning movements, improving bike and pedestrian safety
- Reduces pedestrian crossing distance
- Does not require additional signing or striping
- Modified right-turn design improves sight lines for right-turn yielding movements

DISADVANTAGES

- May require curb installation or relocation
- Impacts trucks and emergency response vehicles
- May require more maintenance of curb after corner radius reduction
- May impact existing signal equipment, if present
- May reduce capacity of right-turn movements

APPLICABLE ROADWAYS

Speed Limit	No limit
Number of lanes	No limit
Total Vehicle Volume	Capacity analysis may be required
Truck Volume	Low, if truck volume is high, pursue modified right-turn design
Non-eligible streets	None
Streets that require special approval	Bus routes and primary emergency response routes
Placement	At an intersection
Maintenance Needs	Curb maintenance

COST:

HIGH TO MEDIUM

Volume Management

This category of traffic-calming techniques includes all techniques that restrict specific movements of vehicular traffic at an intersection or mid-block location. Volume management tools are often used when there is significant cut-through traffic on a local street. It is important to consider where volume will shift when these tools are utilized. Cut-through traffic should be directed towards collector and arterial routes. A study may be required to determine optimal placement to maintain accessibility for residents while mitigating likelihood of cut-through traffic.



Diagonal Diverters

Full Closure





Half Closure

Forced Turn Island





Median Barrier

DIAGONAL DIVERTERS

OTHER NAMES: DIAGONAL ROAD CLOSURE, FULL DIVERTER

A diagonal diverter places a barrier diagonally across a four-legged intersection to restrict traffic to only one direction instead of three possible directions.



Figure 33: Diagonal Diverter (Source: Google Street View)

Diagonal diverters reduce volumes and cut-through traffic by eliminating all through traffic at an intersection.

BIKE AND PEDESTRIAN CONSIDERATIONS:

The diagonal diverter should be designed to not inhibit the bikes or pedestrian access. A gap should be provided in the diagonal diverter to allow bikes to pass through. It should be not be wide enough for a car and have vertical elements, like landscaping or delineators on either side of the gap to prevent vehicles from using it. [3]

ADVANTAGES

- Mitigates cut-through traffic
- Eliminates conflict points at an intersection
- Reduces vehicle speeds
- Reduces number of conflict points for pedestrians and bikes
- Provides opportunity for landscaping

DISADVANTAGES

- Limits accessibility for residents
- May require adverse travel for residents
- Likely to increase vehicular volume on parallel routes
- Requires additional signing and striping
- May require traffic study
- Impacts emergency vehicle accessibility and response times

APPLICABLE ROADWAYS [3]

Speed Limit	25 mph or less
Number of lanes	Only one lane per direction
Total Vehicle Volume	No Limit
Truck Volume	Low to none
Non-eligible streets	Primary industrial site access routes, bus routes, and primary emergency response routes
Streets that require special approval	All streets
Placement	At an intersection
Maintenance Needs	Signing and striping maintenance, repainting, or landscaping upkeep (if used)

COST: [2]

LOW TO MEDIUM

FULL CLOSURE

OTHER NAMES: DEAD END, CUL-DE-SAC

A full closure uses a curb or places a barrier perpendicularly across the full width of the roadway to close the street off to all traffic beyond that point. A removable bollard is required to maintain emergency response access.



Figure 34 : Full Closure (Source: CBB)

Full closures reduce volumes and cut-through traffic by restricting all vehicular traffic past the barrier. They impact accessibility and often divert traffic to parallel routes. A City ordinance and coordination with Fire and Police Departments are required to install a full closure.

BIKE AND PEDESTRIAN CONSIDERATIONS:

The closure should be designed to not inhibit the bikes or pedestrian access. A gap should be provided in the closure to allow bikes to pass through. It should be not be wide enough for a car and have vertical elements, like landscaping or delineators on either side of the gap to prevent vehicles from using it. [3]

ADVANTAGES

- Significantly reduces vehicular volume
- Mitigates cut-through traffic
- Eliminates conflict points at an intersection
- Reduces number of conflict points for pedestrians and bikes
- Provides opportunity for landscaping

DISADVANTAGES

- Limits accessibility for residents
- May require adverse travel for residents
- Likely to increase vehicular volume on parallel routes
- Requires additional signing
- May require traffic study
- May impact on-street parking
- Impacts emergency vehicle accessibility and response times

APPLICABLE ROADWAYS [3]

Speed Limit	No Limit
Number of lanes	Only two-way streets with one lane per direction
Total Vehicle Volume	No Limit
Truck Volume	Low to none
Non-eligible streets	Primary industrial site access routes, bus routes, and primary emergency response routes
Streets that require special approval	All streets
Placement	Mid-block or intersection location
Maintenance Needs	Signing and striping maintenance, repainting, or landscaping upkeep (if used)

COST: [2]

VARIES

HALF CLOSURE

OTHER NAMES: PARTIAL CLOSURE, ONE-WAY CLOSURE

Half closures on a roadway place a barrier perpendicularly across one half of the roadway to close the street off to one direction of traffic beyond that point.



Figure 35: Half Closure (Source: CBB)

Half closures are used to reduce volumes and cut-through traffic in one direction by restricting vehicular traffic in the chosen direction past the barrier.

BIKE AND PEDESTRIAN CONSIDERATIONS:

The half closure should be designed to not inhibit bike or pedestrian access. A gap should be provided in the half closure to allow bikes to pass through. [3]

ADVANTAGES

- Reduces vehicular volume
- Mitigates cut-through traffic
- Eliminates some conflict points at an intersection
- Reduces number of conflict points for pedestrians and bikes
- Provides opportunity for landscaping
- Has less impacts to residents compared to a full closure

DISADVANTAGES

- Limits accessibility for residents
- May require adverse travel for residents
- Likely to increase vehicular volume on parallel routes
- Some vehicles may attempt to illegally avoid the half closure going the wrong direction in the open lane
- Requires additional signing
- May require traffic study
- May impact on-street parking
- Impacts emergency vehicles accessibility and response times

APPLICABLE ROADWAYS [3]

Speed Limit	No Limit
Number of lanes	Only two-way streets with one lane per direction
Total Vehicle Volume	No Limit
Truck Volume	Low to none
Non-eligible streets	Primary industrial site access routes, bus routes, and primary emergency response routes
Streets that require special approval	All streets
Placement	At an intersection
Maintenance Needs	Signing and striping maintenance, repainting, or landscaping upkeep (if used)

COST: [2]

VARIES

FORCED TURN ISLAND

OTHER NAMES: RIGHT-IN/RIGHT-OUT CHANNELIZATION ISLAND

A forced turn island is an island down the center of a roadway at an intersection that restricts movements to only allow right turns in and out of one street.



Figure 36: Forced Turn Island (Source: CBB)

The forced turn island restricts entering and exiting left-turn and through movements on the applied intersection leg, reducing conflict points and volumes on the affected routes.

BIKE AND PEDESTRIAN CONSIDERATIONS:

Intersections with bike and pedestrian facilities present should ensure the forced turn island is wide enough to accommodate a place for pedestrian refuge and has space or cut out to carry the bike facility through the intersection safely. [3]

APPLICABLE ROADWAYS [3]

Speed Limit	25 mph or less
Number of lanes	Two lanes or less per direction
Total Vehicle Volume	No Limit
Truck Volume	No Limit
Non-eligible streets	Primary industrial site access routes, bus routes, and primary emergency response routes
Streets that require special approval	All streets
Placement	Intersection location
Maintenance Needs	Signing and striping maintenance, curb maintenance

COST: [2]

VARIES

ADVANTAGES

- Reduces vehicular volume
- Mitigates cut-through traffic
- Eliminates some conflict points at an intersection
- Reduces number of conflict points for pedestrians and bikes
- Does not impact on-street parking

DISADVANTAGES

- Limits accessibility for nearby properties
- May require adverse travel for nearby properties
- Likely to increase vehicular volume on parallel routes
- Requires additional signing and striping
- May require traffic study
- Impacts emergency vehicle accessibility and response times

MEDIAN BARRIER

OTHER NAMES: MEDIAN DIVERTER, INTERSECTION BARRIER, INTERSECTION DIVIDER

A median barrier is a median island placed in the center of an intersection on the centerline of an intersecting roadway that creates a right-in/right-out on two legs of an intersection.



Figure 37: Median Barrier with Bike and Pedestrian Facilities (Source: Steven Vance)

A median barrier is used to restrict traffic entering and exiting left-turn and through movements. This reduces the number of conflicts between roadway users and volumes on the affected routes.

BIKE AND PEDESTRIAN CONSIDERATIONS:

Median barriers where bicycle and pedestrian facilities are present should have gaps in the center to accommodate cyclists and gaps to accommodate a pedestrian in the crosswalk. [3]

ADVANTAGES

- Reduces vehicular volume
- Mitigates cut-through traffic
- Eliminates some conflict points at an intersection
- Reduces number of conflict points for pedestrians and bikes
- Does not impact on-street parking
- Accommodates bike facilities better than the forced turn island

DISADVANTAGES

- Limits accessibility for nearby properties
- May require adverse travel for nearby properties
- Likely to increase vehicular volume on parallel routes
- Requires additional signing and striping
- May require traffic study
- Impacts emergency vehicle accessibility and response times

APPLICABLE ROADWAYS [3]

Speed Limit	25 mph or less
Number of lanes	Only one lane per direction
Total Vehicle Volume	No Limit
Truck Volume	No Limit
Non-eligible streets	Primary industrial site access routes, bus routes, and primary emergency response routes
Streets that require special approval	All streets
Placement	At an intersection
Maintenance Needs	Signing and striping maintenance, repainting or landscaping upkeep if used

COST: [2]

VARIES



TRAFFIC CALMING MATERIALS

Many traffic calming devices require asphalt or concrete construction. However, some devices can be implemented using lower cost/quick-build elements to achieve the desired traffic calming effect.

Quick-build traffic calming solutions feature elements made from lower-cost, shorter term materials such as paint, flex post delineators, and movable vertical elements (e.g., planters) that can be removed if necessary without permanently altering the streetscape. They may include some curb ramp reconstruction but do not otherwise include curb or drainage reconstruction.

The channelizing devices shown on the following page have proven to be effective in the City of St. Louis and can be used to quick-build the identified traffic calming devices. The type of material used should should not only consider initial installation costs but also costs of maintenance and re-installation.

Quick-build traffic calming solutions, like all traffic calming solutions, are improvements in the public right-of-way that require design and construction plans signed and sealed by a licensed professional engineer with approval of the Street Department.

More information about the construction materials for each traffic calming device can be found in the City's Traffic Calming Engineering Guidelines Design Criteria and Specifications document.

QUICK-BUILD TRAFFIC CALMING MATERIALS[6]

FLEUR DE LIS PLANTERS

(Photo Source: STL CMC)



Fleur de lis planters are large, concrete planters with fleur de lis precast on the side.

Can be used for:

- Curb Extension
- Choker
- Diagonal Diverters
- Full Closures
- Half Closures

STREET ROCKS/ STONE BOULDERS

(Photo Source: STL CMC)



Street rocks, or stone boulders, are natural made large rocks around 3 feet long and 3 feet tall.

Can be used for:

- Curb Extension
- Choker
- Diagonal Diverters
- Full Closures
- Half Closures

PRECAST CONCRETE BLOCKS

(Photo Source: CBB)



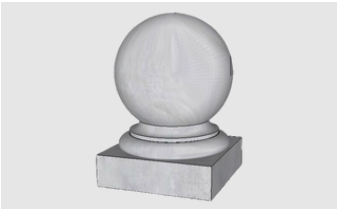
Precast concrete blocks are large, polygon-shaped devices made from precast concrete. They can be painted.

Can be used for:

- Curb Extension
- Choker
- Diagonal Diverters
- Full Closures
- Half Closures

PEDESTAL BALLS

(Photo Source: CBB)



Pedestal balls are large, concrete spheres placed on top of a small concrete slab. They shatter on impact to prevent rolling.

Can be used for:

- Curb Extension
- Choker
- Diagonal Diverters
- Full Closures
- Half Closures

PAWN BOLLARDS

(Photo Source: STL CMC)



Pawn bollards (K72 Style Post) are durable, wide plastic delineators that are installed with high-visibility stripes.

Can be used for:

- Curb Extension
- Choker
- Diagonal Diverters
- Full Closures
- Half Closures

UTILITY POTS

(Photo Source: CBB)



Utility pots are large, cut concrete pipes that are repurposed as planters. They can be painted.

Can be used for:

- Curb Extension
- Choker
- Diagonal Diverters
- Full Closures
- Half Closures
- Traffic Circle

TUBULAR MARKERS

(Photo Source: CBB)



Tubular markers are flexible delineators installed with high-visibility stripes. They are designed to bounce back when struck.

Can be used for:

- Curb Extension
- Choker
- Intersection Corner Radius Reduction

Complementary Tools

Complementary tools are measures that can be used in combination with traffic calming devices to further enhance pedestrian safety and placemaking in a neighborhood.



Pedestrian Refuge Island

Rectangular Rapid Flashing Beacon (RRFB)

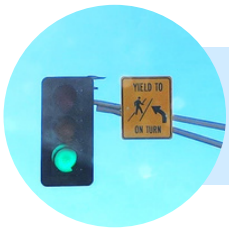




Pedestrian Hybrid Beacon(PHB)

Enhanced Striping





Enhanced Signage

Textured Crosswalks





Streetscaping

PEDESTRIAN REFUGE ISLAND

Pedestrian refuge islands are raised islands with a gap for a crosswalk located in the median of a roadway used to provide a protected space for pedestrians crossing a two-way street.



Figure 38: Pedestrian Refuge Island (Source: CBB)

When crossing the street with a pedestrian refuge island, pedestrians can focus on crossing one half of the street before crossing the other half, thus, reducing the number of conflicts to watch for.

BIKE AND PEDESTRIAN CONSIDERATIONS:

These can be an opportunity for placemaking within a neighborhood if a maintenance agreement is put in place. Regular maintenance must be incorporated to ensure ADA compliance and keep the refuge island free from debris which can make crossing hazardous.

ADVANTAGES

- Provides opportunity for placemaking or gateway treatment
- Can be implemented on higher volume and/or higher speed streets
- Provides additional protection for pedestrians at crosswalks
- Easy to incorporate on streets with a median or two-way left-turn lane

DISADVANTAGES

- Difficult to incorporate on street with no median or two-way left-turn lane
- Requires additional signage and striping
- Landscaping would require frequent maintenance

APPLICABLE ROADWAYS[5]

Speed Limit	No Limit
Number of lanes	Only two-way streets
Total Vehicle Volume	No Limit
Truck Volume	No Limit
Non-eligible streets	None
Streets that require special approval	None
Placement	At a new or established marked crosswalk
Maintenance Needs	Restriping, signage maintenance, replacement when needed

COST:[5] LOW TO HIGH

RECTANGULAR RAPID FLASHING BEACON

Rectangular Rapid Flashing Beacons (RRFB) are a pedestrian crossing sign equipped with a flashing beacon. Once activated by pedestrians, the beacon flashes and prompts drivers to look and stop for pedestrians in the roadway.

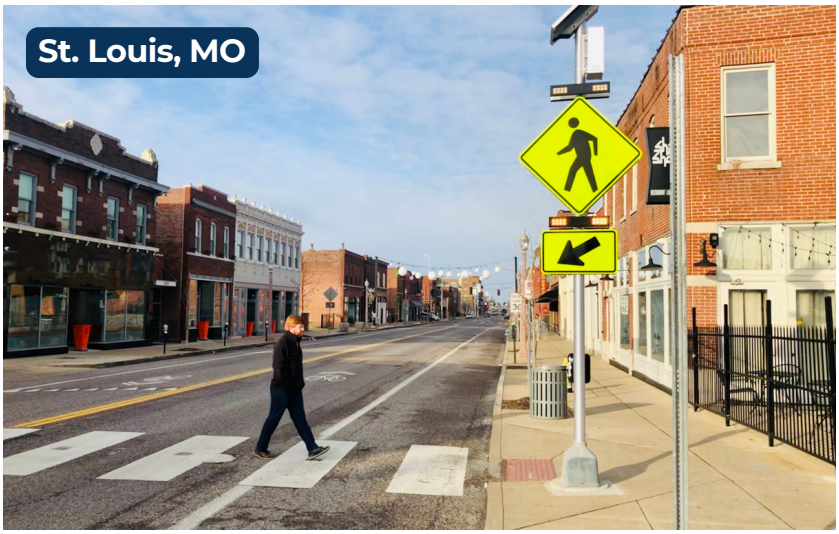


Figure 39: Rectangular Rapid Flashing Beacon (Source: CBB)

Rectangular Rapid Flashing Beacons are used at established pedestrian crossings to improve motorist yielding and pedestrian safety.

BIKE AND PEDESTRIAN CONSIDERATIONS:

Consideration must be made to determine the effectiveness of installing a rectangular rapid flashing beacon on a roadway. Vehicle compliance must be evaluated so not to promote a false sense of security for pedestrians.

ADVANTAGES

- Increases motorist yielding rates and reduces pedestrian crashes
- Can be paired with other traffic calming devices, like chokers or raised crosswalks
- Requires little maintenance once installed

DISADVANTAGES

- Less effective on high volume or high speed roadways
- Can create a false sense of security for pedestrians where drivers fail to yield
- Can require additional striping and signing
- May require public education campaign to be effective

APPLICABLE ROADWAYS [5]

Speed Limit	35 mph or less
Number of lanes	Only 2 lanes per direction
Total Vehicle Volume	High
Truck Volume	Low
Non-eligible streets	None
Streets that require special approval	None
Placement	At a new or established marked crosswalk
Maintenance Needs	Striping and signage maintenance

COST: [5]

MEDIUM TO HIGH

PEDESTRIAN HYBRID BEACON (PHB)

OTHER NAMES: HAWK SIGNAL, HIGH INTENSITY ACTIVATED CROSSWALK

Pedestrian Hybrid Beacons are a pedestrian activated overhead traffic control device that prompts drivers to stop with a red beacon indication. The beacon remains dark when not activated by a pedestrian.



Figure 40: Pedestrian Hybrid Beacon (Source: CBB)

Pedestrian Hybrid Beacons are used on roads where it is difficult for pedestrians to cross due to high vehicle speeds or high vehicle volumes. Examples of crossing difficulties include when gaps in traffic are not sufficient or when speed limits are over 35 mph.

BIKE AND PEDESTRIAN CONSIDERATIONS:

Guidelines from the Manual on Uniform Traffic Control Devices must be met to be placed at a midblock location. These will be most effective at high pedestrian or cyclist traffic locations.

ADVANTAGES

- Significantly increases motorist yielding rates and reduces pedestrian crashes
- Minimizes pedestrian delays
- Effective on high-volume, high-speed, and/or multi-lane roadways

DISADVANTAGES

- Requires special maintenance compared to other complementary tools
- May require public education campaign to be effective
- Removes parking near installation site
- Requires additional signing and striping
- May require utilities to be relocated
- Can slightly increase vehicle travel times

APPLICABLE ROADWAYS[5]

Speed Limit	No Limit
Number of lanes	3 Lanes or More
Total Vehicle Volume	High
Truck Volume	No limit
Non-eligible streets	None
Streets that require special approval	None
Placement	Mid-block location
Maintenance Needs	Similar maintenance needs for a traffic signal

COST:[5]

HIGH

ENHANCED STRIPING

Enhanced striping is additional paint markings in the roadway that more clearly define pedestrian, cycling and vehicle zones.



Figure 41: Enhanced Striping (Source: CBB)

Enhanced striping is used to define the different spaces of the roadway to reduce the likelihood of a crash. It also provides visibility during adverse weather conditions and encourages more cautious driving.

BIKE AND PEDESTRIAN CONSIDERATIONS:

High visibility crosswalk patterns can increase pedestrian visibility at both intersections and midblock crossings. Shared lane markings can be used to denote areas where cyclists may be present on the roadway. Green paint for bicycle lanes can also be used to promote cyclist visibility.

APPLICABLE ROADWAYS

Speed Limit	No Limit
Number of lanes	No Limit
Total Vehicle Volume	No Limit
Truck Volume	No Limit
Non-eligible streets	None
Streets that require special approval	None
Placement	Intersection or Midblock location
Maintenance Needs	Detailed maintenance plan and/or maintenance agreement

ADVANTAGES

- Can increase conspicuity of pedestrians and cyclists
- Easy to incorporate into projects
- Can improve the placemaking of a neighborhood
- Can be quick and easy to install
- Can enhance safety for all users

DISADVANTAGES

- Requires maintenance to remain effective
- Some striping plans can be expensive or difficult to maintain
- Should be paired with other devices for a full traffic calming effect
- Restricted to certain colors and patterns

COST:

LOW

ENHANCED SIGNAGE

Enhanced signage helps promote calmer roadway experiences by increasing conspicuity of various roadway aspects. Enhanced signage can include additional warning signs, dynamic radar speed signs, and flashing LED embedded signs. Additionally, enhanced retroreflectivity in signs provides better visibility during adverse weather conditions and encourages more cautious driving.

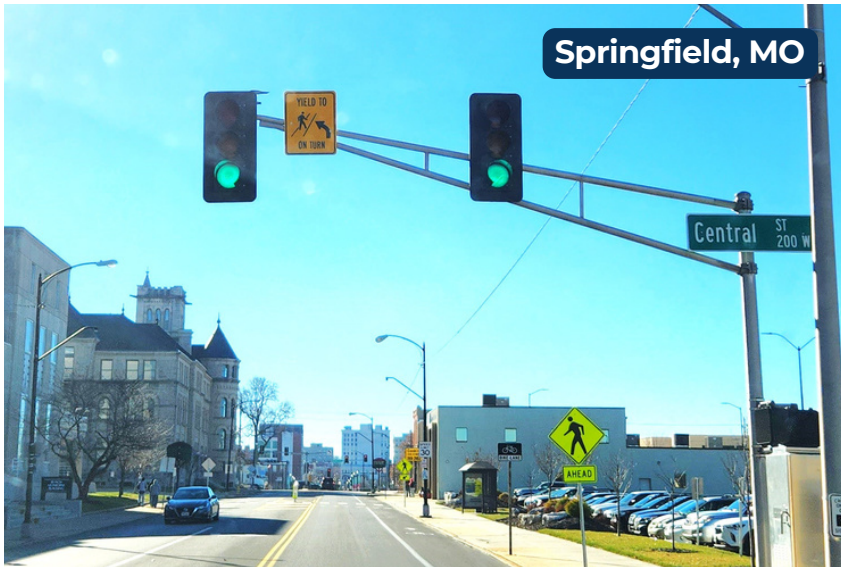


Figure 42: Enhanced Signage (Source: CBB)

Enhanced signage is primarily used for calming traffic and guiding roadway users into making safer and roadway compliant decisions.

BIKE AND PEDESTRIAN CONSIDERATIONS:

May be placed in locations where bicycles or pedestrians could be making unexpected entries into the roadway. Enhanced signage is merely a supplement to traffic calming tools and should not be considered a solution on its own.

ADVANTAGES

- Can be installed on any street
- Can increase conspicuity of pedestrians and cyclists
- Easy to incorporate into projects
- Can be quick, easy, and inexpensive to install
- Can enhance safety for all users

DISADVANTAGES

- Signs need to be replaced periodically
- Too many signs can decrease their effectiveness or lead to driver distraction or confusion

APPLICABLE ROADWAYS

Speed Limit	No Limit
Number of lanes	No Limit
Total Vehicle Volume	No Limit
Truck Volume	No Limit
Non-eligible streets	None
Streets that require special approval	None
Placement	Varies Per Location
Maintenance Needs	Signage maintenance

COST:

LOW

TEXTURED CROSSWALKS

Textured crosswalks increase the visibility of pedestrian crossings at both intersections and midblock locations by replacing traditional pavement with bricks or other pavers laid in a pattern. It is often desirable to install bricks or pavers as borders to the crosswalk, instead of in the crosswalk to avoid maintenance issues within the crosswalk that often impact ADA accessibility.



Figure 43: Textured Crosswalk (Source: Google Street View)



Figure 43: Textured Bricks Outside of Crosswalk (Source: CBB)

Textured crosswalks can be used to slow traffic by placing greater emphasis on pedestrian crossings. However; due to significant maintenance costs, textured crosswalks will only be installed under special circumstances.

BIKE AND PEDESTRIAN CONSIDERATIONS:

Textured crosswalks can help with placemaking in neighborhoods. Maintenance is essential to the integrity of a textured crosswalk. Any disturbed pavement can place a greater risk on cyclist and pedestrian safety when going through or across a textured crosswalk.

APPLICABLE ROADWAYS

Speed Limit	No Limit
Number of lanes	No Limit
Total Vehicle Volume	No Limit
Truck Volume	No Limit
Non-eligible streets	None
Streets that require special approval	All
Placement	Intersection or Midblock location
Maintenance Needs	Detailed maintenance plan and/or maintenance agreement

COST: LOW TO MEDIUM

ADVANTAGES

- Improves aesthetics of pedestrian crossings
- Provides additional visual cue to users that a crosswalk is present
- Can be applied at any pedestrian crossing
- Can be paired with traffic calming tools
- Can improve the placemaking of a neighborhood

DISADVANTAGES

- Difficult and expensive to maintain
- Lose their effectiveness over time and can reduce contrast of pavement markings
- Restricted to certain colors and patterns
- Can only be installed under special circumstances
- Can create accessibility issues due to uneven surfaces if not maintained
- May be noisy for bicyclists and wheelchairs

STREETSCAPING

Streetscaping incorporates landscaping into various aspects of street design to create a more vibrant, welcoming environment. Streetscaping can include bike parking, pedestrian-scale lighting, public art, and seating.



Figure 44: Streetscaping in Central West End (Source: CBB)

Streetscaping is primarily used as a placemaking enhancement as a supplement to a traffic calming tool. It is important to consider maintenance costs when considering streetscaping. Using Missouri native plants can minimize irrigation and pesticide or fertilizer maintenance.

BIKE AND PEDESTRIAN CONSIDERATIONS:

Streetscaping must be maintained to ensure the sight distance allows for all roadway users to be visible. Special consideration must be given to any foliage or roots that may end up within a pedestrian or cyclist zone making traversing the roadway difficult.

ADVANTAGES

- Benefits surrounding commercial or residential properties
- Assists in community placemaking
- Can help with drainage issues
- Street trees can reduce speeds by making the roadway feel narrower
- Native plants contribute to the health of the ecosystem of the natural environment

DISADVANTAGES

- Requires a detailed maintenance plan
- May be expensive to maintain
- If not maintained, can cause sight distance issues for drivers and or pedestrians
- If not maintained, can block view of traffic control devices
- May be difficult to remove
- Can be unsightly if vegetation is not healthy

APPLICABLE ROADWAYS

Speed Limit	No Limit
Number of lanes	No Limit
Total Vehicle Volume	No Limit
Truck Volume	No Limit
Non-eligible streets	None
Streets that require special approval	Must be coordinated with the Forestry Division
Placement	Varies Per Location
Maintenance Needs	Detailed maintenance plan and/or maintenance agreement

COST:

VARIES

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DECISION SUPPORT TOOL

The following decision support tool can be used to select applicable tools based on roadway characteristics. The chart uses functional classification, the posted speed limit, and the average annual daily traffic (AADT) to list eligible traffic calming devices and complementary tools.

The functional classification of a roadway defines the role the route serves in the regional transportation network. More information and the St. Louis metro area functional classification map can be found on East-West Gateway's website.[a]

For a quick check of a roadway AADT, MoDOT maintains an online tool that has AADT data for many streets in St. Louis.[b] Speed and count data at the specific location of consideration should be obtained at the start of the project to confirm eligibility and to be used in a before and after study to evaluate the effectiveness of the project.

Effective traffic calming strategies often include using more than one tool. Traffic calming should be designed with a systematic approach (i.e., appropriate spacing of measures, and consideration for secondary effects of the installations).

The City's Traffic Calming Engineering Guidelines Design Criteria and Specifications document should be utilized for the design and implementation of the desired traffic calming devices and complementary tools.

[a] https://ewgateway.maps.arcgis.com/apps/instant/minimalist/index.html?appid=0e1b4c8dfcc74690a71b47d6e35374e0

[b] https://datazoneapps.modot.mo.gov/bi/apps/maps/Home/MapConfig/AADT

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DECISION SUPPORT TOOL

Posted Speed Limit	Functional Classification			
	Local	Minor Collector	Major Collector	Arterials
≤ 25 mph	1_E 2_A 3_E 4_E 5$_C$ 7 8 9_B 10 11 12 13_G 14 15_H 16_D 17_F 18_F 19_F 20_F 21_F 22 23 25 26 27 28	1_E 2_A 3_E 4_E 5$_C$ 7 8 9_B 10 11 12 14 15_H 16_D 20_F 21_F 22 23 25 26 27 28	1_E 2_A 3_E 4_E 5$_C$ 7 8 10 11 12 14 15_H 16_D 22 23 25 26 27 28	7 8 10 11 14 15_H 16_D 22 23 25 26 27 28
≤ 30 mph	1_E 2_A 3_E 4_E 5$_C$ 7 8 9_B 10 11 12 13_G 14 15_H 16_D 18_F 19_F 22 23 25 26 27 28	1_E 2_A 3_E 4_E 5$_C$ 7 8 9_B 10 11 12 14 15_H 16_D 22 23 24 25 26 27 28	1_E 2_A 3_E 4_E 5$_C$ 7 8 10 11 12 14 15_H 16_D 22 23 24 25 26 27 28	7 8 10 11 14 15_H 16_D 22 23 24 25 26 27 28
≤ 35 mph	7 8 9_B 10 11 14 15_H 16_D 18_F 19_F 22 23 25 26 27 28	7 8 9_B 10 11 14 15_H 16_D 22 23 24 25 26 27 28	7 8 10 11 14 15_H 16_D 22 23 24 25 26 27 28	7 8 10 11 14 15_H 16_D 22 23 24 25 26 27 28
≤ 40 mph	7 8 11 14 15_H 16_D 18_F 19_F 22 25 26 27 28	7 8 11 14 15_H 16_D 22 24 25 26 27 28	7 8 11 14 15_H 16_D 22 24 25 26 27 28	7 8 11 14 15_H 16_D 22 24 25 26 27 28
> 40 mph	7 11 14 15_H 16_D 18_F 19_F 22 25 26 27 28	7 11 14 15_H 16_D 22 24 25 26 27 28	7 11 14 15_H 16_D 22 24 25 26 27 28	7 11 14 15_H 16_D 22 24 25 26 27 28
Average Annual Daily Traffic	≤ 6,000 veh per day	≤15,000 veh per day	No Limit	Capacity Analysis Required

<u>Speed Control: Vertical Deflection</u>

1. Speed Humps
2. Speed Cushions
3. Speed Tables
4. Raised Crosswalks
5. Raised Intersections
6. Prefabricated Alley Speed Bumps – only allowed in alleyways or curb extensions/chokers

<u>Speed Control: Horizontal Alignment</u>

7. Curb Extensions
8. Chokers
9. Chicane
10. Lateral Shift
11. Roundabouts
12. Mini Roundabouts
13. Traffic Circle
14. Road Diet
15. On-Street Parking
16. Intersection Corner Radius Reduction

<u>Volume Management</u>

17. Diagonal Diverters
18. Full Closure
19. Half Closure
20. Forced Turn Island
21. Median Barrier

<u>Complementary Tools</u>

22. Pedestrian Refuge Island
23. Rectangular Rapid Flashing Beacon (RRFB)
24. Pedestrian Hybrid Beacon (PHB)
25. Enhanced Striping
26. Enhanced Signage
27. Textured Crosswalks
28. Streetscaping

Exceptions and Special Conditions

A. Primary snow routes[1] are not eligible; and secondary snow routes and collector streets require approval.
B. Streets that provide primary access to industrial sites are not eligible.
C. Primary snow routes and streets that provide primary access to industrial sites are not eligible; and secondary snow routes and collector streets require approval.
D. Bus routes and primary emergency response routes require approval.
E. Primary snow routes and streets that provide primary access to industrial sites are not eligible; and collector streets, secondary snow routes, bus routes, and primary emergency response routes require approval.
F. Streets that provide primary access to industrial sites, bus routes, and primary emergency response routes are not eligible. Requires City ordinance.
G. Streets that provide primary access to industrial sites, bus routes, and primary emergency response routes are not eligible; primary and secondary snow routes require approval.
H. Must be approved by and coordinated through City of St. Louis Traffic and Lighting Division.

[1] https://www.stlouis-mo.gov/government/departments/street/street-division/upload/Snow-Routes-Alphabetical-Jan-2014.pdf

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REFERENCES

[1] U.S. Department of Transportation - Federal Highway Administration, "Module 3: Toolbox of Individual Traffic Calming Measures Part 2," [Online]. Available: https://highways.dot.gov/safety/speed-management/traffic-calming-eprimer/module-3-part-2.

[2] U.S. Department of Transportation - Federal Highway Administration, "Module 3: Toolbox of Individual Traffic Calming Measures Part 1," [Online]. Available: https://highways.dot.gov/safety/speed-management/traffic-calming-eprimer/module-3-part-1.

[3] U.S. Department of Transportation - Federal Highway Administration, "Module 3: Toolbox of Individual Traffic Calming Measures Part 1," [Online]. Available: https://highways.dot.gov/safety/speed-management/traffic-calming-eprimer/module-3-part-3

[4] Transportation Research Board (TRB), "National Cooperative Highway Research Program (NCHRP) Report 1043: Guide for Roundabouts," 2023. [Online]. Available: https://nap.nationalacademies.org/read/27069/chapter/1.

[5] U.S. Department of Transportation - Federal Highway Administration, "STEP - Resources" [Online]. Available: https://highways.dot.gov/safety/pedestrian-bicyclist/step/resources

[6] St. Louis Community Mobility Committee in partnership with Trailnet, "St. Louis Neighborhood Traffic Calming Guide," July, 2022.

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