



Pedestrian Infrastructure:

Strategies for improving pedestrian safety through low-cost traffic calming

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Prepared for Mass in Motion, an initiative of the MA Department of Public Health

MAKING MASSACHUSETTS MORE WALKABLE

Old City Hall | 45 School Street | Boston, MA 02108 | T: 617.367.9255 | F: 617.367.9285 | info@walkboston.org | www.walkboston.org

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Introduction

While the public health benefits of walking are widely understood among planners and policymakers, the high cost of new infrastructure can make it difficult for municipalities to quickly make active transportation-friendly changes to the roadway system. MassDOT and many municipalities in Massachusetts have made substantial strides in recognizing the needs of pedestrians, bicyclists, and drivers in new construction and major reconstruction projects. However, in some areas, infrastructure is not old enough to need full replacement, and funding for safety and livability retrofits is limited. Low cost fixes to calm traffic and enhance safety on municipal streets and state roads can be a great place to start, as they are likely to be adopted and completed sooner than more expensive projects, and can serve as catalysts for long-term change.

Several cost handbooks are available that provide nationwide cost data. This report utilizes data drawn from local projects to inform Massachusetts communities interested in implementing small, incremental infrastructure improvements. We have compiled information describing recent projects, with examples including stand-alone installations of traffic calming features and corridor-level retrofit projects. All suggested strategies address at least one of four different goals associated with pedestrian infrastructure improvements—safety, speed reduction, placemaking, and walking encouragement.

This report focuses on low cost projects that community organizations, municipal agencies, or private businesses can implement quickly and independently, such as yard signs or roadway striping. The strategies described focus on placemaking, aesthetic improvements, and community-building activities, while the later strategies focus more directly on roadway design. The second brief section of the report summarizes the resource document “Costs for Pedestrian and Bicyclist Infrastructure Improvements: A Resource for Researchers, Engineers, Planners, and the General Public” by the University of North Carolina Highway Safety Research Center (UNC HSRC), and details larger-scale, more costly infrastructure improvements.

Data about local projects has been supplemented with information from UNC HSRC, AARP’s “The Imagining Livability Design Collection” toolkit, and walksteps.org’s design and engineering guidelines. The strategies described in this document can work synergistically with formal infrastructure improvements to create a culture of walking and biking, and all of these improvements can encourage active transportation in Massachusetts’ downtowns and neighborhoods.

* Images without citation are from WalkBoston’s photo library.
Cover image from drivelikeyourkidslivehere.com, August 2015

Summary of pedestrian infrastructure improvement strategies

\$ = less than \$500

\$\$ = \$500- \$1,500

\$\$\$ = over \$1,500

	Safety	Speed	Placemaking	Encouragement	Cost
Approaches					
Slow speed zones	•	•	•	•	\$
Lighter, quicker, cheaper projects	•	•	•	•	\$
Placemaking		•	•	•	\$
Community-built projects	•	•		•	\$\$\$
Streetscape					
Banners			•	•	\$\$
Trees and planters		•	•	•	\$\$
Benches and chairs			•	•	\$\$\$
Pedestrian-scale lighting	•		•	•	\$\$\$
Holiday and event lighting			•	•	\$
Paint			•	•	\$
Murals and paintings	•		•	•	\$
Parklets		•	•	•	\$\$\$
Signs and signals					
Lawn signs	•	•	•	•	\$
In-street pedestrian signs	•	•		•	\$
Pedestrian crossing signs	•				\$
Temporary wayfinding signs			•	•	\$\$
Replacement of signals with stop signs	•	•		•	\$\$\$
Concurrent signals	•			•	\$
Replacement of push button with automatic WALK	•			•	\$
Signal retiming	•			•	\$
Sidewalks					
Marked walking zone	•	•			\$
Organized sidewalk zone	•		•	•	\$

Summary of pedestrian infrastructure improvement strategies (continued)

	Safety	Speed	Placemaking	Encouragement	Cost
Roadway design					
Fog lines	•	•			\$
Striped parking lanes	•	•			\$
Striped bicycle lanes	•	•		•	\$
Advance yield lines	•	•			\$
Curb radius tightening	•	•			\$
Street crossings					
Painted curb bulb-out	•	•			\$
Pedestrian refuge island	•			•	\$\$\$
Crosswalk design/striping	•			•	\$\$
Daylighting	•				\$
Parking					
On-street parking	•	•			\$
Reverse angle parking	•				\$
Parking on alternate sides of the street		•			\$

Overall approaches to low-cost pedestrian infrastructure improvements

The strategies described below can be used as frameworks for thinking about measures that can improve pedestrian safety and enhance the walking environment. Many of these approaches can be implemented quickly, and typically do not require an engineering evaluation. Some will require building community interest and acceptance in order to be most effective. In addition to making the built environment safer and more attractive to pedestrians, many of these strategies may also have the added benefit of building a sense of community.

	Safety	Speed	Placemaking	Encouragement
Approaches				
Slow speed zones	•	•	•	•
Lighter, quicker, cheaper techniques	•	•	•	•
Placemaking		•	•	•
Community-built projects	•	•		•

Slow speed zones

In many European cities, and an increasing number of American communities, residential neighborhoods and main street shopping districts are being designated as slow speed zones where vehicle travel speeds are restricted to 20 mph or less. Slow speed significantly improves pedestrian and bicycle safety and allows the streets to be shared by all users. While long-term built environment changes can help reinforce the slow speed areas, a number of communities have adopted slow speed zones by simply marking their entry points by adding signage and “gateways” created with planters or other inexpensive elements.

\$: None to minimal to repaint parking lines or add signs; price for signs ranges from \$16-\$33, \$7.50 for 16 oz. jar of acrylic paint (amazon.com)



Renderings of proposed neighborways in Somerville, MA (<http://www.somervillestreets.com/>, August 2015)



Proposed entrance to a neighborhood slow zone in New York City (<http://www.streetsblog.org/>, June 2011)

Lighter, quicker, cheaper projects

Lighter, quicker, cheaper (LQC) projects are cost-effective, community-oriented, and collaborative strategies that reclaim public spaces for pedestrian use. Also known as pop-up projects and tactical urbanism, these initiatives are intended to be short-term, but often have lasting implications in terms of generating community buy-in for more permanent projects in the future.

\$: None to minimal beyond coordination with the municipality



Two parklets in Boston designed for Parking Day. Parking Day is a worldwide event that encourages communities to convert metered parking spaces into parks for the day.



Pop-up cafe at North Station in Boston, MA

Placemaking

Project for Public Spaces defines placemaking as “a collaborative process by which we can shape our public realm in order to maximize shared value.” Placemaking strategies offer hands-on opportunities for residents, business owners, city officials, and other stakeholders to determine how to build on local assets and reimagine uses for public spaces that enhance existing community character.

\$: \$15 for 72-count sidewalk chalk pack (amazon.com)



Street chalk is one of the most cost-effective placemaking strategies available to communities.



Foosball table in Dorchester demonstrates “playmaking” as placemaking (bostonglobe.com, June 2015)

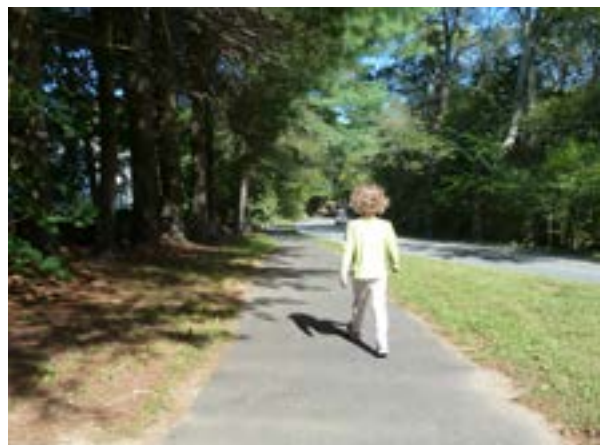
Community-built projects

Depending on the scale of the infrastructure improvements needed, communities can come together to purchase and/or construct projects that are needed to make the walking environment more appealing and safe for pedestrians. In addition to strengthening the community fabric, these resident-led initiatives can sometimes happen more efficiently than those sponsored by the municipality.

\$\$\$: varies depending on project, pedestrian bridge below cost \$25,000; asphalt walkways are less expensive to construct than sidewalks with granite curbing and full drainage



Students in Boxborough, MA planted gardens near the pedestrian bridge connecting the town hall and community center, and volunteers installed the prefabricated structure



Community-built walkway in Lincoln, MA

Streetscape additions and improvements

Enhancing the streetscape not only creates a more attractive walking environment for pedestrians, but also sends visual cues to drivers that pedestrians are likely to be present. Adding parklets, benches, and different kinds of street furniture creates more space for pedestrians to use. Other strategies, such as the addition of banners, lighting, and street trees, can create more pleasant walking environments and encourage residents to walk, rather than drive. Increasing the number of vertical elements along the street corridor can also narrow a driver's visual perspective and slow driving speeds.

	Safety	Speed	Placemaking	Encouragement
Streetscape				
Banners			•	•
Trees and planters		•	•	•
Benches and chairs			•	•
Pedestrian-scale lighting	•		•	•
Holiday and event lighting			•	•
Paint			•	•
Murals and paintings	•		•	•
Parklets		•	•	•

Banners

Banners contribute to community character by helping create a sense of place and adding decorative elements to the streetscape. They can also be a part of a larger district-wide wayfinding strategy. Temporary or seasonal banners can be installed to convey important safety information or advertise community events.

\$\$: customized street pole banners start at \$35 each (northstarflags.com)



Street pole banners (northstarflags.com, August 2015)



"Watch For Pedestrians" banner in Norwood, MA

Trees and planters

There are many benefits to adding street trees, planters, and other kinds of greenery to the streetscape. In addition to providing shade, enhancing street aesthetics, and improving environmental conditions, street trees can also be a useful safety tool. A Texas study found a 46 percent decrease in crash rates across urban arterial and highway sites after landscape improvements were installed (AARP).

\$\$: \$430 (average per tree, UNC Highway Safety Research Center)



Street trees in Cambridge, MA



Street trees, planters on streetlights, and bollards provide a buffer to traffic

Benches and chairs

In addition to providing a buffer to moving traffic, benches and other similar pedestrian amenities make for a more pleasant walking environment and provide needed resting places for seniors and other walkers.

\$\$\$ \$1,550 for permanent benches (average, UNC Highway Safety Research Center) (movable chairs and tables are considerably cheaper options)



Benches built onto a planter in Boston, MA



Seasonal outdoor seating space with movable furniture in Downtown Crossing, Boston

Pedestrian-scale lighting

Standing about 15 feet high, pedestrian-scale lighting is intended to illuminate sidewalks, benches, bus stops, and other pedestrian amenities. Not only is this lighting decorative, but it sends a signal to drivers to slow their speed and be on the lookout for pedestrians. (AARP)

\$\$\$ \$4,880 for permanent option (average per streetlight, UNC Highway Safety Research Center) (see Holiday and event lighting for a temporary option)



Illuminating crosswalks improves visibility of pedestrians at night.



Lighting can also help draw attention to local storefronts

Holiday and event lighting

Holiday and event lighting and other similar decorations are a low-cost placemaking techniques that help add character.

\$: \$12 for 17-foot string of lights (homedepot.com)



Event lighting can make walking at night a more appealing option



Holiday lighting can also create pedestrian spaces out of alleys and other typically poorly-lit spaces

Paint

Paint can be used creatively to signal to drivers that pedestrians are present, and can be incorporated into a larger community project.

\$: \$7.50 for 16 oz. jar of acrylic paint (amazon.com)



Painted traffic circle in Cambridge, MA



Students painting a colorful crosswalk in Salem, MA (Mass in Motion Salem, 2013)

Murals and paintings

Murals and paintings can serve as a reminder to drivers to be cautious in areas where there are typically a lot of pedestrians, such as parking lots. Murals can also highlight historical or cultural events that give communities identity and a sense of place.

\$: \$7.50 for 16 oz. jar of acrylic paint (amazon.com)



Mural on a Madison, WI grocery store



Mural at the Trader Joe's parking lot in Central Square, Cambridge (graffitialley.wordpress.com)



Mural in Haverhill adds community character



Trompe l'oeil "windows" painting in Lowell give a sense of eyes on the street

Parklets

Parklets are a placemaking tool that extend the sidewalk into one or more on-street parking spaces, providing additional accommodations for pedestrians. Parklets are temporary, seasonal installations that enhance existing outdoor community gathering spaces. Downtown business districts are ideal locations for parklets, particularly in front of ice cream shops or coffee shops. Typically, parklets include benches and other kinds of seating, but can also include street trees and planters, bicycle parking, and other visual elements. By creating more space for pedestrians, parklets can make walking a more attractive mode and help pedestrians feel safer with the additional buffer from moving traffic.

\$\$\$: semi-permanent parklets range from \$15,000-\$20,000



Parklet in Somerville, MA



Parklet in Lexington, MA

Signs and signals

Signs and signals are primarily used as tools that enhance pedestrian safety and encourage drivers to slow their speed. Adding signs that highlight the presence of pedestrians creates a safer walking environment, and appropriately-timed signals help clarify for pedestrians and drivers alike how best to navigate complicated roadways. Tools like wayfinding signs can also be part of a larger placemaking strategy.

	Safety	Speed	Placemaking	Encouragement
Signs and signals				
Lawn signs	•	•	•	•
In-street pedestrian signs	•	•		•
Pedestrian crossing signs	•			
Temporary wayfinding signs			•	•
Replacement of signals with stop signs	•	•		•
Concurrent signals	•			•
Replacement of push buttons with automatic WALK	•			•
Signal retiming	•			•

Lawn signs

Lawn signs, such as those in slow speed zones, help highlight the presence of pedestrians. These signs can be used by individual homeowners or business owners, and can be an effective neighborhood-wide message if they multiply. This type of signage is easily moved and has more flexibility in terms of what kind of message the sign is intended to convey.

\$: price ranges from \$16-\$33 (drivelikeyourkidslivehere.com)



Caution sign warning drivers of presence of children in Winchester, MA



Multiple signs can be used to alert drivers to the presence of pedestrians (drivelikeyourkidslivehere.com, August 2015)

In-street pedestrian signs

These are flexible signs placed in the median or centerline at unsignalized crossings announcing that drivers must yield to crossing pedestrians. In-street pedestrian signs not only improve pedestrian visibility, but also serve as a means of narrowing the travel lane and encouraging drivers to slow their speed. These signs are very effective at improving yield rates and are an inexpensive safety tool.

\$: \$250 - \$450 per sign



In-street pedestrian sign in Assembly Row, Somerville



In-street pedestrian signs can be used on the sidewalk if a street is particularly narrow

Pedestrian crossing signs

One of the most common signs utilized to promote pedestrian safety, pedestrian crossing signs provide visual cues for drivers to decrease their speed and to look for pedestrians in crosswalks. Signs can be mounted on reflective posts to improve nighttime visibility.

\$: \$172.75 for sign, galvanized post, and fluorescent inserts (City of Medford)



A pedestrian crossing sign in Lexington, MA

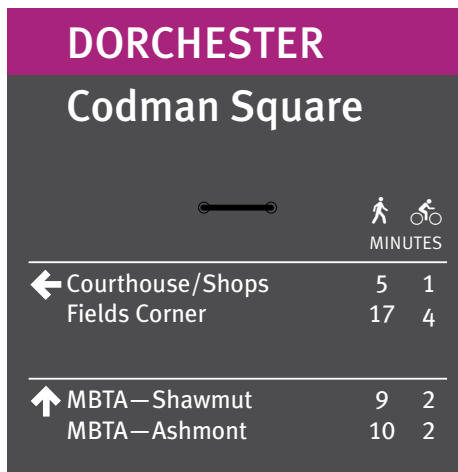


A pedestrian crossing sign in Somerville, MA

Temporary wayfinding signs

Wayfinding signage provides directions for pedestrians so they can better navigate through a new community. These signs typically include directions and walking time or distance to local landmarks, and often have a brightly colored and standardized design. Wayfinding signs can be permanent or temporary installations.

\$\$: \$25 per 18x18 inch temporary signs (includes grommets and ties, price based on bulk purchase)



Codman Square wayfinding sign



Wayfinding sign in Pittsfield, MA

Replacement of signals with stop signs

By replacing signals with stop signs, vehicles have to come to a complete stop, which is safer for pedestrians and calms traffic. This switch may be appropriate on some two-lane streets.

\$\$\$: Costs: \$4,214 per signal removed; average cost for stop sign is \$300 (UNC Highway Safety Research Center)



After replacing a traffic signal with stop signs at Granite Street and Pearl Street in Cambridge, vehicle speed and number of crashes decreased dramatically (maps.google.com, July 2015)

Concurrent signals

Concurrent signals allow pedestrians to cross the street with the flow of traffic. Vehicles must give the right of way to pedestrians in the crosswalk, and this type of signalization helps reduce the wait times for pedestrians. Intersections with concurrent signalization sometimes prohibit drivers from turning right on red. Adding a leading pedestrian interval to the signal phase gives pedestrians a head start before turning traffic begins moving.

\$: If the signal is reasonably up to date, no cost other than staff time



A concurrent signal here would allow pedestrians to move parallel to the flow of traffic



Concurrent signals help reduce pedestrian wait time

Replacement of push button with automatic WALK

Rather than utilize a push button to get a WALK signal, many intersections automatically provide a WALK signal during each signal cycle (approximately every 45-90 seconds). This is an appropriate method of operation for intersections where pedestrians are present during many signal cycles.

\$: If the signal is reasonably up to date, no cost other than staff time



Push buttons do not guarantee a short wait time for pedestrians, and sometimes are installed in confusing locations (<http://www.redmond.gov/>, August 2015)



Pedestrians crossing during the automatic WALK signal in Boston, MA

Signal retiming

If too much time is allocated to allow vehicular traffic to move through an intersection before pedestrians receive a WALK signal, some pedestrians may become impatient and try to cross before getting a WALK signal. Additionally, some signals do not provide enough time for pedestrians to safely clear the intersection. Signal retiming can help both vehicles and pedestrians move more quickly and efficiently.

\$: If the signal is reasonably up to date, no cost other than staff time



Pedestrians put themselves in danger when crossing before receiving a WALK signal



Countdown WALK signals communicate to pedestrians how much time is left to cross the street

Sidewalks

A well-maintained, landscaped, and spacious sidewalk can make a significant difference in the walking environment. A sidewalk is not only a place that holds pedestrian amenities, such as benches, street trees, and lighting, but also serves as a space specifically designated for walking.

	Safety	Speed	Placemaking	Encouragement
Sidewalks				
Marked walking zone	•	•		
Organized sidewalk zone	•		•	•

Marked walking zone

Also known as “faking a sidewalk,” creating a marked walking zone is a low-cost way to visually create a designated walking zone where the right-of-way may not be available to create a sidewalk. This is a good option if more permanent changes are not feasible.

\$: \$3.40 per square foot for pavement markings (average, UNC Highway Safety Research Center)



Before and after views of a walking zone in Norwood, MA

Organized sidewalk zone

While pedestrian amenities, such as benches and street trees, located on the sidewalk provide safety and aesthetic benefits, it is possible that the sidewalk can become too cluttered for pedestrians to move around comfortably. Newspaper boxes, fire hydrants, utility poles, street lighting, and bike racks can become barriers if not properly placed. Ensuring that sidewalks are free and clear of debris, ADA-compliant, and well-maintained is key to a pleasant walking environment.

\$: No cost other than proper design and staff time to manage sidewalk uses



A sidewalk in Cambridge, MA is crowded with a bus shelter, newspaper box, planters, benches, and other amenities.



Sidewalk that leaves room for pedestrians to utilize amenities and navigate down sidewalk comfortably

Roadway design

There are several inexpensive changes that can be made to the design of the roadway that can have a significant impact on pedestrian safety. These strategies are very effective, and most can be done with just paint.

	Safety	Speed	Placemaking	Encouragement
Roadway				
Fog lines	•	•		
Striped parking lanes	•	•		
Striped bicycle lanes	•	•		•
Advance yield lines	•	•		
Curb radius tightening	•	•		

Fog lines

Painting fog lines to narrow vehicle travel lanes to 10-11 feet helps reduce vehicle speed. A recent study by the Canadian Institute of Transportation found that side impact- and turn-related crash rates are lowest at intersections where average lane widths are between 10 and 10.5 feet, and bicycle and pedestrian volumes increase as the lane width decreases. (State Smart Transportation Initiative)

\$: Cost to paint crosswalks, fog lines, and center lines at large 4-way intersection: \$337.50, additional \$28.80 for reflective beads (City of Fall River, MA)



Fog lines that narrow travel lanes to 11 feet help reduce speed



Fog lines mark the travel lanes on a wide street in Woburn, MA

Striped parking lanes

Striped parking lanes have a similar effect of narrowing the travel lanes, thus reducing vehicle speed. The addition of parked cars also creates another buffer between pedestrians and moving traffic (see “On-street parking,” pg. 28).

\$: Standard lane lines are 4-6” wide and costs in Massachusetts over the past few years have averaged about \$.50 to \$.60/linear foot, whether using paint or thermoplastic striping.



Painting parking lanes and bicycle lanes help create designated spaces for pedestrians and bicyclists (Indiana State Department of Health, Division of Nutrition and Physical Activity, July 2015)

Striped bicycle lanes

Striped bicycle lanes have a similar effect of narrowing the travel lanes, thus reducing vehicle speed. The addition of bicycles also creates another buffer between pedestrians and moving traffic.

\$: Standard lane lines are 4-6” wide and costs in Massachusetts over the past few years have averaged about \$.50 to \$.60/linear foot, whether using paint or thermoplastic striping.



Bicycle lane in Somerville, MA.



Bicycle lane in Downtown Crossing, Boston

Advance yield lines

Advance yield lines warn drivers that they are approaching a mid-block crossing. This encourages drivers to slow down when approaching the crossing, which increases the safety of pedestrians that may already be in the crosswalk.

\$: Typical prices for 12" wide markings range from \$.50 per linear foot for paint to \$2.00 per linear foot for thermoplastic.



Advance yield lines warn drivers when they are approaching a mid-block crossing



Advance yield lines in Watertown, MA



Simple advance yield lines in Winchester, MA

Curb radius tightening

At an intersection, the curb can be extended into the street using a variety of materials. Vehicles are forced to reduce their speed when traveling on a tighter turn, which improves the safety of pedestrians crossing at the intersection. Tightening the curb radius also shortens the crossing distance for pedestrians. While paint is a temporary means of tightening the curb radius, a combination of gravel and concrete can be used as a more permanent option that is less expensive than moving the granite curb.

\$: Typical prices for 12" wide markings range from \$.50 per linear foot for paint to \$2.00 per linear foot for thermoplastic



A brightly painted curb extension in New York City (<http://sf.streetsblog.org/>, March 2015).



Curb radius tightening helps shorten the crossing distance in New York City (<http://streets.mn/>, August 2015)



Curb radius tightening in Woburn, MA using gravel, concrete, and planters

Street crossings

Improvements to street crossings serve a variety of functions, including reducing vehicle speed, improving pedestrian visibility, and creating a safer walking environment. Many of these strategies have both temporary and permanent options, so communities can try out certain projects before committing to more expensive, long-term projects.

	Safety	Speed	Placemaking	Encouragement
Street Crossings				
In-street pedestrian signs (see Signs and signals)	•	•		•
Curb radius tightening (see Roadway)	•	•		
Advance yield lines (see Roadway)	•	•		
Painted curb bulb-out	•	•		
Pedestrian refuge island	•			•
Crosswalk design/striping	•			•
Daylighting	•			

Painted curb bulb-out

A curb bulb-out, also known as a curb extension, extends a portion of the sidewalk into the street. This shortens the crossing distance for pedestrians and improves visibility. A painted bulb-out can also have the effect of narrowing the travel lanes for vehicles.

\$: Typical prices for 12" wide markings range from \$.50 per linear foot for paint to \$2.00 per linear foot for thermoplastic



Painted curb bulb-out in San Francisco (<http://sf.streetsblog.org/>, March 2015)



Graphic that demonstrates how a painted curb bulb-out can be used with other strategies to narrow the street crossing (www.fhwa.dot.gov, February 2010)

Pedestrian refuge island

Pedestrian refuge islands, also called crossing islands or median islands, are especially useful on wide roadways. These islands allow pedestrians to deal with one direction of traffic at a time, improve pedestrian visibility, and can serve as spaces for landscaping. (AARP)

\$\$\$: varies based on size and materials, \$13,520 for permanent option (UNC Highway Safety Research Center)



Pedestrian refuge island in Boston, MA



Smaller island in Cambridge, MA (maps.google.com, July 2015)

Crosswalk design/stripping

Keeping crosswalks brightly painted and well-maintained helps alert drivers to look for pedestrians crossing the street, improving pedestrian safety and visibility. Crosswalks that are painted with a zebra or ladder stripe are more effective than two parallel lines, as they are more visible to all road users.

\$\$: Cost to paint crosswalks, fog lines, and center lines at large 4-way intersection: \$337.50, additional \$28.80 for reflective beads (City of Fall River, MA)



Boldly painted crosswalk in Watertown, MA

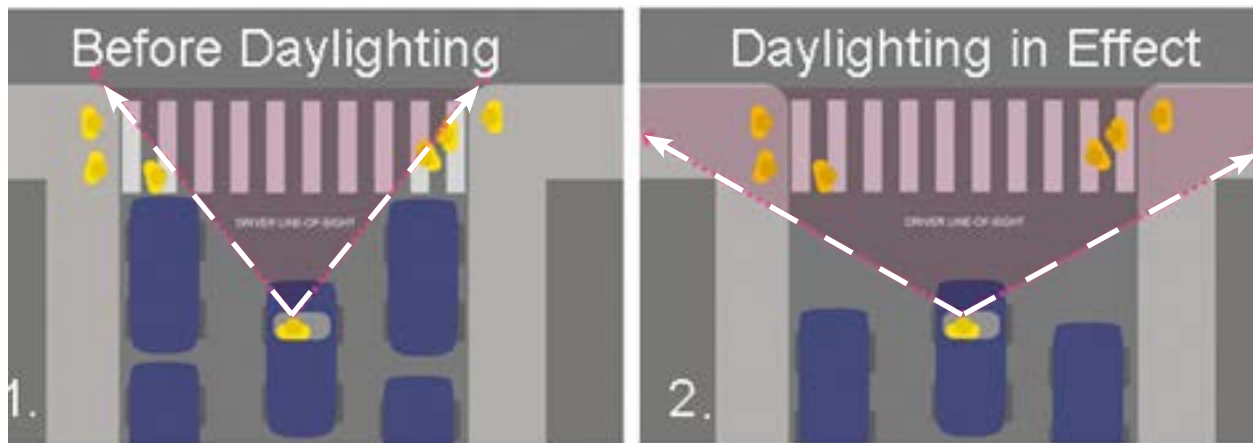


Ladder striped crosswalk in Quincy, MA

Daylighting

Walksteps.org defines daylighting an intersection as “[clearing] sight lines between pedestrian crossings and oncoming cars, usually by creating no-parking zones at the curbs in front of crosswalks at that intersection.” By eliminating the parking spaces closest to the crosswalk, vehicles pulling up to the intersection are better able to see pedestrians.

\$: None beyond coordination with the municipality and cost of paint to create a “no parking” zone



Sight lines are improved with removal of parking spaces closest to crosswalk (<http://www.streetsblog.org/>, January 2009)



Daylighting a mid-block crosswalk in effect in Lexington, MA

Parking modifications

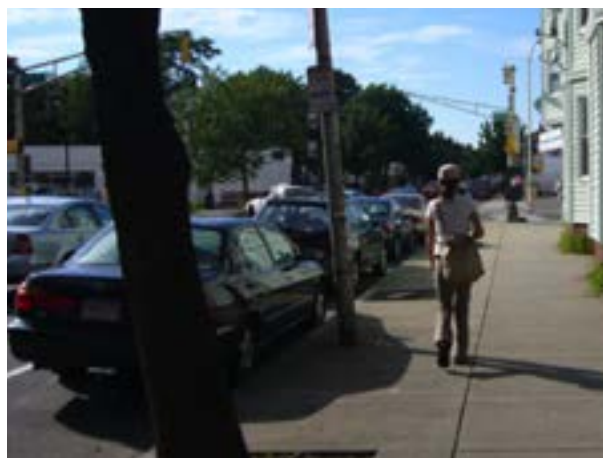
The following set of parking modifications utilize parked vehicles as buffers to separate pedestrians and moving traffic, and also as a means of decreasing vehicle speeds. However, there are some circumstances in which parked vehicles are a detriment to pedestrian safety, particularly near crosswalks.

	Safety	Speed	Placemaking	Encouragement
Parking				
Striped parking lanes (see Roadway design)	•	•		
Daylighting (see Street crossings)	•			
On-street parking	•	•		
Reverse angle parking	•			
Parking on alternate sides of the street		•		

On-street parking

The presence of on-street parked cars creates a physical barrier between pedestrians and moving traffic, which makes sidewalks feel safer and more comfortable.

\$: None other than removal of “No Parking” signs; the addition of pavement markings to show a parking lane or marked parking spots does have a modest cost (see “Striped parking lanes”)



On-street parking buffers pedestrians from the street and slows traffic



On-street parking in Quincy, MA

Reverse angle parking

Angle parking is traditionally designed for vehicles to pull into a parking space, which can make it difficult to see pedestrians when backing out. Reverse angle parking, which requires vehicles to back into angled parking spaces, greatly improves visibility of pedestrians when drivers are exiting the parking space.

\$: Standard lane lines are 4-6" wide and costs in Massachusetts over the past few years have averaged about \$.50 to \$.60/linear foot, whether using paint or thermoplastic striping.



Example of reverse angle parking in Washington, D.C.



Reverse angle parking in Somerville, MA (maps.google.com, July 2015)

Parking on alternate sides of street

Parking on alternate sides of the street is a useful strategy for reducing vehicle speed on residential side streets. Rather than have all cars park on one side of the street, or no cars parked on the street, parking on alternate sides provides more barriers for vehicles that may use these streets as a quick cut-through. Drivers are forced to slow down to maneuver around parked cars.

\$: None if residents simply coordinate parking with one another



Graphic demonstrating how parking on alternate sides of the street can slow traffic

Larger-scale built environment improvements: a summary of strategies

Full reconstruction of streets and sidewalks can include many elements and range from simple to elegant design treatments. WalkBoston thanks the UNC Highway Safety Research Center for providing a straightforward structure for organizing this information. Average costs provided below come from the UNC HSRC report, unless otherwise noted. Many different communities have also provided Massachusetts cost information.

While this information provides examples of how much projects have cost local governments, it is important to remember that construction costs vary widely based on the size of the project that is bid out, the economic situation for contractors at the time of the bid, and various site features (such as drainage and structural conditions). A definitive cost for most construction projects can never be assumed without at least preliminary engineering work to determine the unique characteristics of the site. Some of the features included in this guide can be employed for traffic calming as part of smaller projects, but are frequently seen as part of larger streetscape projects, and may be less expensive per unit in that context (though not broken out to individual prices in the project budget). The inclusion of pedestrian and bike friendly features in all corridor reconstruction and major maintenance projects is the most efficient and comprehensive way to build a more pedestrian-friendly environment in the long-term.

Traffic calming measures

Improvement	UNC HSRC Average Cost	MA Examples
Chicanes	\$9,960	
Curb extensions	\$13,000	Springfield - Crosswalk bump-out, mid-block: \$7,000-10,000 each - Crosswalk bump-out, intersection: \$10,000-\$20,000 each Cambridge - Concrete curb extension: \$25,000
Diverter	Full diverter: \$26,040 Partial diverter: \$15,060	
Island median	\$13,520 per island	
Raised crossing	Raised crossing: \$8,170 Raised intersection: \$50,540	Cambridge - Raised intersection: \$60,000-\$85,000; each catch basin cost \$8,000
Roundabout/traffic circle	\$85,370	Northampton - \$1.6 million (part of larger road redesign project)
Speed tables/bumps	Speed bump: \$1,550 Speed table: \$2,400	

Pedestrian accommodations

Improvement	UNC HSRC Average Cost	MA Examples
Bollard	\$730 each	
Curb ramp	Detectable warning strip: \$42/ sq. ft. Wheelchair ramp: \$810 each	Lexington - \$2,500 per ramp
Fence/gate	Fence: \$130/linear ft. Gate: \$910/linear ft.	
Gateway	Gateway: \$22,750 each Gateway sign: \$340 each	
Lighting	\$4,880 per streetlight	
Railing	\$100 per linear ft.	
Street furniture	Street tree: \$430 each Bench: \$1,550 each Bus shelter: \$11,560 each Trash/recycling receptacle: \$1,420 each	
Street closure	Full street closure: up to \$120,000 Partial street closure: \$10,290-\$41,170	

Pedestrian crossings and paths

Improvement	UNC HSRC Average Cost	MA Examples
Crosswalks	\$2,540 for high-visibility crosswalks	Springfield - \$1,500 for crosswalk street treatment
Sidewalks	Asphalt: \$35/linear ft. Brick: \$60/ linear ft. Concrete: \$32/linear ft.	
Paths	Boardwalk: \$2.2 million/mile Paved multi-use trail: \$481,000/mile Unpaved multi-use trail: \$121,000/mile	
Mid-block crossings	\$2,700-\$71,000	

Signals and signs

Improvement	UNC HSRC Average Cost	MA Examples
Flashing beacon	\$10,000 each	
Pedestrian hybrid beacon	\$57,700 each	
Pedestrian and bicycle detection	\$390 each	
Speed trailer/monitor	\$9,500 each	
Signal upgrades		Lexington - \$50,000-\$100,000
LED countdown pedestrian signal heads	\$740 each	
Signs	\$300 each	Springfield - \$10-20/ sq. ft.

References

Traffic Calming, Roadway Design to Reduce Traffic Speeds and Volumes. TDM Encyclopedia
Victoria Transport Policy Institute, Updated 15 April 2015, <http://www.vtpi.org/tdm/tdm4.htm>.

Costs for Pedestrian and Bicyclist Infrastructure Improvements, UNC Highway Safety Research Center,
October 2013.