New Jersey School Zone Design Guide

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New Jersey Safe Routes to School

New Jersey School Zone Design Guide

Prepared for:

The New Jersey
Department of Transportation

Prepared by:

The RBA Group

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Disclaimer

This Design Guide has been prepared to provide information on engineering measures and treatments that can be utilized to enhance pedestrian and bicyclist accommodations to, from and around schools. This publication does not constitute a standard, specification, or regulation, and is not intended as a comprehensive reference for all aspects of student pedestrian and bicycle safety.

The inclusion of measures in this report should not be considered as justification for their inclusion at any specific location. Their application, as with any traffic control devices, is dependent upon site-specific conditions and engineering judgment.

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Chapter 1: Introduction and Overview

The NJ School Zone Design Guide provides guidance for the community of people, government and schools involved in the effort to enable and encourage children, including those with disabilities, to walk and bicycle to school.

Purpose of the NJ School Zone Design Guide

This Guide is intended to be used as a resource for school boards, school administration, police, parents and engineers to advance the goals of the NJ Safe Routes to School (SRTS) Program.

The focus of the Design Guide is on engineering measures that can be utilized to make the environment to, from and around schools a place where children and their parents feel safe and want to walk and bicycle. Engineering measures include physical improvements to the transportation infrastructure in the vicinity of the school and on school property that are intended to improve access and safety for travel by walking and bicycling and minimize conflicts with motorized traffic. They are typically designed to address specific problems or needs that have been identified and can range from simple sidewalk replacement/repair to more complex traffic calming devices, such as roundabouts or speed humps.

The inclusion of engineering measures in this guide does not necessarily mean they should be included in every school zone. Their application, as with any traffic control devices or design elements, is dependent upon site-specific conditions and engineering judgment.

The Design Guide is based on:

- the Federal Highway Administration's *2009 Manual on Uniform Traffic Control Devices* (MUTCD),
- the American Association of State Highway and Transportation Officials (AASHTO) *Guide for the Development of Bicycle Facilities*,
- AASHTO *Guide for the Planning, Design, and Operation of Pedestrian Facilities,*
- National Center for Safe Routes to School Online Guide, and
- the National Center for Safe Routes to School and the Institute of Transportation Engineers (ITE) *SRTS Briefing Sheets.*

Safe Routes to School (SRTS)

The goals of the SRTS Program are to encourage more students to walk and bike to school where it is safe to do so and to improve the areas where it is not safe.

Students crossing in Ridgewood, NJ.
Image: The RBA Group

Health, Safety and Transportation

Building an environment that supports children's ability to walk or bicycle to school safely achieves a wide range of benefits for students, the school and the community. These benefits include reduced traffic in the vicinity of schools, improved air quality, creation of safer, calmer streets and neighborhoods, and increased physical activity among students and families, contributing to healthier lifestyles.

Today, fewer children are walking and bicycling to school, and more children are at risk of becoming overweight and obese than children 30 years ago. The U.S. Department of Health and Human Services recommends that children engage in 60 minutes or more of physical activity each day and that the bulk of this physical activity comes through aerobic exercise. By walking or bicycling to school, children can easily incorporate exercise into their day and increase their overall physical activity. Children who walk one mile to and from school each day get approximately two-thirds of the recommended level of sixty minutes of physical activity a day. Plus, research shows that children who walk to school have higher levels of physical activity throughout the day and are more likely to get the full sixty minutes of activity in a day.

Not only does regular physical activity reduce obesity, it also helps build and maintain healthy bones and muscles, reduces feelings of depression and anxiety and promotes psychological well-being. Furthermore, research shows that active children tend to have better academic achievement, enhanced concentration, and better classroom behavior.[1]

Many children do not currently walk or bike to school due to safety concerns. This guide is intended to assist communities in identifying and developing solutions to those safety concerns. Proper design and focus on the school zone through the SRTS program can lead to a decrease in the number of pediatric pedestrian injuries for school-aged children. A safety analysis by the California Department of Transportation estimates that the safety benefit of SRTS included up to a 49 percent decrease in the childhood bicycle and pedestrian collision rates.[2] In NJ, the SRTS program is centered around a comprehensive 5E approach to ensure that school zones are not only designed to be self-enforcing but that children are also given the proper educational tools to cultivate their pedestrian and bicycling skill sets in order to help them eventually navigate the way to school on their own.

The 5 Es

The SRTS Program is organized around five complementary strategies known as the five Es. They are:

1. **Engineering: Making the environment safer for walking and bicycling**
2. **Encouragement: Encouraging kids to walk and bike to school more often**
3. **Education: Teaching kids and parents safe ways to walk and bike**
4. **Enforcement: Changing driver, walker and bicyclist behavior as they travel together along the road**
5. **Evaluation: Checking to see how many kids are walking and biking as a result of the program or how conditions have improved**

Projects that incorporate all five Es are likely to be more effective and sustainable.

[1] Centers for Disease Control and Prevention, "Health and Academic Achievement" (05/2014). www.cdc.gov/healthyyouth/health_and_academics/pdf/health-academic-achievement.pdf
[2] Marla Orenstein, Nicolas Gutierrez, Thomas Rice, Jill Cooper, and David Ragland, "Safe Routes to School Safety and Mobility Analysis" (April 1, 2007). UC Berkeley Traffic Safety Center. Paper UCB-TSC-RR-2007-1

NJ SRTS Overview

History of the NJ SRTS Program

In 2003, the New Jersey Department of Transportation's Office of Bicycle and Pedestrian Programs utilized on-call consultant support and a statewide Technical Advisory Committee to develop a SRTS Program. In 2004, NJDOT launched a series of SRTS pilot demonstration programs in varied community settings around the state. At the same time, the Department initiated the Safe *Streets* to School Program and in 2006, awarded approximately $5 million in state funds to 60 infrastructure projects to improve safety around schools.

Safe *Routes* to School was established as a federal program under the Safe, Accountable, Flexible, Efficient Transportation Equity Act – A Legacy for Users (SAFETEA-LU) in 2005. The NJDOT designated a full-time SRTS Coordinator, developed its first SRTS Strategic Plan and initiated a competitive grant program to fund local and statewide engineering, enforcement, education and encouragement projects to enable elementary school children to walk and bike to school safely.

In 2012, Congress passed a new transportation bill: Moving Ahead for Progress in the 21st Century (MAP-21). Under this legislation, SRTS has been combined with two other programs (Transportation Enhancements and Recreational Trails) under the Transportation Alternatives Program. NJDOT has elected to continue SRTS as a standalone federal-aid program. It is currently administered by the NJDOT, in partnership with the North Jersey Transportation Planning Authority (NJTPA), the Delaware Valley Regional Planning Commission (DVRPC) and the South Jersey Transportation Planning Organization (SJTPO).

As of October 2014, NJDOT has awarded more than $19 million in federal SRTS funds to 129 projects at 212 schools in 98 communities across New Jersey. Another $5 million has supported these local projects with statewide programs. More rounds of infrastructure grants and educational programs are planned to fulfill the goals of the Safe Routes to School Program.

How does the NJ SRTS Program work today?

The overall SRTS program is overseen by the SRTS Coordinator in the NJDOT's Office of Bicycle and Pedestrian Programs. The SRTS Coordinator is responsible for monitoring all aspects of the program. This includes managing the non-infrastructure program, participating in the SRTS infrastructure grant program solicitation and selection process and helping to ensure that state and federal requirements are met. The federally funded SRTS grant program is administered by NJDOT's Division of Local Aid and Economic Development. It is operated as a competitive grant program in which proposals from applicants to develop and implement infrastructure projects are solicited and evaluated.

Why develop accommodations along walking and bicycling routes to and from school?

- Improvements provide a safer environment for the whole community — 24 hours a day, not just before and after school.
- Walking and biking to school reduces the amount of greenhouse gas emissions released as it reduces the number of children that are driven to school.
- Over time, bicycle and pedestrian improvements can save tax dollars.
- Walking and bicycling are fun, healthy, non-polluting, friendly, educational, and economical!

Walk to School Event in Tenafly, NJ. Image: VTC

The Alan M. Voorhees Transportation Center (VTC), working closely with NJDOT, operates the NJ Safe Routes to School Resource Center (NJ SRTSRC) which provides services, training, coordination, and technical assistance directly to regional planning organizations, schools and school districts, and local and regional governments.

In 2011, NJDOT implemented the New Jersey Safe Routes to School Non-Infrastructure Technical Assistance Program. This program is a cooperative venture involving New Jersey's eight Transportation Management Associations (TMAs), the NJ SRTSRC and NJDOT. NJDOT provides federal funding, program administration and oversight; the NJ SRTSRC provides services, training, evaluation, and technical assistance to all eight NJ TMAs; and the SRTS Regional Coordinators at each of the TMAs proactively reach out to schools, local governments and other organizations to provide them with a variety of SRTS non-infrastructure services. Services include assistance with pedestrian safety assemblies, bicycle rodeos, walking school buses and Walk and Bike to School Day events.

As part of this program, all New Jersey municipalities and K-8 schools are eligible to receive free, non-construction related services. TMAs are also charged with prioritizing disadvantaged communities in their outreach efforts to allow for an equitable distribution of services.

Resources

NJDOT Safe Routes to School Program
Email: srts@dot.state.nj.us
Website: www.state.nj.us/transportation/community/srts/

New Jersey SRTS Resource Center
Telephone: 848-932-7901
Email: srts@ejb.rutgers.edu
Website: www.saferoutesnj.org

The National Center for SRTS
Website: www.saferoutesinfo.org/

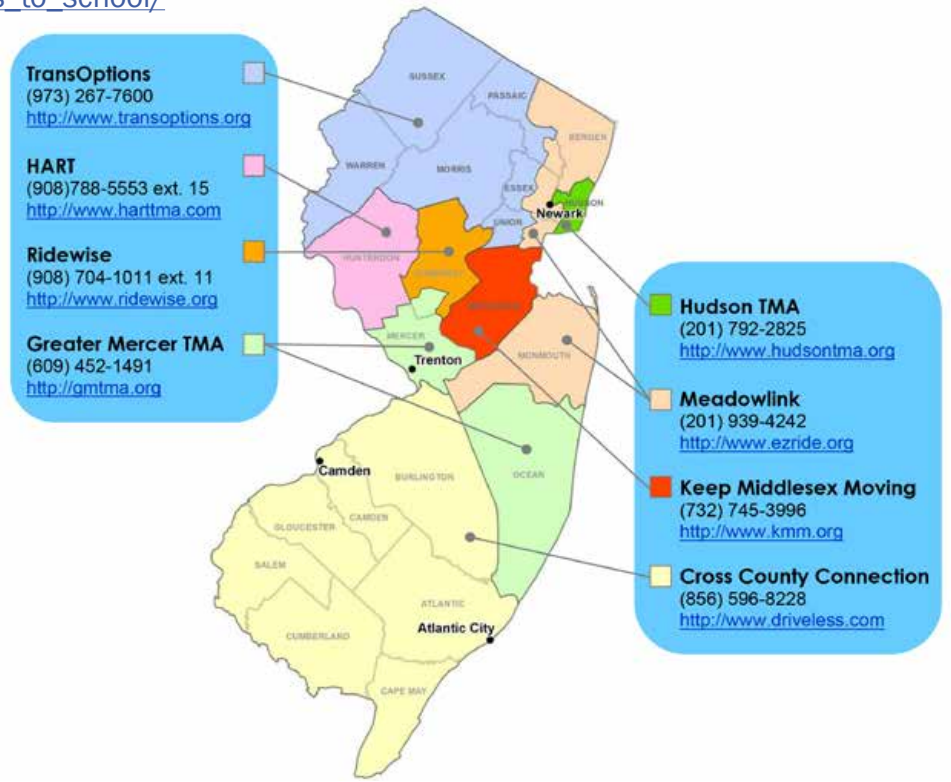
Federal Highway Administration (FHWA) SRTS
Website: www.fhwa.dot.gov/environment/safe_routes_to_school/

SRTS National Partnership
Website: www.saferoutespartnership.org/

The Official Web Site of International Walk to School
Website: www.iwalktoschool.org/

The USA Web Site for International Walk to School Events
Website: www.walkbiketoschool.org/

Centers for Disease Control and Prevention (CDC) Kids Walk to School
www.cdc.gov/nccdphp/dnpa/kidswalk/



Chapter 2: What is a School Zone?

There are generally three zones around the school one must think about when applying safety standards for walking and bicycling routes to school: the state statutory definition of school zone, the student catchment area or enrollment boundary, and the school walking zone.

What is a school zone?

The State Statutory Definition of School Zone

Title 39 of the New Jersey Statutes Annotated (N.J.S.A.) contains the laws that control every publicly maintained roadway, as well as the majority of laws that govern bicycle and pedestrian matters. It also includes two definitions for “school zone.” N.J.S.A. 39:1-1 describes a school zone as:

1. The section of roadway adjacent to a school, or,

2. Where school crossings have been established in the vicinity of a school, upon which are maintained appropriate "school signs" in accordance with specifications adopted by the chief administrator and in accordance with law. "School crossing" means that portion of a publicly maintained roadway where school children are required to cross the roadway in the vicinity of a school.

The focus of this Design Guide is on engineering measures that can be utilized to make the environment around schools a place where children and their parents feel safe and want to walk and bicycle. Because the first statutory definition is limited to the area around the school and the second statutory definition is confined to crossings, both of these definitions of “school zone” are too restrictive for the purposes of this Guide.

The section of roadway adjacent to a school (one definition of a school zone, as defined by NJ State Statute) is shown in yellow above.

Student Catchment Area or Enrollment Boundary

The student catchment area or enrollment boundary refers to the geographic area from which students are eligible to attend a local school. This area is the theoretical outside limit for a "school zone." For schools with a geographically expansive catchment area, some students will live too far away from school to reasonably be expected to walk or bike. In addition, the growth of charter and magnet schools has made applying an enrollment boundary more difficult because these schools can typically draw from anywhere within a school district. Therefore, the student catchment area, as a practical matter, and for the purposes of this design guide, could cover too much territory to function as the school zone.

School Walking Zone

The concept of "school zone" that is the focus of this design guide is best described by the term school walking zone. The school walking zone can be defined as the area surrounding a school that includes the public rights of way that are most frequently and intensively used by students and others accessing the school, especially by walking or by bicycle. In this design guide, unless otherwise specified, the term "school zone" is synonymous with the term "school walking zone."

Student Catchment Area or Enrollment Boundary shown in red.

School Walking Zone with half-mile radius shown in light orange and one-mile radius shown in darker orange.

School walking zones vary in size depending on local policies, context and the student enrollment boundary. While there is no established definition of a school walking zone, a number of sources provide guidance regarding the extent of a school walking zone.

- Under the FHWA program guidance for the federal Safe Routes to School (SRTS) funding program, projects and activities must be located or take place within two miles of a primary or middle school (grades K – 8).
- Also suggestive is the fact that New Jersey law does not require and the state does not provide funding to bus public school students that live within two miles of school.
- The MUTCD defines a school zone as "a designated roadway segment approaching, adjacent to and beyond school buildings or grounds, or along which school related activities occur."
- The NJ SRTS Resource Center recommends a school walking zone covering the area within at least one half mile of the school.
- The National Center for Safe Routes to School general rule of thumb is that the walking boundary is one half mile to one mile around an elementary school, and sometimes further for middle and high schools.

For this design guide, the term school zone or school walking zone refers to the area within approximately a one-mile radius of a school – a distance easily covered by most elementary students on foot or bike. This area should be adjusted as needed to take into account local conditions, such as the extent of the school catchment area, traffic conditions, geographic constraints and other local concerns. During the course of determining the school walking zone, it is likely that conditions that are problematic to pedestrians and bicyclists will be discovered which may need to be remedied by applying the design guidance contained in this document.

School Busing

New Jersey Administrative Code (N.J.A.C) 6A:27 sets forth the rules governing the transportation of students to and from school. A school district is required to provide busing only to those students who live more than 2 miles from their public elementary and middle schools and more than 2.5 miles from their public high schools and to certain special education students. Boards of education are not required by law to provide busing for students who live less than remote from school even for safety reasons. However, many districts have opted to bus students who live below these distance thresholds, a service known as "courtesy" busing or non-mandated busing. Some school districts help defray the cost of courtesy busing by charging the student's parents or legal guardians for this service. Municipalities may also contract with boards of education for this service and charge the parents. This transportation service is called "subscription" busing.

State law (N.J.S.A. 18A:39-1.5) requires school districts that provide courtesy busing to adopt a policy addressing the busing of students who walk along hazardous routes between their homes and schools. The policy must include a list of hazardous routes that require courtesy busing and the criteria used in designating the routes as hazardous. In New Jersey, routes are considered hazardous based on criteria such as high traffic volume, traffic speed, roads with blind curves or steep inclines and declines, lack of sidewalks, presence of bridges and train tracks, and busy roads or highways that must be crossed to reach the school. School districts must work with municipal officials and police officers when designating a route hazardous.

For more information visit, www.state.nj.us/education/finance/transportation/

Is there any relationship between a drug-free, drunk-driving free or smoke-free school zone and a school walking zone?

No, there is no relationship. Drug-Free / Drunk-Driving Free / Smoke-Free School Zones include the areas on or within 1,000 feet of property used for school purposes and which is owned or leased to any elementary or secondary school or school board. Any Drug-Free / Drunk-Driving Free / Smoke-Free School Zone map must be created and adopted by the municipality. The map is intended to be used as evidence in prosecutions arising under the criminal laws of the state (N.J.S.A. 2C:35-7).

How do you designate a school zone?

Designating a school zone or school walking zone is accomplished by local action, often on an ad hoc basis by, for example, a SRTS working group as part of the process of developing a SRTS Travel Plan. School zone boundaries can be formalized by the school board or a municipality by formal adoption of the SRTS Travel Plan or by ordinance.

School zones, as defined by New Jersey statute, do not need to be adopted by municipal ordinance or resolution; however, designated school crossings can be adopted by municipal ordinance or resolution. A municipality may choose to designate crossings as school crossings where special emphasis is needed due to a combination of the number of crossing school children, geometry of the approaching roadways, approach speed, and traffic volumes. Special emphasis could include placement of an adult school crossing guard, installing signage, pavement markings or a signal.

How is a reduced school speed zone designated?

A reduced speed zone is designated through signing supplemented with striping. A school zone should be marked with special signing to alert drivers of the high concentration of children. School crossing signs, speed signs, and school zone pavement markings remind drivers to treat the area with special care and attention.

Image: The RBA Group

Where should the school speed limit zone begin and end?

NJDOT has adopted the federal Manual on Uniform Traffic Control Devices (MUTCD) for rules and regulations concerning the placing, specification, location and maintenance of highway and traffic signs and markings (N.J.S.A. 3:4-183.27). According to the 2009 MUTCD, the beginning point of a reduced school speed limit zone should be at least 200 feet in advance of the school grounds, a school crossing, or other school related activities; however, this 200-foot distance should be increased if the reduced school speed limit is 30 mph or higher (MUTCD Section 7B.15).

The speed limit in NJ, unless otherwise posted, is 25 mph when passing through a school zone (N.J.S.A. 39:4-98). Therefore, many school speed limit zones may be as short at 400 ft. However, the beginning and end points of a school speed limit zone should be determined based on the location of other traffic control devices, features and locations where children cross the roadway.

What is the school zone speed limit? Who determines the speed limit?

Establishing and enforcing the proper school zone speed limit is critically important. The speed limit in New Jersey, unless otherwise posted, is 25 miles per hour (mph) when passing through a school zone during recess, when the presence of children is clearly visible from the roadway, or while children are going to or leaving school, during opening or closing hours (N.J.S.A. 39:4-98). Because it is established by statute, a 25 mph school zone speed limit does not require adoption of an ordinance and approval from NJDOT.

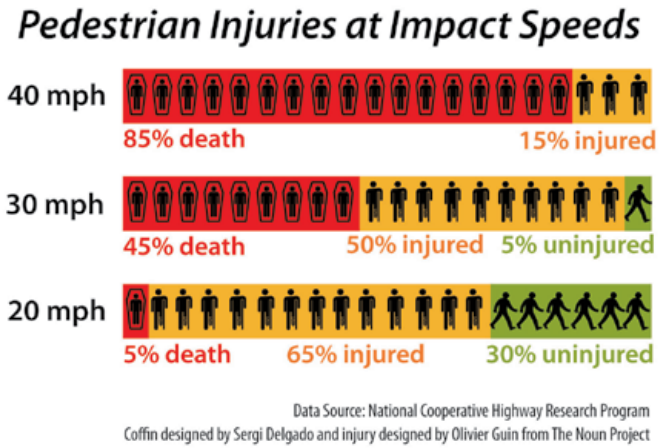
However, not all school speed limit zones are 25 mph. Local authorities, with reference to roadways under their jurisdiction, may by ordinance, or in the case of county authorities, by ordinance or resolution, designate a reasonable and safe speed limit that is less than or greater than 25 mph after an engineering and traffic investigation. The establishment of school speed limits should always be done in coordination with the agency having jurisdiction over the roadway in question, particularly if the limits are less than or greater than 25 mph [N.J.S.A. 39:4-98(c)].

Hoboken's 20 is Plenty Campaign

In October 2010, the City of Hoboken launched a "Twenty is Plenty" driving and pedestrian safety public awareness campaign to encourage drivers to consider driving no faster than 20 mph despite the 25 mph speed limit on most Hoboken streets. The campaign was inspired by the "20's Plenty for Us" effort started in Britain. Hoboken promoted the Twenty is Plenty effort through newspapers, flyers at the Parking Utility, and with electronic signs at major inbound streets.

Why is driving 20 mph so important?

Driving just 5 mph slower can have a profound impact on the safety of pedestrians.



For more information on Hoboken's "20 is Plenty"campaign visit www.hobokennj.org/departments/transportation-parking/twenty-is-plenty/

For more on England's "20 is Plenty for Us" effort visit www.20splentyforus.org.uk/

When does "when children are present" apply?

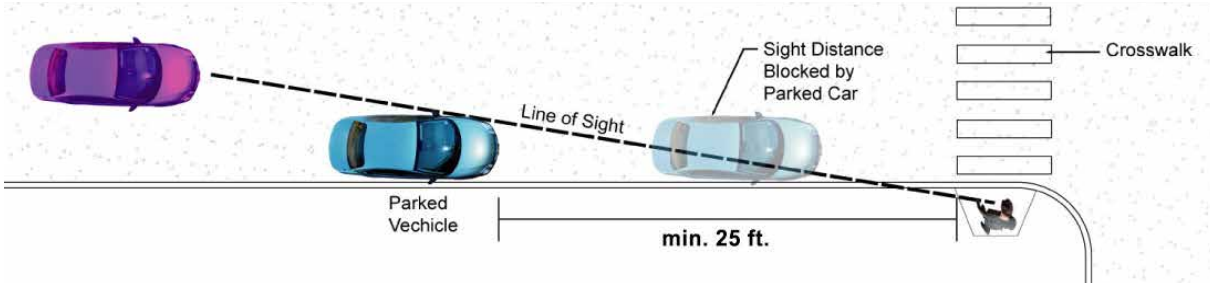
"When children are present" does not apply at all times in a school zone. The Superior Court of New Jersey has determined the lower speed limit in a school zone is only applicable (1) during school hours, but only during recess, when children are clearly visible from the roadway, or (2) when children are going to or leaving school during opening or closing hours of school (State of New Jersey v. Floyd A. Beierle (1999)).The reduced school zone speed limit does not apply outside of these times.

Regardless of the time of day or year, drivers should always be alert and on the lookout for children when driving near schools, parks or other attractions.

What other traffic laws relate to school zones?

Restricting parking in advance of crosswalks and corners improves visibility of the crossing for both drivers and pedestrians. According to N.J.S.A 39:4-138, parking is not permitted:

- within an intersection;
- on a crosswalk;
- within 50 feet of a "stop" sign; or
- within 25 feet of the nearest crosswalk or side line of a street or intersecting highway or within 10 feet of the nearest crosswalk or side line of a street or intersecting highway, if a curb extension or bulb-out has been constructed at that crosswalk.



Recommended Parking Setback for Sight Distance. Image: The RBA Group

Criteria for Safe Speed Limit Design

According to N.J.S.A. 39:4-98, when designating reasonable and safe speed limits for a street under its jurisdiction, as part of an engineering and traffic investigation, a municipality or county shall consider, but not be limited to, the following criteria: crash history; residential density; the presence, or lack, of sidewalks; the prevalence of entry and exit ways for business and commercial establishments; whether school children walk adjacent to the street on their way to and from school; the proximity of recreational or park areas, schools, community residences, family day care homes, child care centers, assisted living facilities or senior communities; and input from the school district and other community representatives.

The City of New Brunswick has begun installing plastic pylons in the no-parking area, a practice called "daylighting." The cost of purchasing and installing the standard-use pylons is minimal and can be done in-house with little delay.
Image: VTC

Are designating school walking and/or bicycling routes required by law?

New Jersey state laws or regulations do not require school districts to have walking or bicycling route plans that designate particular routes to school. Therefore, there is no official or uniform process for designating a school walking or bicycling route.

Who is responsible for developing school walking and/or bicycling routes?

There is no singular entity responsible for developing school walking or bicycling routes. A school route map should be developed through a partnership between the school and surrounding community ideally as part of the development of a comprehensive Safe Routes to School (SRTS) School Travel Plan. A SRTS School Travel Plan "maps out" how to improve pedestrian and bike travel to and from school by identifying where students currently walk and bike, where students would walk and bike if they could and what changes need to be made so that students can and will walk and bike to school. A SRTS School Travel Plan should be prepared by a team of school officials, municipal representatives, local law enforcement, parents, students, safety advocates and other interested parties responsible for student safety.

Mapping the neighborhood is one of the six elements of a SRTS School Travel Plan. The other elements include a school description, working group and partnerships, walk/bike barriers and opportunities, goals and actions, and evaluation. For more on developing a SRTS School Travel plan, visit the NJ SRTS Resource Center at: www.saferoutesnj.org/resources/stp/

Get Points with your School Travel Plan

Though applications to receive NJDOT SRTS grants do not require a School Travel Plan, schools that have completed a School Travel Plan will be eligible for extra points for submitting the Plan in the application for SRTS infrastructure grant funding. While the preparation of a SRTS Travel Plan is not an eligible activity for New Jersey SRTS funding, schools and municipalities can receive assistance in developing school travel plans from the Safe Routes to School Regional Coordinators at their Transportation Management Association (TMA). You can find your Regional Coordinator on the NJ SRTS Resource Center website at www.saferoutesnj.org/about/regional-coordinator-tmas/

To receive consideration for Silver level SRTS Recognition, share your School Travel Plan with the NJ Safe Routes to School Resource Center by emailing it to srts@ejb.rutgers.edu. For more information on the Recognition Program Levels, visit www.saferoutesnj.org/levels/

Municipalities and school districts registered to Sustainable Jersey can include School Travel Plans as part of the submission requirements to receive certification. For more on Sustainable Jersey, visit www.sustainablejersey.com/

Recommendations for a School Route Plan

The federal MUTCD recommends that a school route plan for each school serving elementary and high school students should be prepared in order to develop uniformity in the use of school area traffic controls and to serve as the basis for a school traffic control plan for each school (MUTCD, Section 7A.01). The school route plan should be developed by the school, law enforcement and traffic officials responsible for school pedestrian safety and should include a map. The map should show

- streets,
- the school,
- existing traffic controls
  - signalized intersections,
  - stop or yield sign approaches,
  - crossing guard locations,
- established school walk routes, and
- established school crossings including marked crosswalks.

How should school walk routes and school bike routes be developed?

Before routes can be designated, a team of school administrators, parents, teachers, students, municipal engineers and planners, and elected officials should comprehensively evaluate safety concerns along these potential routes. Steps in this process include:

Step 1 Inventory existing conditions, barriers, and opportunities in the school neighborhood

- Start with a base map that shows the location of the school and the surrounding neighborhood. The area evaluated will vary depending on the extent of the selected school walking zone. It is recommended that all the routes within one half mile to one mile of the school are assessed. The team can use paper road maps or use the NJ SRTS Resource Center online tools to map out the school zone. www.saferoutesnj.org/resources/stp/maps/
- Conduct a walk and/or bike assessment to identify existing facilities and safety concerns that could impact students walking and bicycling to and from school. While the walk and bike assessments are very similar, the challenges pedestrians and bicyclists face can be very different. For example, a few minor cracks in the sidewalk might be fine if you are walking, but a smooth road surface which is free of debris that can cause flat tires is much more important for bicyclists. Also, a walk assessment can identify areas where crosswalks are faded or missing, however it will not indicate whether or not there is a safe place to lock bikes at school. Therefore, it is important to conduct both walk and bike assessments. More information, including downloadable materials for conducting a walk and bike assessment, is available at www.saferoutesnj.org/resources/stp/walkbike-assessments/#

Mapping exercise in Lumberton, NJ. Image: The RBA Group

Step 2 Identify suggested travel routes

- A recommended route should be selected on the basis of community input, traffic patterns, traffic volume, speed limits, road hazards, high crime areas, and the existence of sidewalks, paths, crosswalks, bike lanes, traffic signals and crossing guards. The chosen route should limit the number of street crossings and provide the greatest separation between students and traffic.
- Sometimes the safer route is not the most direct. However, routing students more than a block or two out of their way should be avoided or they will likely ignore the selected route. When determining the feasibility of requiring children to walk a longer distance to a street crossing with an existing traffic signal, the MUTCD recommends considering the following factors: the availability of adequate sidewalks or other pedestrian walkways to and from the location with existing control, the number of students using the crossing, the age levels of the students using the crossing and the total extra walking distance.
- Ultimately, every street should be a walking or bicycling route. However, until that vision is achieved, identifying suggested walking and bicycling routes can help steer people to safer routes.

Step 3 Create and distribute the maps to the school community

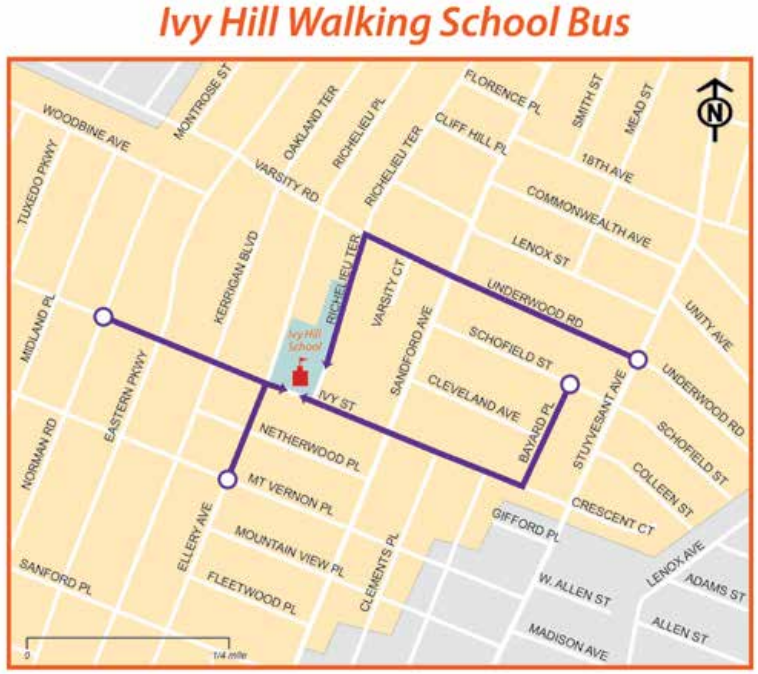
- The map can be posted on the school website or handed out to parents and students.

Step 4 Work with community partners to make recommended improvements

- Seldom are school walk or bike routes ever completely free from safety risks. Once created, these maps can help municipalities and school administrators identify priorities for where sidewalk and roadway investments should be targeted.

Step 5 Reevaluate the routes

- Once developed, the routes need to be reassessed annually by the team of school administrators, parents, teachers, students, municipal engineers and planners, and elected officials to ensure they are still meeting the needs of the student population. This can be accomplished by periodically completing walk and bike assessments can help evaluate progress in reaching SRTS goals.



Map distributed to the Ivy Hill Elementary School community in Newark, NJ for Walk to School Day. Image: The RBA Group

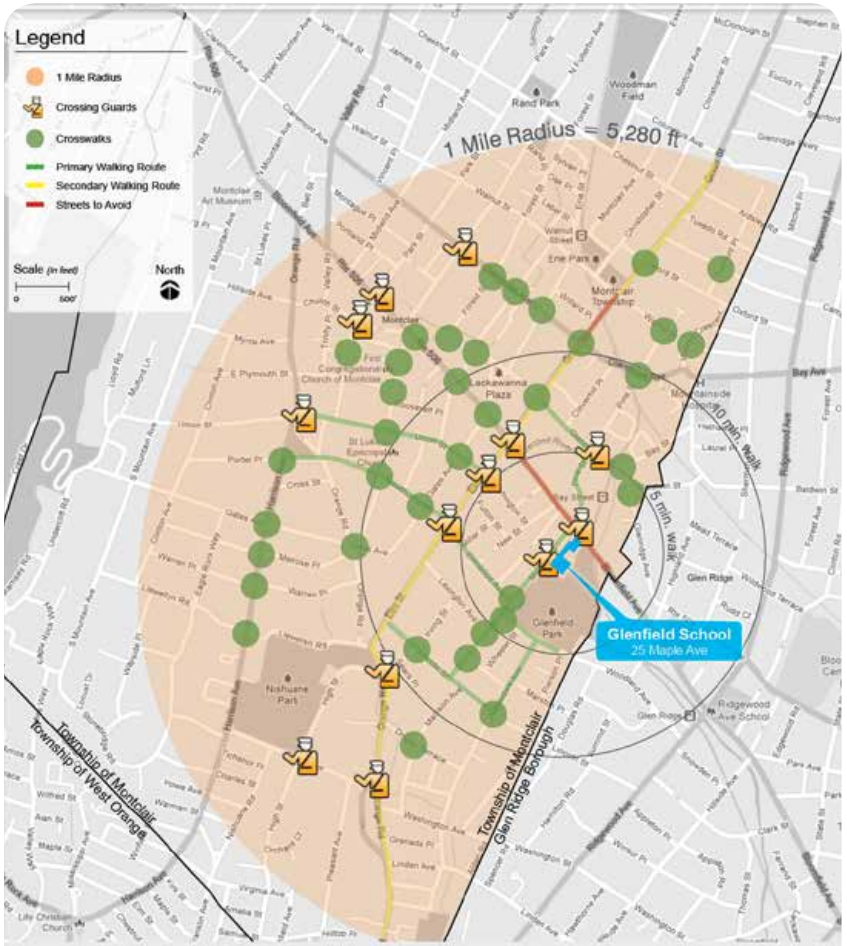
For more information on establishing a school walking route refer to *School Route Maps and the Tools to Create Them* developed in 2007 by the Pedestrian and Bicycle Information Center (PBIC). The resource is available at guide.saferoutesinfo.org/engineering/school_route_maps_and_the_tools_to_create_them.cfm.

The School Administrator's Guide to School Walk Routes and Student Pedestrian Safety by the Washington Traffic Safety Commission and Washington State Department of Transportation suggests processes for developing and maintaining school walk routes. The guide can be downloaded from www.wsdot.wa.gov/NR/rdonlyres/5463FD69-F7B9-477D-B9AA-D21CEEFCF722/0/SchoolAdminGuide.pdf.

Example: Developing a Walking Route Map for Montclair

In 2008, the Township of Montclair, through its SRTS Task Force, applied for and received funding through NJDOT for the development of three (3) E's of its district-wide Safe Routes to School program (Engineering, Encouragement and Enforcement). As part of this effort, the Township selected a consultant team to conduct SRTS workshops and develop Travel Plans.

In developing the Travel Plans, the project team confirmed preliminary walking and bicycling routes and analyzed the basic elements required for safe routes. The project team performed field investigations to observe the conditions around the schools. Observations were made of the physical conditions around the school campuses and surrounding neighborhoods, parking patterns and restrictions, as well as auto and foot traffic and circulation. Information was also gathered from local stakeholders – staff, students, parents, as well as community members such as the Township Engineer, local police, health and bicycle advocates, board of education transportation representatives, and local crossing guards through interviews, travel surveys and community workshops. The resulting maps identify key features of the school neighborhood such as the location of crossing guards, primary and secondary walking routes and crosswalks.



Map 1 - *School Location Map*

Pedestrian Related Laws (N.J.S.A. 39:4-32 to 39:4-36)

Drivers and pedestrians are responsible for each other's safety.

Pedestrians must:

- Not leave a "curb or other place of safety" by walking or running into the path of a vehicle which is so close that it is impossible for the driver to yield or stop. [N.J.S.A. 39:4-36(a)(2)]
- Yield to drivers when crossing a road at any point other than within a marked or unmarked crosswalk at an intersection. [N.J.S.A. 39:4-36(a)(4)]
- Not cross a roadway against the "stop" or red signal at a crosswalk, whether marked or unmarked, unless otherwise specifically directed to go by a traffic or police officer, or official traffic control device. [N.J.S.A. 39:4-32(a)]
- Walk on sidewalks where they are provided and accessible. (N.J.S.A. 39:4-34)
- Walk along the extreme left side of a highway or its shoulder when possible facing approaching traffic, when practicable, if there is no sidewalk. (N.J.S.A 39:4-34)
- Exercise due care for his/her safety. [N.J.S.A. 39:4-36(a)(5)]
- Not cross any highways having roadways separated by a median barrier except where provision is made for pedestrians to cross. (N.J.S.A. 39:4-34)
- Cross intersections at crosswalks where traffic is directed by a police officer or traffic signal. (N.J.S.A. 39:4-33)

Pedestrians risk fines and community service if they fail to yield the right of way to motorists anywhere except at crosswalks [N.J.S.A 39:4-36 (b)].

Drivers must:

- Stop and remain stopped while a pedestrian is in a marked crosswalk. [N.J.S.A. 39:4-36(a)(1)]
- Stop and remain stopped for pedestrians crossing within the adjacent crosswalk into which the motorist is turning right from either a red signal, stop or yield sign. [N.J.S.A. 39:4-36(a)(1) and (2)]
- Stop and remain stopped if a pedestrian is within one lane of their half of roadway. [N.J.S.A. 39:4-36(a)(1)]
- Not overtake and pass a vehicle that is stopped to permit a pedestrian to cross the roadway. [N.J.S.A. 39:4-36(a)(3)]
- Yield to pedestrians at unmarked crosswalks at an uncontrolled intersection. [N.J.S.A. 39:4-36(a)]
- Exercise due care for the safety of any pedestrian upon a roadway. [N.J.S.A. 39:4-36(a)(5)]

With the passage of NJ Assembly Bill 1329 in 2010, drivers now risk $200 fines, 15-day community-service sentences and four points if they fail to bring their vehicles to complete stops at crosswalks to allow pedestrians to pass in front of them. The new law, N.J.S.A. 39:4-36(b), provides that when a collision occurs between a vehicle and a pedestrian within a marked crosswalk, or at an unmarked crosswalk at an intersection, there shall be permissive inference that a driver did not exercise due care for the safety of the pedestrian. The law also specifies that a pedestrian crossing on a "Go" or green signal has the right of way over all vehicles, including those making turns.

Chapter 3: MUTCD Traffic Control for School Zones

This chapter sets forth standards and guidance for the use of school zone signage, pavement markings and related devices throughout the State of New Jersey. This guide is based upon the standards and guidance presented in the 2009 Manual on Uniform Traffic Control Devices with Revisions Number 1 and 2 incorporated (MUTCD). The recommendations are typical solutions that should be applied, keeping in mind the unique needs of each school environment. The location of signage and distances relative to the school grounds noted here should be considered "best practice."

Standard Signage and Pavement Markings for School Zones

The following signs and pavement markings are recommended for use in school zones. School warning signs and any supplemental plaques used in association with these warning signs shall have a fluorescent yellow-green background with a black legend and border unless otherwise noted. Refer to the 2009 MUTCD for full guidance. A PDF of the manual is available at mutcd.fhwa.dot.gov/pdfs/2009r1r2/pdf_index.htm.

School Zone Sign Assembly (MUTCD Section 7B.08)

This sign assembly should be used on all approaches that enter a school zone. Guidance on the placement of school zone sign assembly is found in MUTCD Section 2C.4, Table 2C-4. This sign is an assembly of two signs and includes the SCHOOL Marker sign (S4-3P) below the School sign (S1-1). The marker sign should always be used to distinguish this warning sign from the School Crosswalk sign assembly. The downstream end of a designated school zone may be identified with an END SCHOOL ZONE (S5-2) sign.

Many local jurisdictions also find it beneficial to use this sign to advise road users that they are approaching a school that is adjacent to a highway or where additional care is needed, even if no school crossing is involved and the speed limit remains unchanged. This is permissible.

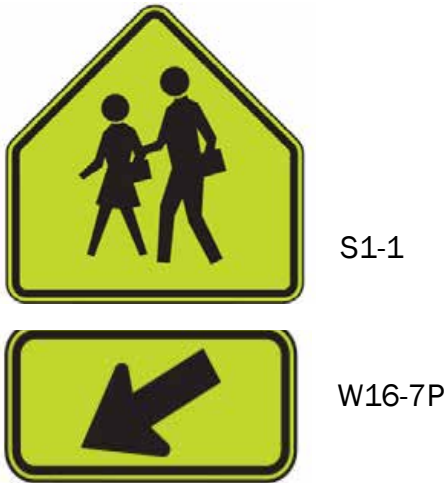
S1-1

S4-3P

School Zone Sign Assembly

School Crosswalk Sign Assembly (MUTCD Section 7B.12)

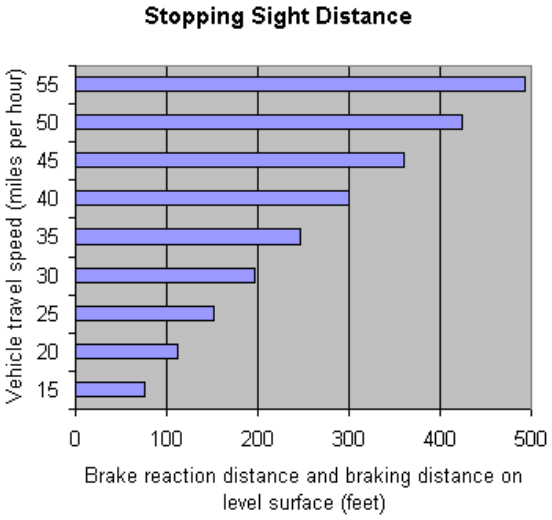
This sign assembly is used to identify a crosswalk that is not protected by a stop or yield sign or a traffic signal. This sign is used primarily within the reduced school speed zone and/or along established school walking routes and/or where a significant student crossing exists. The School Crosswalk sign assembly consists of a School sign (S1-1) supplemented with a diagonal downward arrow (W16-7P) plaque. Guidance on the placement of the school crosswalk sign assembly can be found in the MUTCD Section 2A.16, Figure 2A-3. When used outside of the reduced school speed zone, this sign must be accompanied by the School Advance Crossing sign assembly.



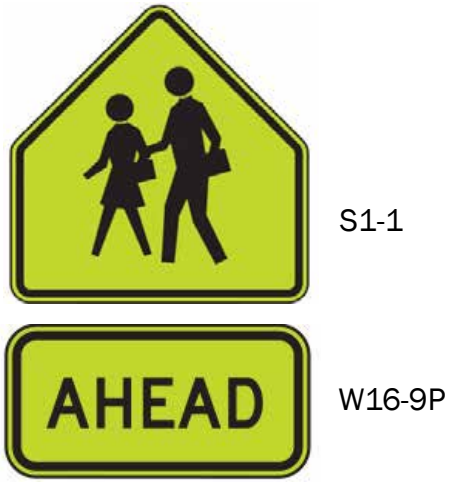
School Crosswalk Sign Assembly

School Advance Crossing Sign Assembly (MUTCD Section 7B.11)

This sign assembly, while often misapplied, is used exclusively in conjunction with the School Crosswalk sign assembly as a means of advanced warning. This sign assembly is only used when the school crosswalk exists outside of the posted reduced school speed zone, and therefore acts in lieu of the School Zone sign assembly in those areas. This sign assembly should precede the School Crosswalk sign assembly in each direction by enough distance to allow a motorist to stop before the crosswalk. For example, a motor vehicle traveling on a level surface at a rate of 30 miles per hour (MPH) will need approximately 200 feet to stop before a crosswalk. This distance will change depending on speed and roadway conditions. See Table 2C-4 in the MUTCD for advanced placement guidelines.



Source: National Center for Safe Routes to School



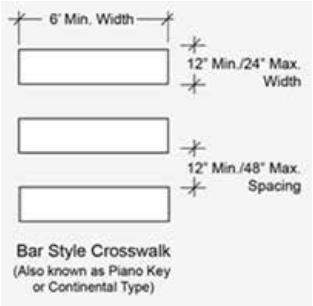
School Advance Crossing Sign Assembly

Marked Crosswalk (MUTCD Section 7C.02)

All designated pedestrian crossings within a school zone and along established school walking routes should be marked with a bar style crosswalk (also known as piano key or continental type). This is preferred over the formerly conventional use of "zebra" stripes, due to its visibility and durability. Marked crosswalks not protected by signalization or stop control should always be accompanied by the School Crosswalk sign assembly. Additional protection may include in-street crosswalk signs, refuge islands, raised crosswalks and/or flashing beacons.

Marked crosswalks alone, without other measures designed to reduce traffic speeds, shorten crossing distances, enhance driver awareness of the crossing, and/or provide active warning of pedestrian presence, should not be installed across uncontrolled roadways where the speed limit exceeds 40 mph and either:

- The roadway has four or more lanes of travel without a raised median or pedestrian refuge island and an ADT (average daily traffic) of 12,000 vehicles per day or greater; -or-
- The roadway has four or more lanes of travel with a raised median or pedestrian refuge island and an ADT of 15,000 vehicles per day or greater.



Bar style crosswalk in Hoboken, NJ.
Image: The RBA Group

School Sign Assembly

School Area Sign, warns road users that they are approaching a school area that may include school buildings or grounds, a school crossing, or school related activity adjacent to the roadway.

S4-3P

School Zone Assembly, used to warn road users that they are approaching a designated school zone

W16-9P

School Advance Crossing Assembly, used to warn road users that they are approaching a crossing where school children cross the roadway

W16-7P

School Crossing Assembly, used to warn approaching road users of the location of a crossing where school children cross the roadway

Distracted Driving in School Zones

Distracted driving (including talking or texting on cell phones, using GPS for navigation, eating, and listening to music) around schools can adversely impact safety for children walking and bicycling to school and influence parent decisions about how children will get between home and school. Research indicates that the probability and severity of a crash taking place are strongly influenced by driver attention. Various studies have documented an almost six times greater risk when dialing a phone and 23 times greater risk when texting. Other studies show that using a cell phone while driving delays your reaction time as much as having a blood alcohol concentration of .08, the legal limit for drunk driving.

Distracted driving draws driver attention off the road and away from the primary task of driving. This lengthens reaction time and puts pedestrians, bicyclists, drivers and passengers at greater risk. Research from Safe Kids USA shows that one out of every six drivers in school zones is distracted by the use of cell phones, eating, drinking, smoking, reaching behind, grooming and reading. The study, "Characteristics of Distracted Drivers in School Zones: A National Report," consisted of more than 40,000 observational road-side surveys conducted by local Safe Kids researchers in 20 locations across the United States. Use of electronics (such as cell phones, PDAs and Smartphones) was the leading category of distraction while driving at 9.8 percent.

Findings from the study include:

- The majority of distracted drivers were observed during the afternoon school zone hours as compared to the morning hours.
- Distracted drivers appeared more frequently in school zones without flashing lights and in school zones that had a daily traffic volume of 10,000 or more cars.
- Drivers of larger vehicles such as sports utility vehicles, pickup trucks, and minivans were more distracted than car drivers.

The study also found that having a law on the books may somewhat decrease the prevalence of distracted driving. The study, which covered communities in 15 states, showed that those states with laws regulating cell phone or hand-held electronic device use in a vehicle were 13 percent less likely to have distracted drivers in school zones. New Jersey law bans the use of hand-held devices and texting for all drivers (N.J.S.A. 39:4-97.3). Hands-free cell phone use is also prohibited for bus drivers and novice drivers. New Jersey defines novice drivers as those under the age of 21 with a GDL or a provisional license.

Source: MyParkingSign.com

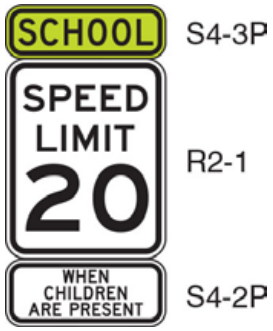
Resources

- Safe Kids USA, "Characteristics of Distracted Drivers in School Zones: A National Report," 2009 www.safekids.org/research-report/distracted-drivers-school-zones-national-report-2009
- National Center for Safe Routes to School, "Getting Results: SRTS Programs That Reduce Speeding and Distracted Driving," www.saferoutesinfo.org/sites/default/files/resources/srts_gettingresults_drivingbehavior_0.pdf
- Official US Government Website for Distracted Driving, www.distraction.gov/
- Strayer DL, Drews FA, Crouch DJ. (2006). "A comparison of the cell phone driver and the drunk driver." Hum Factors. 2006; 48: 381-91. www.distraction.gov/download/research-pdf/Comparison-of-CellPhone-Driver-Drunk-Driver.pdf

Optional Signs & Pavement Markings for School Zones

School Speed Limit Sign Assembly and END SCHOOL SPEED LIMIT Sign (MUTCD Section 7B.15)

This sign assembly is used where a reduced school speed limit zone has been established. The School Speed Limit assembly is placed at or as near as practical to the point where the reduced school speed limit zone begins. However, the School Zone sign assembly must be installed in advance of the first School Speed Limit sign assembly. In addition, the downstream end of a designated reduced speed school zone should be identified with an End School Speed Limit sign. A standard Speed Limit sign showing the speed limit for the section of highway that is downstream from the authorized and posted reduced school speed limit zone may be mounted on the same post above the END SCHOOL SPEED LIMIT sign (S5-3).



School Speed Limit Sign Assembly

End School Speed Limit Sign

Warning Beacons (MUTCD Section 4L.03)

Warning Beacons can be used to call attention to a School Speed Limit sign assembly or a School Zone sign assembly. Flashing yellow beacons are one of the most effective safety improvements a school can make, as they have been shown to decrease vehicle speeds an average of five to seven miles per hour in school zones. The "When Flashing" marker should be used if the sign is automated with a flashing beacon. If not automated with a beacon, the marker sign should read "When Children are Present." This marker is preferred over a sign that lists school times, as school hours vary from year to year, and the information is often too small and complex to be comprehended by a passing driver.

This system is most effectively applied to arterial and/or multi-lane roadways where drivers would not otherwise note school zone signage due to traffic conditions, speed of travel, and competing signage. The flashing lights should be timed to correspond to school arrival and dismissal times. Warning beacons may also be used with the School Crosswalk Sign Assembly or School Advance Crossing Sign Assembly.

Warning Beacon in Haddon Heights, NJ. Image: The RBA Group

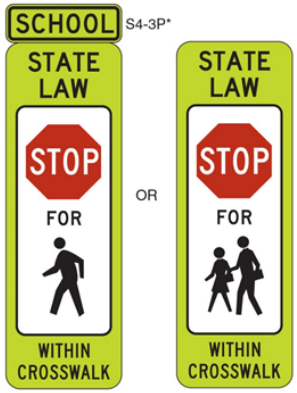
"Slow School" Pavement Markings (MUTCD Section 7C.03)

This pavement marking should be used as an additional warning where vehicle speeds are a concern. It should be placed in proximity to reduced school speed zones or School Speed Limit sign assemblies. These markings are most effective on single lane local or collector streets, where they are visible from a distance and not obscured by heavy vehicle traffic. This application offers a cost-effective alternative to flashing beacons and may be more appropriate in a residential environment where flashing beacons may not be desirable.

"Slow School" pavement markings on Glenwood Avenue in East Orange, NJ. Image: The RBA Group

In-Street Crosswalk Signs (MUTCD Section 7B.12)

The In-Street Pedestrian Crossing (R1-6a) sign or the In-Street Schoolchildren Crossing (R1-6c) sign may be used at mid-block crosswalks that are not protected by stop signs or signalization. If the In-Street Pedestrian Crossing (R1-6a) sign is used at a school crossing, a 12 x 4-inch SCHOOL (S4-3P) plaque may be mounted above the sign. The sign is placed on the yellow centerline immediately adjacent to (not within) the crosswalk. It should be placed on the side of the crosswalk that most vehicles approach from or as geometry permits. They are more effective on unsignalized two-lane low-speed streets than on multi-lane high-speed streets. They can be easily damaged and need to be reset or replaced when struck. When portable in-street signs are used for school crossings, they should be monitored by a school official or school crossing guard.



R1-6A R1-6C

Vertical Reflective Strip (MUTCD Section 2A.21)

This reflective strip should be used at stop controlled intersections that have crosswalks within the school zone and along school walking routes to call extra attention to the stop sign. Reflective fluorescent yellow-green strips may also be used on School Area signs. The strip shall be at least 2 inches in width and placed for the full length of the post from the sign to within 2 feet above the edge of the roadway. The color of the reflective strip must match the sign background, except that the color of the strip for the YIELD and DO NOT ENTER signs shall be red.

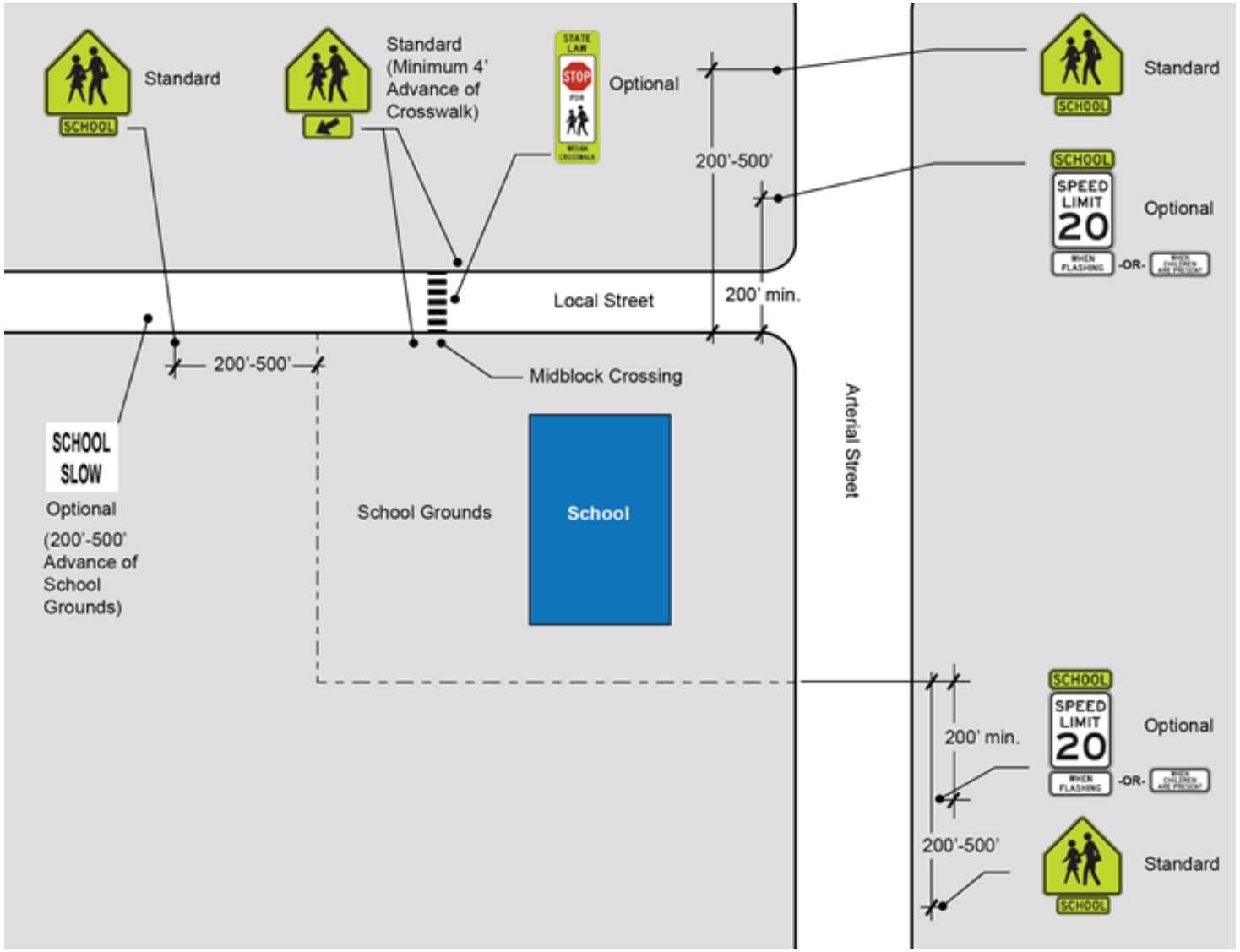
Reflective tape on stop sign post in Newark, NJ. Image: The RBA Group

Sign Placement

While the MUTCD provides guidance for the type of signage and its application, the placement of school zone signage is often dictated by standards set forth by state and local jurisdictions. New Jersey has no such standards, therefore the location of signs and distances relative to the school zone recommended here should be considered "best practice." Refer to the diagram for sign placement.

Signs should be used judiciously, as overuse may lead to driver noncompliance and excessive signs may create visual clutter.

Where practical, signs can be combined on one post to reduce sign clutter. Image: Minnesota Department of Transportation



Graphic: Fitzgerald & Halliday, Inc.

Signage Selection Matrix

Signs must be selected in response to the type of roadway and pedestrian crosswalk facilities located within proximity of a school. The following matrix should be used as a guide for signage options.

	Local or Collector Street	Arterial Street or Multi-Lane Street	Streets w/ Speed limit 30 mph or above	Midblock Crosswalk within School Zone	Midblock Crosswalk outside of School Zone
School Warning Sign (S1 + S4-3P)	●	●	●		
Crosswalk Warning Sign (S1+ W16-9P)					●
Crosswalk Sign (S1 + W16-7P)				●	●
In-Street Crosswalk Sign (R1-6C)				○	○
School Speed Limit Sign (S4-3P + R2-1 + S4-2P) or (S4-4P)			●		
Flashing Beacon		○	○		
Slow School Pavement Marking	○		○		
Oversized Signage		○	○		

● **Optional Application** ○ **Standard Application**

Table: Fitzgerald & Halliday, Inc.

Size of School Signs (MUTCD Section 7B.01)

The sizes of signs and plaques to be used on conventional roadways in school areas shall be as shown in the table below. The sizes in the Conventional Road column shall be used unless engineering judgment determines that a minimum or oversized sign size would be more appropriate. The sizes in the Minimum column shall be used only where traffic volumes are low and speeds are 30 mph or lower, as determined by engineering judgment. The sizes in the Oversized column should be used on roadways that have four or more lanes with posted speed limits of 40 mph or higher. The sizes in the Oversized column may also be used at other locations that require increased emphasis, improved recognition or increased legibility.

Sign	Sign Designation	Section	Conventional Road	Minimum	Oversized
School	S1-1	7B.08	36 x 36	30 x 30	48 x 48
School Bus Stop Ahead	S3-1	7B.13	36 x 36	30 x 30	48 x 48
School Bus Turn Ahead	S3-2	7B.14	36 x 36	30 x 30	48 x 48
Reduced School Speed Limit Ahead	S4-5, S4-5a	7B.16	36 x 36	30 x 30	48 x 48
School Speed Limit XX When Flashing	S5-1	7B.15	24 x 48	—	36 x 72
End School Zone	S5-2	7B.09	24 x 30	—	36 x 48
End School Speed Limit	S5-3	7B.15	24 x 30	—	36 x 48
In-Street Ped Crossing	R1-6, R1-6a, R1-6b, R1-6c	7B.11, 7B.12	12 x 36	—	—
Speed Limit (School Use)	R2-1	7B.15	24 x 30	—	36 x 48
Begin Higher Fines Zone	R2-10	7B.10	24 x 30	—	36 x 48
End Higher Fines Zone	R2-11	7B.10	24 x 30	—	36 x 48

Plaque	Sign Designation	Section	Conventional Road	Minimum	Oversized
X:XX to X:XX AM X:XX to X:XX PM	S4-1P	7B.15	24 x 10	—	36 x 18
When Children Are Present	S4-2P	7B.15	24 x 10	—	36 x 18
School	S4-3P	7B.09, 7B.15	24 x 8	—	36 x 12
When Flashing	S4-4P	7B.15	24 x 10	—	36 x 18
Mon-Fri	S4-6P	7B.15	24 x 10	—	36 x 18
All Year	S4-7P	7B.09	24 x 12	—	30 x 18
Fines Higher	R2-6P	7B.10	24 x 18	—	36 x 24
XX Feet	W16-2P	7B.08	24 x 18	—	30 x 24
XX Ft	W16-2aP	7B.08	24 x 12	—	30 x 18
Turn Arrow	W16-5P	7B.08, 7B.09, 7B.11	24 x 12	—	30 x 18
Advance Turn Arrow	W16-6P	7B.08, 7B.09, 7B.11	24 x 12	—	30 x 18
Diagonal Arrow	W16-7P	7B.12	24 x 12	—	30 x 18
Diagonal Arrow (optional size)	W16-7P	7B.12	21 x 15	—	—
Ahead	W16-9P	7B.11	24 x 12	—	30 x 18

Note: 1. Larger sizes may be used when appropriate.
2. Dimensions are shown in inches and are shown as width x height.
3. Minimum sign sizes for multi-lane conventional roads shall be as shown in the Conventional Road column.

Chapter 4: Determining Placement of Crossing Guards

The proper placement of well-trained crossing guards is one of the most effective methods to improve student and crossing guard safety at crossings. There are many factors that contribute to the need for a crossing guard at a particular location including the age of students, road conditions (width, number of lanes), sight distances, presence or absence of traffic control devices, vehicle speed, traffic and pedestrian volumes, truck traffic, location of crossing, and crash history.

According to the NJ SRTS Resource Center, "Every school day, over 6,400 crossing guards throughout New Jersey assist hundreds of thousands of children walking and biking to and from school."

How to Identify the Locations where Crossing Guards are Needed

Provisions for hiring and training qualified individuals have long been established in New Jersey State Law (N.J.S.A. 40A:9-154.1 - 40A:9-154.4. According to State statute, "the chief of police or other chief law enforcement officer of a municipality *shall have the right to position school crossing guards on any street or highway within the municipality;* provided, however, that such guards may be stationed only when it is necessary to control or direct vehicular or pedestrian traffic during those time periods of a school day when it is necessary to control traffic." (emphasis added)(N.J.S.A. 40A:9-154.4). It is recommended that the identification of adult school crossing guard locations involve not only the police department, but also the traffic engineering and/or planning departments, school representatives, and parents.

There are no specific state guidelines or criteria in New Jersey to determine which crossings require an adult crossing guard. The design and implementation of an adult school crossing guard program is largely a local decision and no set of guidelines can cover all the unique conditions that may describe crossing locations. The police department along with the municipality's traffic engineering and/or planning department and school representatives should determine the criteria for locations that need crossing guards, and then gather the information about local conditions that will be used to determine the need for the crossing guards.

A crossing guard assists pedestrians cross the street.
Image: VTC

MUTCD Adult Crossing Guards

While no national criteria exist for identifying which street crossings in a community require a crossing guard, the Manual on Uniform Traffic Control Devices (MUTCD) provides some general guidance on how to determine the need for a guard at a particular location.

Section 7D.02
"Adult crossing guards may be used to provide gaps in traffic at school crossings where an engineering study has shown that adequate gaps need to be created (see Section 7A.03), and where authorized by law."

Section 7A.03
"The frequency of gaps in the traffic stream that are sufficient for student crossing is different at each crossing location. When the delay between the occurrences of adequate gaps becomes excessive, students might become impatient and endanger themselves by attempting to cross the street during an inadequate gap. In these instances, the creation of sufficient gaps needs to be considered to accommodate the crossing demand."

What information should be collected when identifying the locations where crossing guards are needed?

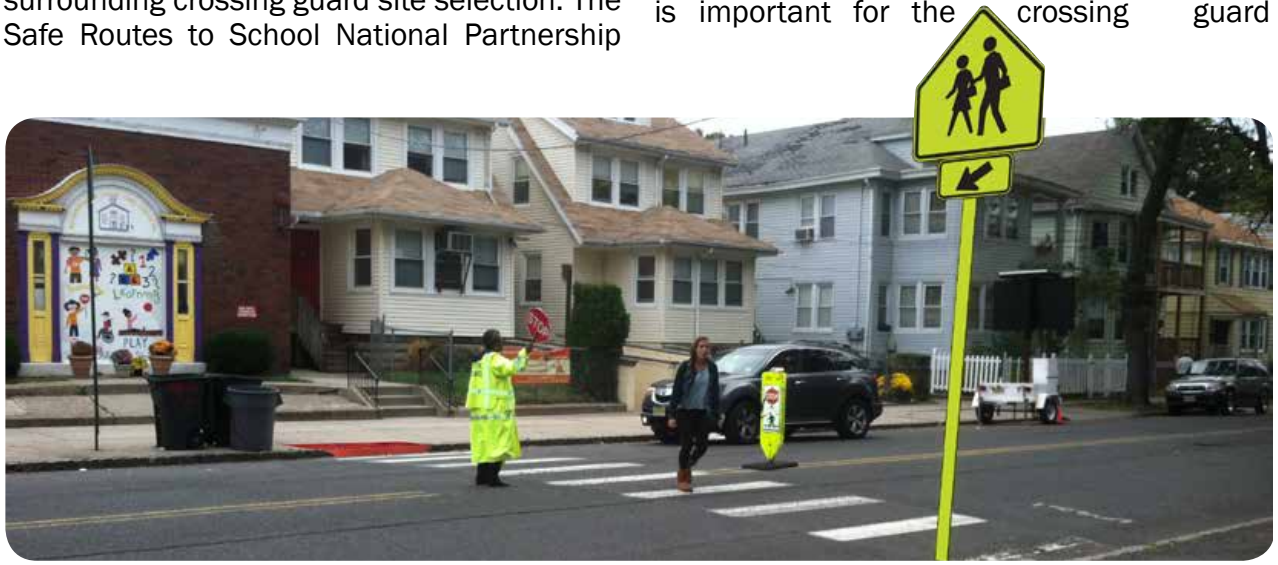
Adult school crossing guards should be assigned to school crossings only after the need is established. While there are a variety of criteria that can be applied to determine the need for a crossing guard, the criteria utilized must be applied consistently to allow a community to provide crossing guards where schools need them the most. In order to guarantee that the criteria are applied consistently, it is recommended that the municipality adopt a policy outlining the guidelines. Developing a uniform procedure of study and analysis can also help the municipality avoid complaints and questions surrounding crossing guard site selection. The Safe Routes to School National Partnership recommends that local communities consider collecting the following information when identifying guard placement:

The age of the students who are crossing

Generally, younger children need more assistance than older children because they have a more difficult time judging the speed and distance of approaching vehicles and may be tempted to cross when it is unsafe.

The width of the street and the number of lanes of traffic students must cross

Wide streets with multiple lanes of traffic typically require the use of two or more adult school crossing guards. If only one crossing guard is assigned to a multi-lane street, it is important for the crossing guard



Crossing guard at an unsignalized mid-block crossing. Image: The RBA Group

to remain in the center of the roadway while assisting students and be aware of what is happening in every lane before directing students to enter the crosswalk.

The sight distance at the crossing

These conditions are measured from the students' and drivers' perspectives using actual vehicle operating speeds. Sight distance can be affected by temporary obstructions, such as parked vehicles and piled snow near the crossing.

Younger students walking to school. Image: VTC

Safe gaps in traffic

Available gaps in traffic are a primary factor in determining the need for a crossing guard. Are the gaps long and frequent enough to allow safe crossing opportunities? The Institute of Transportation Engineer's (ITE) School Trip Safety Program Guidelines states that on the average, at least one adequate gap should occur each minute to allow for children to cross without undue delay or risk. However, other factors, such as volume of child pedestrians, should also be considered when determining the need for adult school crossing guards or other traffic control. If traffic volumes during crossing hours do not correspond to enough safe gaps, some method to interrupt traffic should be considered, such as a crossing guard or traffic signal. See the following section on *How to Conduct a Gap Study.*

Presence of traffic control devices, including traffic signals, signs and pavement markings

If present, are the traffic controls sufficient? Is the time allotted for pedestrian crossing sufficient? For example, a signalized intersection at a school crossing location should always have WALK/DON'T WALK signals.

The speed of vehicles at the crossing

Vehicles that travel faster require greater stopping distances, and younger children have more difficulty than adults in judging the speed of a fast-approaching vehicle.

A crossing guard assists pedestrians at a signalized crossing. Image: VTC

Model Municipal Crossing Guard Policy

www.saferoutesnj.org /crossingguards

The model policy was developed as a guide for New Jersey municipalities seeking to adopt a School Crossing Guard Policy and can be downloaded at www.saferoutesnj.org/wp-content/uploads/2011/12/Model-Municipal-Crossing-Guard-Policy.pdf. The model policy includes the following section on crossing guard placement.

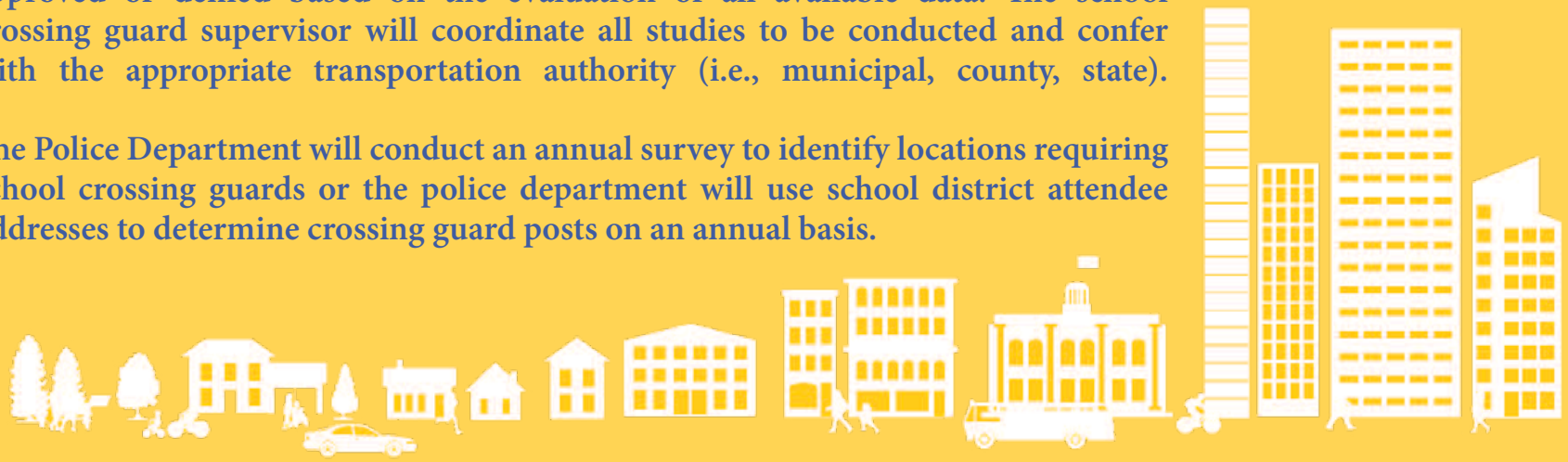
In New Jersey, crossing guard placement is determined by the municipality through traffic engineering studies and consultation with the local school district based on the following:

Sites where a school crossing guard may be needed are surveyed by the Police Department and the Engineering Department following requests or observations made by the school crossing guard supervisor, school officials, and/or concerned parents.

1. The request for establishing a new school crossing guard post should be put in writing to the school crossing guard supervisor who, in response, conducts an observational survey of the location during key times.

3. The request for a school crossing guard at a prospective location will be approved or denied based on the evaluation of all available data. The school crossing guard supervisor will coordinate all studies to be conducted and confer with the appropriate transportation authority (i.e., municipal, county, state).

4. The Police Department will conduct an annual survey to identify locations requiring school crossing guards or the police department will use school district attendee addresses to determine crossing guard posts on an annual basis.



Volumes of traffic and pedestrians

Local transportation planning or engineering departments can provide or help collect this data. Vehicle counts may be readily available, but pedestrian counts will likely need to be made during this process. The number of students currently using pedestrian facilities as well as the projected pedestrian demand based on school demographics or improvements to infrastructure should be determined.

The attendance boundary and walk zone for each school

The distances that walk zones extend from schools as well as policies regarding the provision of bus service can impact the number of children walking to school and the routes they take.

Crash history of the crossing

The type and time of day that each crash occurs at a specific location should be recorded and analyzed.

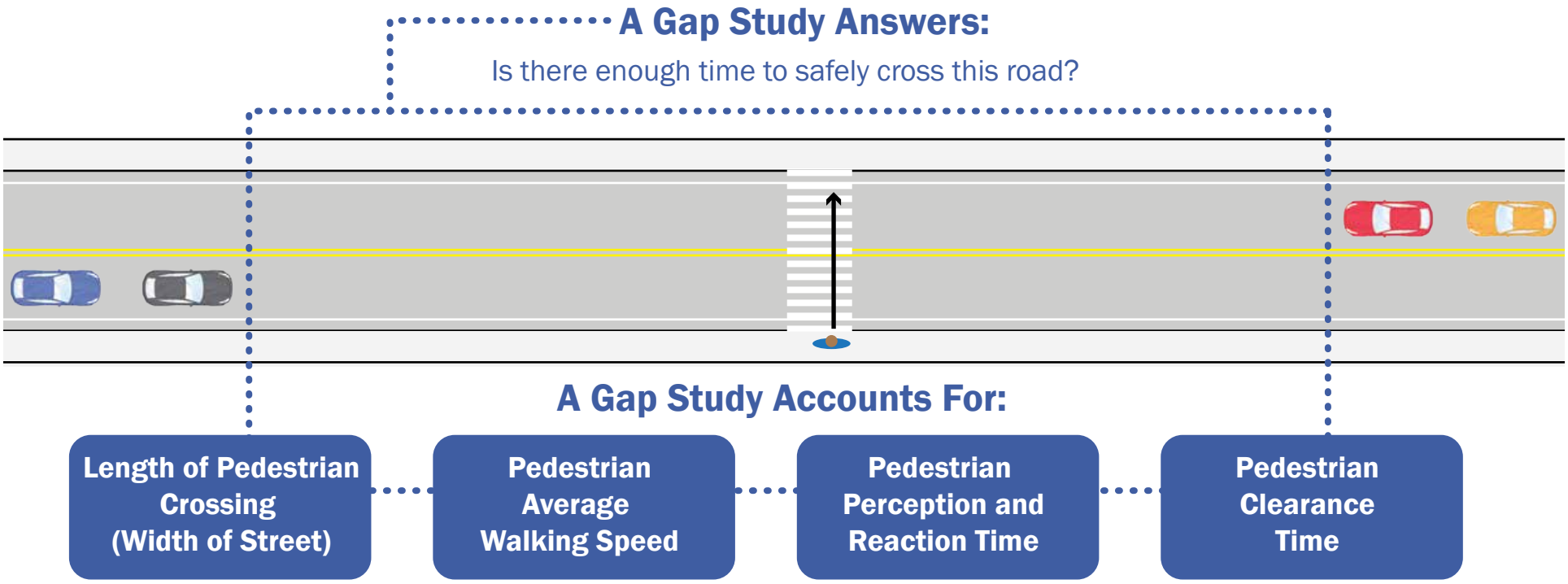
The distance the crossing is from a school and the type of adjacent land use

A crossing in close proximity to a school within a residential neighborhood may attract more student pedestrians than, for example, a crossing located farther from a school surrounded by non-residential land uses.

High volume student crossing in Dover, NJ. Image: The RBA Group

How to Conduct a Gap Study

Available gaps in traffic are a primary factor in determining the need for a crossing guard. Gap studies provide a method of quantitative analysis for road crossing opportunities accounting for the duration of gaps in motor vehicle traffic, the length of the pedestrian crossing (width of street), and pedestrian average walking speed, perception and reaction time, and clearance time in order to determine where crossing guards are needed to ensure safe crossing. According to the Institute of Transportation Engineer's (ITE) *School Trip Safety Program Guidelines*, an acceptable gap may be defined as the minimum time between vehicles that 85 percent of all groups of pedestrians waiting to cross a street will accept as adequate to cross the street. On the average, at least one gap should occur each minute to allow for children to cross without undue delay or risk.



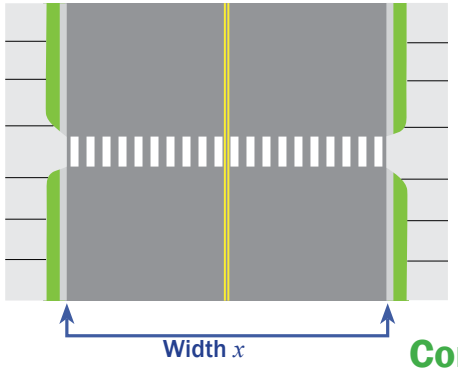
Gap studies consist of determining the number of rows of pedestrians in the predominant (85th percentile) pedestrian group size, determining the length of a minimum adequate gap, measuring the number and size of gaps in the traffic stream, and determining the sufficiency of adequate gaps. The minimum safe crossing time, the gap, is calculated using the following formula:

$$\text{Gap} = \frac{\text{Width of Street}}{\text{Average Walking Speed}} + \text{Perception \& Reaction Time} + \text{Pedestrian Clearance Time}$$

Width of Street

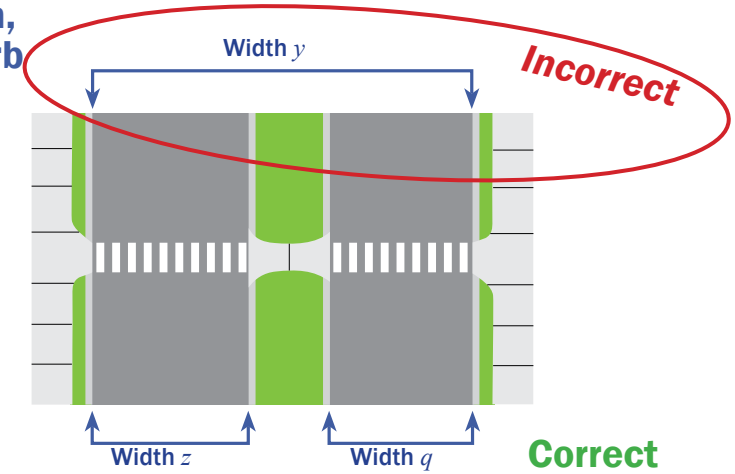
The crossing distance is normally measured from one curb to the other. If the roadway is divided such that the median provides a safe haven for the school crossing, a minimum adequate gap will be determined for each half of the crossing.

Without median, measure curb to curb.



Correct

With median, measure curb to curb on either side.



Correct

Average Walking Speed

The 2009 MUTCD assumes a walking speed of 3.5 feet per second, but allows consideration of slower walking speeds to accommodate slower pedestrians such as those in wheelchairs or who are visually impaired. Large groups of children as well as childern hand assisted by adults also have slower walking speeds. Therefore, the slower 3 feet per second walking speed should be assumed as the average walking speed (MUTCD Section 4E.06).

3
feet per second

Perception and Reaction Time

Physical and cognitive abilities of young children differ from the abilities of adults. In general, gap studies add 3 seconds to account for the time required for a child to look both ways, make a decision, and begin walking across the street.

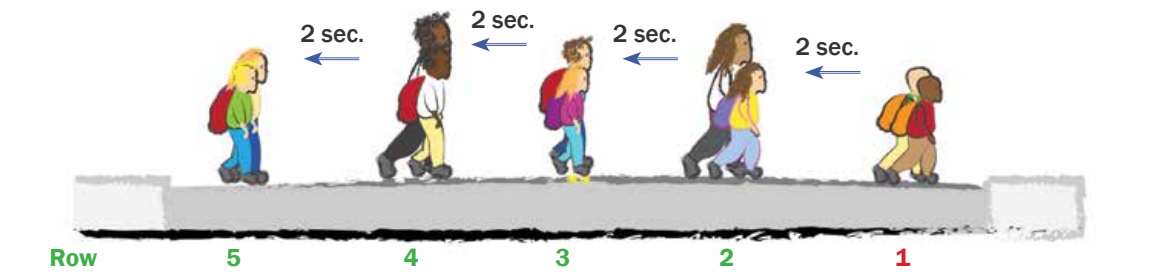
3
seconds

Pedestrian Clearance Time

Pedestrian clearance time is the additional time (in seconds) required to clear large groups of students from the roadway. Children are assumed to cross the roadway in rows of five with two-second time intervals between each row. The clearance time is equal to 2(N - 1) where N is the number of rows in 85th percentile group size, 1 represents the first row and 2 is the time interval between rows in seconds.

$$2(N-1)$$

- 2 = seconds between each row
- N = number of rows in 85th percentile of group size
- 1 = first row is subtracted from calculation



Calculating Pedestrian Clearance Time: How to determine "N", the number of rows in the 85th percentile pedestrian size group

The survey should begin upon arrival of the first child and end when the last one has crossed the street. The field survey portion of the study must be done under normal conditions involving the weather, school schedule, nearby traffic generator schedule, etc.

Pedestrian Group Survey Size

The observer should count the students as they gather into groups to wait for a gap in the traffic and record the sizes of the group in the table below. It is important to record the number of children because the school crossing signal warrant in the MUTCD includes a requirement of a minimum of 20 students during the highest crossing hour (MUTCD Section 4C.06 Warrant 5, School Crossing).

Pedestrian Group Size Survey

Location: Crossing Main St @ Maple Ave, Anytown, NJ

Date: 05/15/13 | Time from: 7:30 AM | Time to: 9:00 AM | Observer: Liz W.

Street Width: 35' | Raised Median: No | Width of median: N/A

Notes:

Group Size	Number of Students in Each Group	Number of Groups	Cumulative Number of Groups	# of Rows (N)
5 or less	2, 2, 4, 3, 5, 2, 3, 4	8	8	1
6 – 10	6, 8, 6, 7, 7	5	13	2
11 – 15	12, 11, 14	3	16	3
16 – 20	17, 19	2	18	4
21 – 25				5
26 – 30				6
31 – 35				7
36 – 40				8
41 – 45				9
46 – 50				10
	Total Students:	**Total Number of Groups:**	18 × 0.85 = 15.3	**N =** 3

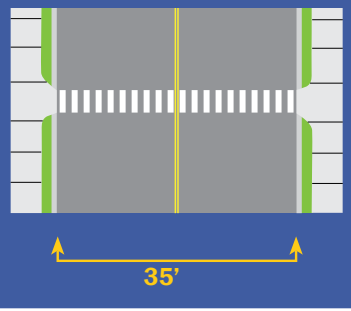
Table adapted from Iowa DOT's Office of Traffic Safety Form 1 – Pedestrian Group Size Survey

In order to obtain the 85th percentile group size:

1. Multiply the cumulative total number of groups by 0.85.
2. Fit the product of 1 within the series of ranges established in the Cumulative Number of Groups column. In this case, 15.3 fits between 13 and 16, so assign it to the row with 16.
3. The N value for 16 groups is 3. The N value of 3 will be used to complete your Gap Study.

Example: Determining the Minimum Adequate Gap

width of street



average walking speed

3

feet per second

perception & reaction time

3

seconds

pedestrian clearance time

2(N-1)

where N=3 (see calculation on previous page)

$$\text{Gap} = \frac{\text{Width of Street}}{\text{Average Walking Speed}} + \text{Perception \& Reaction Time} + \text{Pedestrian Clearance Time}$$

$$= \frac{35}{3} + 3 + 2(3-1)$$

$$= 18.67$$

$$\approx 19 \text{ seconds}$$ **Minimum Adequate Gap for Safe Crossing**

After the minimum adequate gap is calculated, the actual gaps in traffic must be measured. The length of each gap greater than the minimum (19 seconds in the example above) is recorded. If there is at least one safe gap per minute of crossing time, there may be no need for any special traffic controls. If, however, there is not at least one safe gap per minute, officials should consider using an adult crossing guard or traffic signal to create safe gaps.

What are the Guidelines for School Crossing Guard Use?

As is true for all traffic control measures, certain warrants must be met before adult guards are employed. An adult crossing guard should be considered when:

1. a school crossing guard is more feasible and economical than either a pedestrian bridge or tunnel or a traffic signal specifically installed to handle the crossing problem; and/or

2. there are special hazards, at either signalized or non-signalized locations, which can be properly handled only by adult supervision. These hazards include unusual conditions such as complicated intersections, heavy vehicular turning movements and high vehicular approach speeds; and/or

3. a change in school routes is imminent, thus requiring protection at the location for only a limited time. An example would include construction within a city which detours the preferred school route to another location that may need additional control.

Specific criteria regarding number of students, traffic volume and roadway condition vary depending on location. Guidelines from various states and cities across the country regarding the need for adult crossing guards include those produced by the State of California, the State of Utah, the City of Weston, Florida, and the City of Springfield, Missouri, and are described in the examples that follow.

Crossing guard wearing a retroreflective jacket.
Image: VTC

Examples of Guidelines for Crossing Guard Deployment

California Criteria for Adult Crossing Guards (California MUTCD 2012 Edition, Section 7D.02 Adult Crossing Guards)

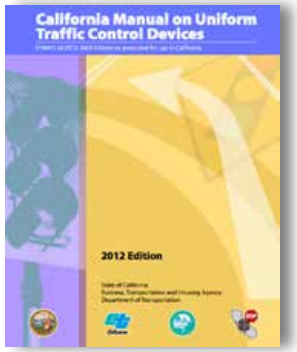
Adult Crossing Guards normally are assigned where official supervision of elementary school pedestrians is desirable while they cross a public highway on the "Suggested Route to School", and at least 40 elementary school pedestrians for each of any two hours (not necessarily consecutive) daily use the crossing while going to or from school. Adult crossing guards may be used under the following conditions:

1. At uncontrolled crossings where there is no alternate controlled crossing within 180 meters (or 460 feet); and
   - **a.** In urban areas where the vehicular traffic volume exceeds 350 during each of any two hours (not necessarily consecutive) in which 40 or more school pedestrians cross daily while going to or from school; or
   - **b.** In rural areas where the vehicular traffic volume exceeds 300 during each of any two hours (not necessarily consecutive) in which 30 or more school pedestrians cross daily while going to or from school.

   Whenever the critical (85th percentile) approach speed exceeds 40 mph (64km/h), the guidelines for rural areas should be applied.

2. At stop sign-controlled crossings:
   Where the vehicular traffic volumes on undivided highways of four or more lanes exceed 500 per hour during any period when the school pedestrians are going to or from school.

3. At traffic signal-controlled crossings:
   - **a.** Where the number of vehicular turning movements through the school crosswalk exceeds 300 per hour while school pedestrians are going to or from school; or
   - **b.** Where justified through analysis of the operation of the intersection.



www.dot.ca.gov/hq/traffops/engineering/mutcd/ca_mutcd2012.htm

Utah Traffic Control for School Zones, Section 7D.02 Adult Crossing Guards

Adult crossing guards shall be used at school crosswalks for elementary schools in:

1. All Reduced Speed School Zones; and,

2. School Crosswalk Zones at signalized intersections where the posted speed limit is 30 mph or greater; and,

3. All roundabouts.

For elementary schools, if no adult crossing guard is provided per above, then that School Crosswalk Zone or Reduced Speed School Zone shall be removed, and the Student Neighborhood Access Program (SNAP) plan shall be revised by the School Community Council.

Under Utah law, all elementary, middle and junior high schools are required to create and distribute a SNAP Plan, which shows the safest routes to school.

SNAP™
Student Neighborhood Access Program

www.udot.utah.gov/snap

City of Weston, FL Minimum Guidelines for the Placement of Adult Crossing Guards for Public Elementary and Middle Schools

Adult School Crossing Guards should be assigned at designated crossing locations along the safe walk routes where 25 or more students are present during official school zone times. School Crossing Guards may also be used under the following conditions:

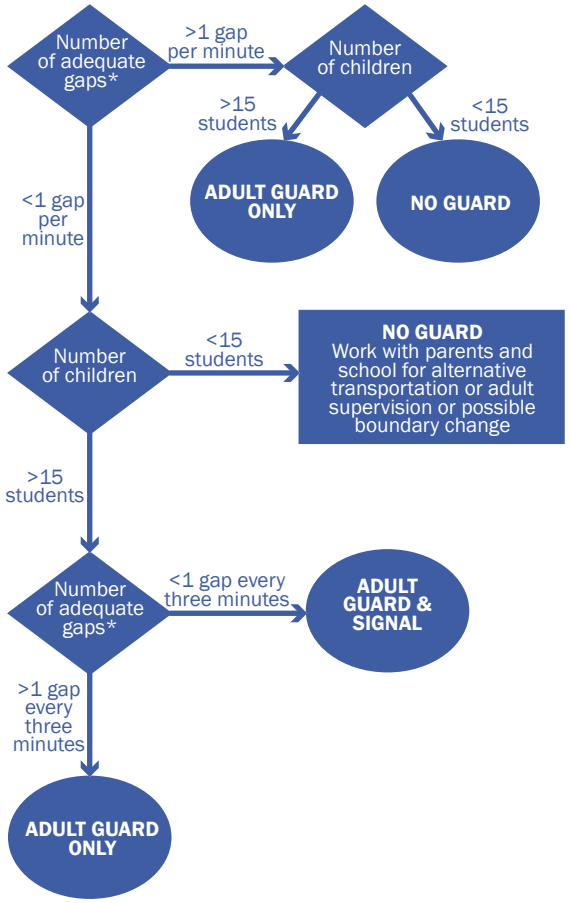
1. At uncontrolled crossings where there are no alternative controlled crossings within 600 feet; and
   - **a.** Vehicular traffic volume exceeds 350 during official school zone times; or
   - **b.** Where the gap in traffic is less than what is needed to cross the street
2. At stop sign controlled crossings where the vehicular traffic volume conflicts with the crosswalk and exceeds 500 during the official school zone times
3. At mid-block pedestrian signal controlled crossings
4. At intersection traffic signal controlled crossings where the number of vehicular turning movements through the crosswalk exceeds 300 during official school zone times

The placement of additional crossing guards at a specific location is recommended under the following conditions:

1. Four or more lanes of travel, including turn lanes
2. Physically divided roadways
3. Turning movements that conflict with the student crosswalk
4. Where students are required to utilize more than one crosswalk at the intersection
5. Sight visibility issues (both vehicular and pedestrian should be considered)

www.westonfl.org/media/docs/misc/Weston_Crossing_Guard_Placement_Guidelines.pdf

Flow Chart Depicting the Process for Placement of a School Crossing Guard in the City of Springfield, MO



www.springfieldmo.gov/documentcenter/view/2939

What is the process for requesting new adult crossing guards?

All requests for new adult crossing guards should be directed to the school district or the police department. The school district will make the request to the police department, who will arrange the collection of the necessary data to thoroughly study the location. The school crossing guard supervisor within the police department will coordinate all studies to be conducted and confer with the appropriate transportation authority (i.e., municipal, county, state).

If the standards are met for placing a crossing guard, the police department will explore funding options available for hiring a new crossing guard. When the funds are budgeted, the new adult crossing guard will be placed. If the standards for a new crossing guard are not met, the police department will notify the school district that the standards were not met.

Annual Reviews

In New Jersey, the governing body of any municipality may appoint school crossing guards for terms not exceeding one year and may revoke such appointments for cause and after proper hearing before the chief of police or other chief law enforcement officer of the municipality (N.J.S.A 40A:9-154.1). In order to allocate crossing guards in the most effective manner, the police department should conduct an annual survey to identify locations that require school crossing guards. During these annual reviews the placement and/or removal of school crossing guards should be reviewed by both a representative of the engineering department and the school district. It is important for police officers to document their process and decisions for assigning or removing a crossing guard post.

Decommissioning a Crossing Guard Post

As student populations shift or age out of the need for crossing guard assistance with crossing streets, crossing guard posts may need to be moved or decommissioned. When decommissioning a post, the municipality should use the same criteria used to determine if a crossing guard is necessary at a particular location. Factors should include the number of students, the age of students, road conditions (width, number of lanes), sight distances, presence or absence of traffic control devices, vehicle speeds, traffic and pedestrian volumes, truck traffic, location of crossing, and crash history.

If appropriate, the municipality should perform a gap study of the crossing location to look at the width of the street and the pedestrians' average walking speed, perception and reaction time, and clearance time. If officials find that there is at least one adequate gap in the traffic per minute to allow for safe crossing, the decommissioning may be justified on this basis.

Officers may work with the schools and/or may contact the families affected to explain the change and to inform walkers of alternative routes to school. The critical points to remember when decommissioning a post are to document the decision made, the reasons behind the decision, and to inform the communityof the change in a timely manner.

Crossing Guard Resources

The NJ SRTS Resource Center compiles resources and tools to support school crossing guards and to assist traffic safety officers. The Resource Center also conducts training programs for Municipal Police Traffic Safety Officers that supervise school crossing guards. The training includes crossing guard positioning and procedures, state and federal law and regulations, and hands-on practice to set up similar training for crossing guards in your community. The *New Jersey School Crossing Guard Manual for Supervisors* is part of the statewide school crossing guard training program and serves as a reference document to reinforce classroom and field training.

More information and resources, including the manual, are available at www.saferoutesnj.org/crossingguards

Chapter 5: Crossing the Street

Whether walking or bicycling, a student's journey to school will more than likely require crossing one or more streets.

Per the *Safe Routes to School Guide*, maintained by the National Center for Safe Routes to School at saferoutesinfo.org, the development of safe crossings for children is guided by several principles including the need to:

1. Establish or identify good crossing locations.
2. Reduce crossing distances.
3. Provide crossings that are direct, so that children with physical and visual impairments can easily negotiate them.
4. Use appropriate traffic controls such as marked crosswalks, traffic signals, and warning signs or flashers.
5. Slow motor vehicle speeds.

Treatments and/or practices that can be used to provide safer street crossings within school zones include: marked crosswalks, curb ramps, curb extensions, pedestrian refuge islands and medians, tight curb radii, parking restrictions, pedestrian and bicycle bridges and underpasses, rectangular rapid flashing beacon (RRFB), and pedestrian hybrid beacon (HAWK signal).

Pedestrian Safety is a Shared Responsibility

According to the New Jersey Driver's Manual, the most important pedestrian safety message for New Jersey residents is: Pedestrian safety is a shared responsibility. There is no single cause of crashes involving pedestrians. Pedestrians and motorists must all do their part to keep pedestrians safe.

Relative to pedestrians in crosswalks, New Jersey motorists must:

- Stop for pedestrians in marked crosswalks.
- Watch for and yield to pedestrians when turning right on red.
- Obey speed limits.
- Be sure not to block or park in crosswalks.
- Keep the vehicle's windshield clean for maximum visibility.
- Be alert for pedestrians at all times.
- Be aware of areas where pedestrians are most likely to appear (near schools, town centers, residential neighborhoods, parks).

Image: The RBA Group

- Never pass another vehicle that has stopped for a pedestrian.
- Stop for all pedestrians in a crosswalk, even if they began crossing with a proper signal and they are still in the crosswalk when the signal changes.
- Remember that pedestrians are the most vulnerable roadway users.
- Keep in mind, motorists share the responsibility for maintaining pedestrian safety.

Marked Crosswalks

A crosswalk is an extension of the road, sidewalk, curb or edge of the shoulder at an intersection for people on foot. Crosswalks may be either marked or unmarked. A marked crosswalk is any portion of the road outlined by painted markings or a different texture, such as concrete or pavers. Marked crosswalks are an essential tool for helping pedestrians move safely, conveniently, and predictably across roadways. A marked crosswalk can benefit pedestrians by directing them to cross at locations where appropriate traffic control, including traffic signals or school crossing guards, either currently exist or can be provided. It should be noted, however, that marked crosswalks, in and of themselves, do not slow traffic or reduce pedestrian crashes. In most cases, marked crosswalks should be used in conjunction with other pedestrian safety devices such as pedestrian signals or signage to increase visibility and driver awareness. Refer to Chapter 3 of this document for MUTCD standards on marked pedestrian crosswalks.

General guidelines include:

- Marked crosswalks should be designed to minimize crossing distances and should be straight, to make them easier for people with visual impairments to navigate.
- The decision to mark a crosswalk at an uncontrolled location should be guided by an engineering study. Factors considered in the study should include vehicular volumes and speeds, roadway width and configuration, stopping sight distance, distance to the next controlled crossing, night time visibility, grade, and pedestrian volumes. In the final analysis it may be determined that the crosswalk is appropriate but that traffic control (HAWK signals, RRFB or other) is required.
- According to the 2009 MUTCD, marked crosswalks alone (without other substantial treatments) should not be installed across uncontrolled roadways where the speed limit exceeds 40 miles per hour or either:
  - The roadway has four or more lanes of travel without a raised median or pedestrian refuge island and an average daily traffic (ADT) of 12,000 vehicles per day or greater; or
  - The roadway has four or more lanes of travel with a raised median or pedestrian refuge island and an ADT of 15,000 vehicles per day or greater.
- The minimum crosswalk width is six feet, but school-related crosswalks should be 10 to 15 feet wide or wider at crossings with high numbers of students.
- School-related crosswalks should be checked annually before the start of the school year. If necessary, fresh paint, inlay tape or thermoplastic should be applied and other improvements made to keep the crosswalks in good condition. Although initially more costly than paint, both inlay tape and thermoplastic are more cost-effective in the long run. Inlay tape is recommended for new and resurfaced pavement, while thermoplastic may be a better option on rougher pavement surfaces. Both inlay tape and thermoplastic are more visible and less slippery than paint when wet.

High-visibility crosswalk in Montclair, NJ.
Image: www.pedbikeimages.org/Tiffany Robinson

Unmarked Crosswalks

Crosswalks exist at all legs of all intersections but not every crosswalk is marked with painted lines. In fact, most are unmarked. In New Jersey, the driver of a vehicle must stop and stay stopped for a pedestrian crossing the roadway within any marked crosswalk, and they shall yield the right-of-way to a pedestrian crossing the roadway within an unmarked crosswalk at an intersection (N.J.S.A 39:4-36(a)).

Pedestrians crossing at an unmarked crosswalk. Image: Arterial

Curb Ramps

Curb ramps provide pedestrians with a means of negotiating any change of elevation between the sidewalk and roadway. This is especially important for people using wheelchairs, strollers, walkers, crutches, handcarts, and pedestrians who have trouble stepping up and down high curbs. Per 2004 Americans with Disabilities Act (ADA) guidelines, curb ramps must be installed at all intersections and at mid-block locations to access on-street accessible parking spaces, where provided, and at all new passenger loading zones.

ADA guidelines state that curb ramps should be perpendicular wherever possible, where each corner has two ramps installed perpendicular to the face of the curb (vs. a single ramp facing diagonally into the intersection). In doing so, the curb ramps lead directly along the line of travel, guiding pedestrians into the crosswalk rather than into the middle of the intersection. This design is especially desirable to pedestrians with vision impairments.

Curb ramps and crosswalks should be clear of obstacles. Existing conflicting elements should be moved as opportunities and budgets allow. No new poles, utilities or other impediments should be placed in the curb ramp return areas. When a corner is retrofitted with new curb ramps, the crosswalk markings may have to be moved so that the curb ramp fully aligns within the crosswalk.

Intersections should have two perpendicular, ADA-compliant curb ramps per corner. Image: The RBA Group

Diagonal curb ramps are not desirable because they force pedestrians into the intersection and are more difficult for visually-impaired people to determine the correct crossing location and travel direction. Image: Arterial

Curb Extensions

Curb extensions narrow the roadway by providing an extension of the sidewalk area into the parking lane thereby reducing crossing distances and pedestrian exposure to motor vehicles. This design also brings pedestrians out from behind parked motor vehicles and helps pedestrians and drivers to better see each other. Smaller children who are often invisible behind parked motor vehicles and may take longer to cross the street would particularly benefit from curb extensions. For main streets, reducing the crossing time permits the green-light time for the major street traffic to be increased proportionately (AASHTO, 2009).

A curb extension also can slow turning vehicles and prevent drivers from parking on or near a crosswalk. Curb extensions must be designed to accommodate drainage. There are cases where curb extensions may not be needed or desirable on every leg of an intersection, such as when the street is narrow, parking is not permitted, or the curb would interfere with a bicycle lane or the ability of fire trucks or other large vehicles to negotiate a turn (AASHTO, 2009).

A mid-block storm-water curb extension example, Route 45 in Woodbury, NJ. Image: NJDOT

A median with a staggered crosswalk forces pedestrians to turn and face oncoming traffic before crossing the second half of the crosswalk. In order to curtail shortcutting and force pedestrians to follow the intended path, some medians may also have attractive fencing to corral pedestrians in the correct direction. Image: Oregon Department of Transportation

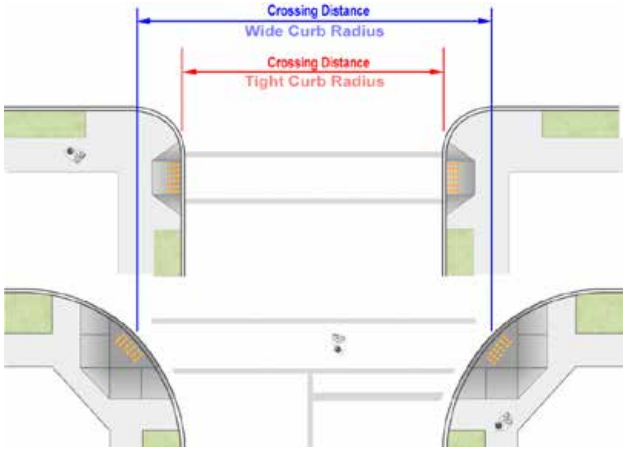
Pedestrian Refuge Islands and Medians

Medians and islands help pedestrians cross streets by providing refuge areas that are physically separated from the automobile path of travel. A median separates opposing lanes of traffic, while an island is a protected spot within a crosswalk for pedestrians to wait to continue crossing the street or to board transportation such as a bus. Medians and islands reduce the crossing distance from the curb and allow pedestrians to cross during smaller gaps in traffic. Medians and islands are useful to pedestrians who are not able to judge distances accurately. Medians and islands also help people with slow walking speeds cross long intersections with short signal cycles. These benefits are especially important for children, who tend to cross streets more slowly and have less experience with crossings than adults. Because medians and islands separate traffic into channels going in specific directions, they require crossing pedestrians to watch for traffic coming in only one direction at a time.

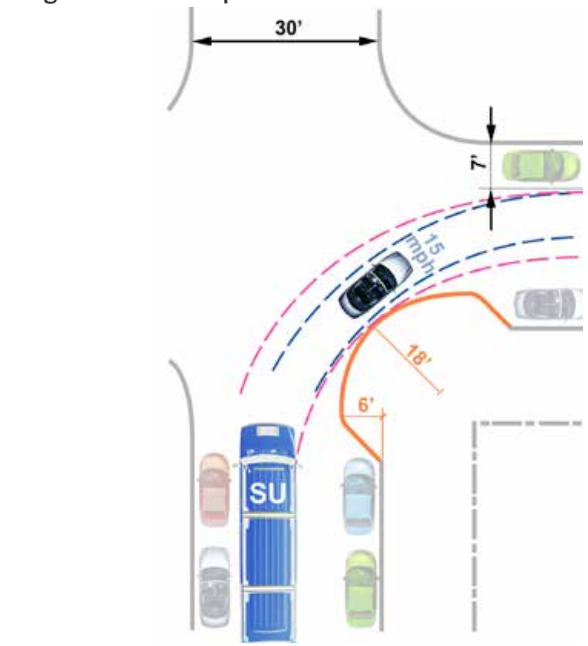
Tight Curb Radii

Reducing the curb radius "extends" the curb/sidewalk into the intersection. This design decreases the number of crash conflicts by reducing the speed of the turning vehicles and allows for the pedestrian to see and be seen. It also shortens the crossing distance so the pedestrian spends less time in the street with less exposure to conflicts with motor vehicles.

The *Safe Routes to School Guide* states that when designing curb radii, consider the area motor vehicles actually need when turning. In other words, the needs of all road users including pedestrians, bicyclists, buses, trucks and cars should be considered in designing or retrofitting corner turn radii. Instead of assuming that every corner needs to be cut back, look at other factors such as on-street parking and bicycle lanes to determine how much space a turning motor vehicle will need. The effective radius should take into account, the width of parking lanes and bicycle lanes on both streets. Large trucks do not need to stay on their half of the street when turning onto local streets. There is no need to design for the largest vehicle that might ever use a street, especially for residential streets within neighborhoods.



Crossing Distance (Wider vs. Tighter Curb Radii); Image: The RBA Group



Single Unit (SU) Truck Turning Radii vs. Personal Car Turning Radii. Image: The RBA Group

Parking Restrictions

In New Jersey, parking is not permitted within 50 feet of a stop sign or within 25 feet of a crosswalk, unless a curb extension exists at the crosswalk (N.J.S.A. 39:4-138). According to the National Center's *Safe Routes to School Guide*, restricting parking at corners will improve visibility of the crossing for both drivers and pedestrians. The *Guide* states that, at a minimum, 30 feet should be kept clear in advance of marked crosswalks to help pedestrians and drivers see each other better. While distances greater than 30 feet are generally better, parking restrictions have to be balanced with the need of the motorists. For example, if parking is severely restricted or completely removed near schools, motorists may ignore all parking restrictions.

Image: The RBA Group

Pedestrian and Bicycle Bridges and Underpasses

There are locations where a pedestrian bridge or underpass is the only way for pedestrians and bicyclists to safely cross the road, such as when children would otherwise be forced to cross freeways or major multi-lane arterial streets to get to or from school. According to the Federal Highway Administration's (FHWA) Designing Sidewalks and Trails for Access Guide, pedestrian bridges and underpasses are most efficient in areas where pedestrian attractions such as shopping centers, large schools, recreational facilities, parking garages and other activity centers are separated from pedestrian generators by high-volume and/or high-speed arterial streets. However, the benefits of bridges and underpasses must be weighed against their substantial costs, which can be $2 million or more. The convenience of bridges and underpasses should also be considered. They require the pedestrian to change elevation and expend energy, and they may require pedestrians and bicyclists to follow an indirect path. As a result, there may be some resistance to using them. Some schools station crossing guards at such facilities to ensure that students use them.

A pedestrian bridge connects Millburn Middle School with the athletic fields across Old Short Hills Road (CR 527). The bridge also serves as a gateway to downtown. Image: Bing Maps

An RRFB signal has been installed in Atlantic County at the intersection of Old Tilton Road (NJ 687) and the Linwood Bikepath. Image: The RBA Group

Rectangular Rapid Flashing Beacons (RRFB)

Rectangular rapid flashing beacons (RRFBs) are active warning devices used to alert motorists of crossing pedestrians at uncontrolled crossings. They remain dark until activated by pedestrians, at which point they emit a bright, rapidly flashing yellow light, which cautions drivers to stop. The Manual on Uniform Traffic Control Devices (MUTCD) suggests that RRFBs can significantly increase yielding rates over standard pedestrian warning signs, thereby increasing pedestrian safety.

RRFBs should be installed on both the right and left sides of the crosswalk, or in a median if available; however, because decreased effectiveness may result from overuse, RRFBs should be limited to locations with the most critical safety concerns, such as pedestrian and school crosswalks with uncontrolled vehicle approaches. RRFBs have received interim approval from FHWA (pending their formal inclusion in the MUTCD) under Section 1.A.10 of the 2009 MUTCD; however, jurisdictions wishing to use them must inform FHWA prior to installing them on any roadway.

HAWK Signals

The pedestrian hybrid beacon (also known as the High intensity Activated crossWalK (or HAWK)) is a pedestrian-activated warning device located on the roadside or on mast arms over midblock or unsignalized pedestrian crossings. The beacon head consists of two red lenses above a single yellow lens. The beacon head is "dark" until the pedestrian desires to cross the street. At this point, the pedestrian will push an easy to reach button that activates the beacon. After displaying brief flashing and steady yellow intervals, the device displays a steady red indication to drivers and a "WALK" indication to pedestrians, allowing them to cross a major roadway while traffic is stopped. After the pedestrian phase ends, the "WALK" indication changes to a flashing orange hand to notify pedestrians that their clearance time is ending. The hybrid beacon displays alternating flashing red lights to drivers while pedestrians finish their crossings before once again going dark at the conclusion of the cycle.

The pedestrian hybrid beacon is a potential solution for midblock or unsignalized crossing locations where neighborhoods are located on the opposite side of a wide or busy street from a school. It is often difficult to get drivers to stop or yield to pedestrians at uncontrolled crossings on high volume, high speed, or multi-lane roadways, even if crosswalk markings and advance pedestrian warning signs are installed. At the same time, there may not be enough pedestrians crossing to warrant a full traffic signal. The warrants for the pedestrian hybrid beacon are much easier to meet, compared to the warrants of a full traffic signal.

Pedestrian hybrid beacons should only be used in conjunction with a marked crosswalk. In general, they should be used if gaps in traffic are not adequate to permit pedestrians to cross, if vehicle speeds on the major street are too high to permit pedestrians to cross, or if pedestrian delay is excessive. Transit stops and school locations may be good places to consider using the pedestrian hybrid beacon. Chapter 4F of the MUTCD contains a section on the pedestrian hybrid beacon and when and where it should be installed. Practitioners should follow the MUTCD guidelines.

Since the pedestrian hybrid beacon is a traffic control device many people are not yet familiar with, effort should be made to perform outreach to the public before implementation so there is no confusion about how the beacon operates and what drivers and pedestrians should do when encountering it.

HAWK Signal across Route 27 to the Metropark Train Station. Image: NJDOT


Pedestrians utilizing the HAWK signal to get to the Metropark Train Station. Image: NJDOT

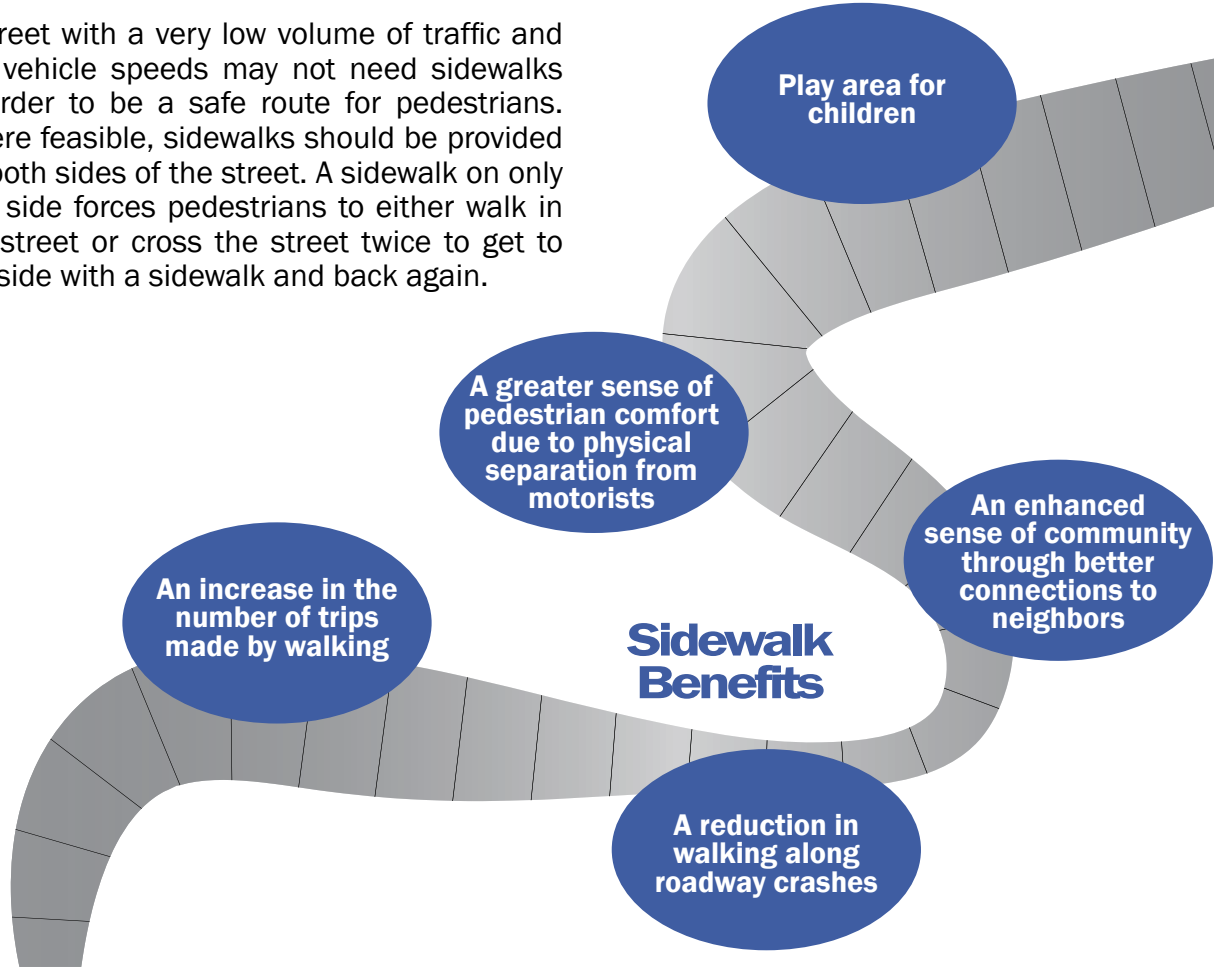
Chapter 6: Along the Street

This section describes the types of infrastructure that should be in place along school routes to make walking and bicycling to school safer.

Sidewalks

In communities with sidewalks, it is often more convenient to choose walking as a transportation mode or a recreational activity. For children, sidewalks provide an essential environment for safe, independent mobility. In addition, sidewalks can provide a safe, communal play area for a variety of games and activities including drawing with chalk, playing hopscotch, and learning to bicycle or roller skate, among others.

Most sidewalks in New Jersey are constructed by landowners as part of the development process. They may also be built by a state, county, or local agency in connection with roadway construction or reconstruction or as an independent project. The State's Residential Site Improvement Standards (RSIS) set forth sidewalk requirements for residential development in the state. No comparable set of standards exists for non-residential developments. Streets that do not have sidewalks, particularly those on routes where children walk or bicycle to school, should be identified and assessed to determine if retrofitting these streets with sidewalks is appropriate. It is possible that a street with a very low volume of traffic and low vehicle speeds may not need sidewalks in order to be a safe route for pedestrians. Where feasible, sidewalks should be provided on both sides of the street. A sidewalk on only one side forces pedestrians to either walk in the street or cross the street twice to get to the side with a sidewalk and back again.



Considerations for Sidewalks

Sidewalk Surface Types

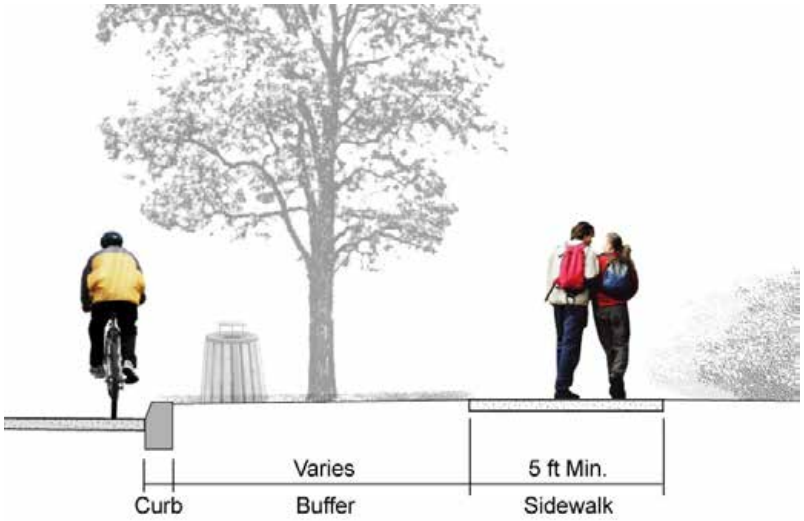
Sidewalks can be surfaced with a variety of materials to accommodate varying budgets and contexts. While urban, suburban, and heavily used sidewalks are typically made of concrete, less expensive walkways may be constructed of asphalt, crushed stone, or other materials if they are properly maintained and accessible (usable by those with disabilities or those pushing carts or strollers). Concrete is more expensive than asphalt to install, but it lasts longer and requires less maintenance, which may make it a better value in the long run. Although brick pavers may appeal to some designers, they can require more maintenance and create a tripping hazard condition. Pavers may also pose a problem to pedestrians in wheelchairs if the bricks settle or become lifted. Safe sidewalk surfaces should be firm, stable, and slip-resistant.

Examples of concrete, asphalt and brick paver sidewalks.

Sidewalk Width

The width of a sidewalk depends primarily on the number of pedestrians who are expected to use the sidewalk at a given time — high-use sidewalks should be wider than low-use sidewalks. Per the Federal Highway Administration's (FHWA) Recommended Guidelines/Priorities for Sidewalks and Walkways, a sidewalk width of five feet is needed for two adult pedestrians to comfortably walk side-by-side; all sidewalks should be constructed to be at least this width. Near parks, schools, and other major pedestrian generators sidewalks should be eight to ten feet wide.

Every attempt should be made to locate streetlights, utility poles, sign posts, fire hydrants, mail boxes, parking meters, bus benches, and other street furniture out of the sidewalk. When that is not possible, sidewalk furnishings and other obstructions should be located consistently so that there is a clear travel zone for pedestrians with vision impairments. A wider sidewalk should be provided to accommodate this line of obstructions.



Sidewalk cross section. Image: The RBA Group

Sidewalk Buffer Zones

Buffers between pedestrians and motor vehicle traffic are important to provide greater levels of comfort, security, and safety to pedestrians. In general, there are four types of sidewalk buffers:

1. Planting strip of grass and trees - This is the preferred buffer as it provides a more pleasant, shaded environment for walking.
2. Bicycle lane –Whether or not a planting strip is possible, a bicycle lane can provide or add to an acceptable buffer between pedestrians and motor vehicles.
3. Parked cars –Parking spaces, especially when parked vehicles are present, provide a great buffer between pedestrians and moving vehicles; however, parked cars also create a visual screen for motorists who are not looking for pedestrians that want to cross midblock.
4. Street furniture - Examples include benches, newspaper boxes, street lighting, and public art.

Sidewalk with a planting strip. Image: The RBA Group

If a sidewalk buffer does not exist, an effort should be made to provide a wider sidewalk. A wider sidewalk allows pedestrians to better avoid the splash zone (area subjected to spray from vehicles traveling through water). It also provides a snow storage area and a more comfortable separation between moving vehicles and pedestrians.

Guidelines for sidewalk buffers are available in the FHWA's Designing Sidewalks and Trails for Access (Section 4.1.2) at www.fhwa.dot.gov/environment/sidewalk2/sidewalks204.htm and AASHTO's Guide for the Planning, Design, and Operation of Pedestrian Facilities (Section 3.2.4).

Other Sidewalk Design Considerations

- The distance between the sidewalk surface and the bottom of signs placed in or right next to the sidewalk shall be at least seven feet to avoid injury to pedestrians.

- Bushes, trees, and other landscaping should be maintained to prevent encroachment into the sidewalk. Jurisdictions should adopt ordinances requiring local property owners to trim the landscaping along their frontage to maintain clear and unobstructed sidewalks.

- Per FHWA guidelines, guy wires and utility tie-downs should not be located in or across sidewalks at heights below seven feet. When placed adjacent to sidewalks or pedestrian walkways, the guy wires should be covered with a bright yellow (or other high-visibility) plastic guard to make the wire more visible to pedestrians. Guy wires of any color will not be visible to blind pedestrians and must not be located within the pedestrian route.

Girls walking in downtown Somerville. Image: Arterial

- Bus shelters should be located between the sidewalk and the street, or between the sidewalk and adjacent property, so that waiting passengers do not obstruct the flow of pedestrians along the sidewalk. Benches and other street furniture should be placed outside the walking paths to maintain the accessibility of the walkway and to provide good pedestrian service. In addition, curb ramps should be provided at bus stops because it is not always possible for the bus to pull close enough to the curb to deploy a lift.

- Street lighting improves pedestrian visibility and personal security and should be provided on school access routes. On streets with a large number of trees, street lighting scaled to pedestrians (low lights) illuminates the sidewalks even after the trees grow quite large. Street lighting improves safety by allowing pedestrians and motorists to see each other. It also contributes to aesthetics. Two-sided lighting should be considered along wide streets. Two-sided lighting consists of two light fixtures on one light pole. One fixture illuminates the roadway and the other illuminates the sidewalk or pedestrian realm. It is especially important to provide lighting at pedestrian crossings. Lighting can also be helpful along streets adjacent to the school grounds to minimize vandalism and improve security. While most school walking activity occurs during daylight hours, the morning school trip in the middle of winter often occurs during hours of darkness, and school activities often occur during nighttime hours.

On-Street Bicycle Facilities

Bicycling is an important way for children to travel to and from school. Bicycling can help students who live too far from school to walk comfortably to participate in active transportation. An important thing to remember is that the use of on-street facilities is more appropriate for older children who have sufficient bicycle handling skills and knowledge of bicycle and traffic safety rules than it is for young children just learning to ride.

A considerable amount of all bicycling occurs on the street system, and for children especially, most will occur in the streets near where they live. Children of all ages will bicycle to school if given the opportunity. When designating bicycle routes to encourage bicycling to school, all age groups should be targeted including elementary, middle, and high school students.

A bike train arriving at Thorton Creek Elementary School in Seattle, WA. Image: walkbikeschools.wordpress.com

Bicycle Lanes

Bicycle lanes provide a striped and stenciled lane for one-way bicycle travel on roadways. Bicycle lanes offer a comfortable space for older or more experienced children to ride. Typically, bicycle lanes are installed on roadways with higher traffic speeds and volumes than residential streets. Where the lane is directly serving a school, however, communities may elect to stripe bicycle lanes on low-traffic residential streets in order to provide an additional level of visibility for younger bicyclists. Per the Safe Routes to School Guide from the National Center for SRTS:

- Bicycle lanes located next to motor vehicle parking should be at least five feet wide.
- The preferred width of bicycle lanes next to a curb is also five feet, although four feet, excluding the gutter pan, may be adequate.
- Bicycle lanes should not be wide enough to accommodate a motor vehicle as drivers may attempt to use a wide bicycle lane as a travel lane.
- Bicycle lanes should be designated through the use of signs or painted symbols and, if appropriate, motor vehicle parking restrictions.

A newly striped bicycle lane on Diesterweg Street in Egg Harbor. Image: NJDOT

Shared Lane Markings

Shared Lane Markings (SLM) (sometimes known as “sharrows”) are placed in a travel lane to indicate that motorists and cyclists are sharing the road. Sharrows assist cyclists by helping them to position themselves in the appropriate part of the travel lane, away from the curb, or, where there is parking and opening of car doors. They also help motorists by alerting them that cyclists are likely to be using the lane with them. Shared lanes are different than a dedicated bike lane, which has a solid white line separating the car lane from the bike lane. Sharrows are used when the roadway width in insufficient for a dedicated lane.

Newly-installed “sharrow” in Hoboken.
Image: The RBA Group

According to the National Safe Routes to School Guide, SLMs should not be placed on roadways that have a speed limit above 35 mph and cannot be placed on road shoulders or in designated bicycle lanes. Information on Shared Lane Markings, including proper placement, can be found in Section 9C.07 of the 2009 Manual on Uniform Traffic Control Devices (MUTCD).

Paved Shoulders

Paved shoulders benefit both bicyclists and drivers. They provide a place for bicyclists to ride that is removed from the motor vehicle travel lane and reduce the likelihood of crashes from run-off-the-road motor vehicle crashes. Providing shoulders on existing roadways or including them in new roadway projects can also be justified by the safety benefit provided to drivers of motor vehicles. While pedestrians can walk along them, shoulders should not be considered a good substitute for sidewalks in urban areas. Per the FHWA’s Recommended Guidelines/Priorities for Sidewalks and Walkways, a five-foot wide shoulder is acceptable for bicyclists along low-volume rural highways. Greater width, up to eight to ten feet, is desirable along high-speed highways, particularly those with a large number of trucks. An edgeline should be marked to separate the shoulder from the roadway.

Burlington County has been striping 6-inch edge lines on shoulders along roadways with high bicyclist and pedestrian use, including this section of County Route 528 in a school zone in Bordentown Township.
Image: NJDOT

Multi-Use Paths

Multi-use paths, sometime known as shared-use paths, are parallel and adjacent to a roadway or on their own separated right of way and add to the connectivity of the pedestrian and bicycle network. Paths can sometimes connect neighborhoods directly with schools and thereby, shorten the distance children must walk or bicycle. However, paths must be designed properly, especially where they intersect roadways, to minimize the risk of pedestrian and bicyclist crashes. Guidelines for designing paths are available in the FHWA *Designing Sidewalks and Trails for Access Part 2* and in the American Association of State Highway and Transportation Officials' (AASHTO) *Guide for the Development of Bicycle Facilities, 2012 edition*.

Per AASHTO guidelines:

- The width of a multi-use path can range from 8 to 14 feet or more.
- Under most conditions, the recommended minimum width for a two-direction path designed for bicyclists and pedestrians is ten feet.
- When heavy pedestrian and bicycle traffic is expected, a path width of 12 to 14 feet is recommended.

According to the *Safe Routes to School Guide* from the National Center for SRTS:

- Abandoned rail lines and utility corridors often make excellent corridors for multi-use paths.
- Pavement for multi-use paths can be asphalt or concrete.
- Measures should be taken to keep motor vehicles off of the path, while maintaining access for maintenance vehicles.
- Agencies should monitor conditions along the path for maintenance and repair.

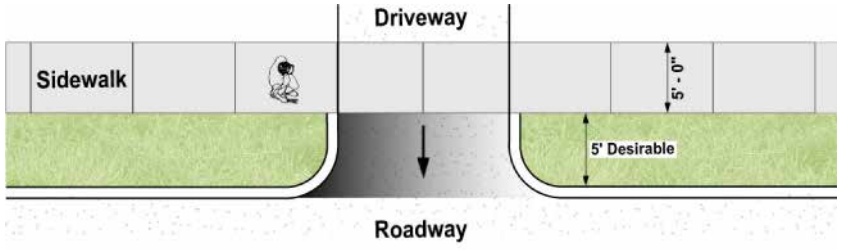
Students use a multi-use path to get to school in Chesterfield, NJ.
Images: NJDOT

Driveways

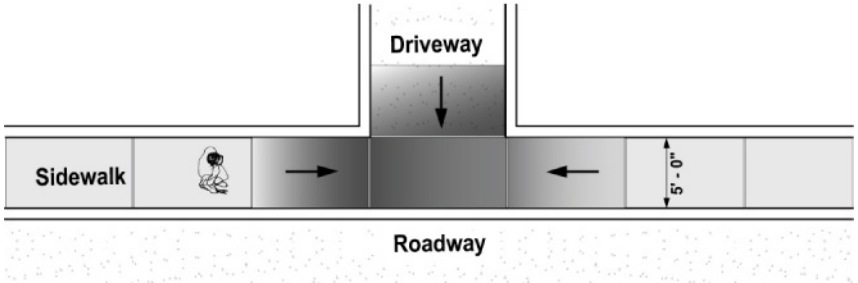
Designing driveway crossings for pedestrians can improve the walking environment, improve visibility and reduce conflicts between drivers and pedestrians. Reducing the number of driveways can make it easier for people with disabilities to access and walk on the sidewalk. Per the National Safe Routes to School Guide, the following principles should be applied to driveway design:

- The sidewalk continues across the driveway at the same elevation or level.
- The driveway apron does not go through the sidewalk.

Ramps may be necessary for pedestrians to cross the street at intersections but the rest of the sidewalk network should be continuous and at one level. Providing a level, continuous sidewalk not only brings the sidewalk up to the standards of universal access for persons in wheelchairs or on crutches, but also changes driver behavior. The driver exiting or entering such a driveway is more aware that they are crossing a sidewalk, will proceed more slowly and is more likely to stop. Fewer driveways and narrower driveway crossings provide improved pedestrian safety, especially in busy commercial zones. School walking routes should keep busy driveway crossings to a minimum. If young students are required to cross a busy school driveway, an adult should be assigned to monitor or direct the students at the driveway.



Good example - sidewalk continues across driveway apron.
Image: The RBA Group



Bad example – driveway apron goes through the sidewalk.
Image: The RBA Group

Wayfinding along School Routes

Wayfinding signage and markings provide direction to students and parents and mark roads as preferred travel routes. Wayfinding could include paint markings designating preferred corridors by color or markers, such as the one pictured to the right, that designate safe travel routes. These markings and signs also increase visibility of walking routes among the community and encourage more children to walk or bike to school. This guide recommends wayfinding markings or signage to be placed on primary school travel corridors.

Pavement markings indicate the school walking route in Trenton. Image: VTC

The Richmond Liberty Trail utilizes a blue compass marker to point visitors to the next historical site. Volunteers used stencils to paint the icons. Image: www.visitrichmondva.com

Fizzy the Dragon points the way for students on Walk and Bike to School Day in Chesterfield, NJ. Image: NJDOT

Carson City, NV marks its “Kit Carson Trail,” with a six-inch wide, blue skid-resistant surface line. Image: RVfor5.blogspot

The Windsor-Essex County, Canada Active and Safe Routes to School project provided signs for walking routes. Image: www.saferoutestoschool.ca/

Chapter 7: Traffic Calming

By design, traffic calming is a self-enforcing traffic management approach that forces motorists to alter their speed or direction of travel. The purpose of traffic calming is to improve safety, especially for pedestrians and bicyclists, and to improve the"livability" of streets for residents and visitors. Enhanced safety is one of the most fundamental benefits of traffic calming. By decreasing the volume and/or reducing the speed of motor vehicles, the number and severity of crashes is greatly diminished.

What techniques are used in traffic calming?

Traffic calming techniques may include education, enforcement, or engineering – "the three E's" – to shift traffic patterns and/or reduce speeds. Most traffic calming measures focus on engineering changes to alter driver behavior. Engineering techniques are the focus of this chapter. Traffic calming measures can generally be separated into three groups based on the goal they are trying to achieve: speed control, volume control, and safety enhancement. Volume control attempts to minimize motor-vehicle volumes or cut-through traffic through restricted turns, roadway closures or median barriers. Speed control measures include **passive** concepts such as gateways or streetscapes that change a driver's perception of a corridor as well as **active** concepts that force a driver to physically alter their travel path and slow down. Certain safety enhancements, such as in-pavement lighting or raised crosswalks, have the additional benefits of raising driver awareness and slowing traffic, and are typically implemented in combination with other traffic calming techniques. Education and enforcement programs should be considered before, and as a complement to, engineering efforts.

What does Traffic Calming do?

Passive traffic calming techniques can include visual prompts that give drivers the perception that they are entering a traffic-calmed area. Examples include streetscaping and/or landscaping, textured/colorized pavement, on-street parking, striped bicycle lanes or variable message signs with speed radar. Passive traffic calming also includes creating a physical environment where the driver slows down as a reaction to changes in the roadway. Examples include narrowed lanes, rumble strips, and on-street parking.

Active traffic calming could include vertical deflection, or raised roadway treatments that force the motorist to slow down, such as speed humps/tables, raised crosswalks, or raised intersections. Active traffic calming could also include horizontal deflection to limit the speed a vehicle can safely travel through an intersection or along a roadway, such as full or mini-roundabouts, chicanes, or center island medians. Lastly, active traffic calming could also include constrictions, or horizontal extensions that limit vehicle speed by narrowing the travel way such as curb extensions, neck downs, bulb outs, or pedestrian island refuges.

Effective traffic calming strategies often include using more than one measure. Traffic calming decisions should be made using a systematic approach. Measures should be appropriately spaced and any secondary effects of the installations must be considered.

There are several communities in New Jersey that have developed traffic calming programs or implemented traffic calming measures. These include: Hoboken, Maplewood, Fair Lawn, Woodbury, Haddonfield, Camden, Montclair, and Lawrence Township.

Pedestrian refuge in Lawrence Township, NJ. Image: NJDOT

> **"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."**
>
> **Institute of Traffic Engineers**

Types of Traffic Calming Measures Best Suited for School Zones

The following describes and illustrates various traffic calming measures which can be employed in and around school zones. In addition to describing the measures, a list of general benefits and drawbacks associated with each measure is also presented. The intent is to provide the reader with a quick indication of what might be expected if this measure is implemented.

Following the descriptions, a matrix provides a concise summary of the traffic calming tools.

Gateway

Description: A signing and/or landscaping treatment to alert motorists they are entering a lower speed environment and they should expect bicyclists and pedestrians. A gateway treatment can be used at entrances to school zones, neighborhoods, commercial areas, town centers, or busy places of activity. Gateways can be as simple as signs and landscaping. They are typically supplemented with other traffic calming measures such as bulb outs, public art and raised crosswalks.
Benefits: Can be visually aesthetic and heighten awareness. Creates a unique image for an area.
Drawbacks: Can require routine maintenance.
Costs: Varies

Gateway to Forest Hill School in Camden, NJ. Image: VTC

Stationary Radar Sign/ Speed Display Board/ Speed Feedback Sign

Description: Radar signs are interactive signs that draw motorists' attention to their speed and the road's legal speed limit. They work by informing motorists when they are exceeding the speed limit. They can be used in residential areas, school zones, construction zones, or other safety zones. Radar signs can be permanently mounted on signposts or temporary installations using self-contained trailers.
Benefits: Radar signs have proven to slow down traffic, even years after their initial installation. They are particularly effective on high volume arterials, where physical measures would restrict traffic flow, as well as local roads and in school zones.
Drawbacks: Radar signs do not slow traffic as much as physical measures. Motorists' compliance is voluntary. Enforcement is still necessary.
Costs: $5,000 - $15,000 each

Temporary speed feedback trailer in Jersey City, NJ. Image: The RBA Group

Permanent speed feedback sign in front of an elementary school in Delanco, NJ. Image: NJDOT

Pavement Marking/Stencil

Description: Pavement markings are another means to alert or inform a motorist of a condition or a potential situation. Painted lines and symbols need to be selected and placed in accordance with the Manual on Uniform Traffic Control Devices (MUTCD). Some examples include: The word "SLOW" can be painted on a travel lane to encourage motorists to drive slowly and painted white edgelines can be used to visually narrow streets. Crosswalks can be used to alert motorists of pedestrian activity. Bicycle lanes can be striped and on-street parking can be delineated. Pavement markings are also used in conjunction with signs and other measures.

Benefits: Low cost and easy to install. Can increase motorist awareness of pedestrians and bicyclists.
Drawbacks: Requires regular maintenance. Not visible with snow-covered roads.
Costs: Low

SLOW SCHOOL ZONE pavement marking in Ridgewood, NJ.
Image: The RBA Group

Textured and Colored Pavement

Description: Paving materials such as brick, cobbles, stamped concrete or concrete pavers can be used to delineate separate space for pedestrians or bicyclists. The variety of color and texture signal to drivers that they are traveling in a pedestrian-centric zone. Some projects include colored and textured pavement along the entire calmed roadway. However, limiting the special pavement to edges, such as on-street parking lanes or center line is preferred. Stamped concrete or concrete pavers are preferred to bricks or blocks for pedestrian zones or bicycle paths because they offer a smoother travel surface. Striping may still be necessary to maximize visibility for motorists in inclement weather or darkness.
Benefits: Textured pavements attract the driver's attention visually, audibly, and physically and are ideal for residential and neighborhood shopping areas. They are permanent and effective and can add to the aesthetic identity of a neighborhood.
Drawbacks: Some materials, particularly cobblestones, present a hazardous riding surface to bicyclists and may be uncomfortable for pedestrians, especially those in wheelchairs. Loose or uneven installations of paving stones pose a tripping hazard to pedestrians and should be regularly inspected, increasing maintenance costs over ordinary asphalt or concrete pavement.
Costs: Low to Moderate. Costs vary depending on materials used and size of paving area.

Textured crosswalk in Montclair, NJ.
Image: The RBA Group

Landscaping

Description: Landscaping defines pedestrian and vehicle areas, reduces the visual width of the roadway, and provides a more pleasant street environment for all. Landscaping can include trees, bushes and/or planters which can be planted in the buffer area between the sidewalk and the street. Landscaping is often used in conjunction with other traffic calming measures such as roadway narrowing, traffic islands, and sidewalk improvements.
Benefits: Landscaping increases motorists' awareness and can help define a neighborhood identity. Its installation is long term and increases the quality of life of a community.
Drawbacks: Depending on the design, the installation and maintenance costs can be high. Maintenance costs can be minimized by choosing appropriate plants and providing adequate space for them to grow.
Costs: Moderate to high - varies depending on scale and materials/ plantings

Landscaped buffer in Jersey City, NJ. Image: The RBA Group

Rumble Strips

Description: Rumble strips are raised buttons or grooves closely spaced on the roadway surface to create noise and vibration. They are typically installed to alert drivers of an upcoming curve or speed change. They are also commonly placed in the shoulders of freeways to alert drivers who might veer or drift off the road. They are also placed in the centerline area to alert drivers who may be drifting into oncoming traffic.
Benefits: Rumble strips are a permanent method to alert motorists they are entering an area with high pedestrian activity or other safety concerns. They do not require any additional right of way and their installation does not disrupt existing traffic patterns. They are inexpensive.
Drawbacks: Rumble strips are effective only through the noise and vibration they create. This same noise and vibration are their biggest detraction, particularly in residential areas. Drivers can more easily ignore rumble strips than other calming methods that vertically or horizontally deflect vehicles. Without adequate signage, rumble strips could startle motorists, potentially creating a hazardous condition. They also require increased maintenance; particularly during roadway re-paving.
Costs: $7 - $10/foot

Rumble strips in Newark, NJ. Image: The RBA Group

Signage

Description: Traffic signs can be used to alert or inform motorists of a condition or a potential situation. Signs need to be selected and placed in accordance with the Manual on Uniform Traffic Control Devices (MUTCD). Speed limit signs, pedestrian/bicycle/school crossing signs, and in-street pedestrian crossing signs have been used by municipalities to warn motorists of high pedestrian activity, and can help to reduce speeds. Signs are also used in conjunction with other measures such as pavement markings.
Benefits: Can be low cost. Increases awareness.
Drawbacks: Can clutter the roadway especially on residential streets. In-street signs may get hit or may need to be removed at night and placed back during the day. Overall effectiveness can vary.
Costs: Varies, depending on type and amount of signage.

In-Street Stop for Pedestrians Sign with SCHOOL plaque mounted above the sign in Glen Ridge, NJ.
Image: The RBA Group

Narrowed Lanes

Description: Studies have shown that wider travel lanes allow for faster vehicular travel speeds. Conversely, drivers naturally go more slowly when navigating narrow travel lanes, providing a more subtle calming effect than other physical calming methods. Visually narrowing travel lanes using paint while leaving a several foot shoulder that emergency vehicles or cyclists can utilize, effectively provides a narrow lane for motorists and a wider lane for emergency vehicles and law enforcement. Lanes can also be physically narrowed by providing on-street parking on one, or both, sides or by adding bollards, planters, or bike lanes. Narrowing traffic lanes makes slower speeds seem more natural to drivers and less of an artificial imposition, as opposed to other physical treatments that compel lower speeds or restrict route choice.

Benefits: Excess right-of-way can be shifted to providing wider sidewalks, bicycle lanes, or on-street parking. Simple roadway restriping to achieve roadway narrowing is inexpensive.
Drawbacks: Without other provisions for bicyclists, the narrower road may increase motor vehicle/bicycle conflicts.
Costs: Varies depending on method of narrowing the roadway.

Narrowing the travel lanes on River Road in Hudson County, NJ allowed room for bike lanes. Image: NJ.com

Hoboken's Traffic Calming Toolkit

In 2011, the City of Hoboken prepared a Traffic Calming Toolkit to provide residents and community leaders with information about the City's Traffic Calming Policy, to highlight common traffic calming measures, and to explain the protocol used in selecting the most appropriate measures for each application. For more on the City's Traffic Calming Program, visit www.hobokennj.org/departments/transportation-parking/traffic-calming-toolkit/.

Hoboken's Traffic Calming Decision Making Process

Step 1 — Department of Transportation and Parking reviews traffic calming requests and conducts data collection and evaluation.

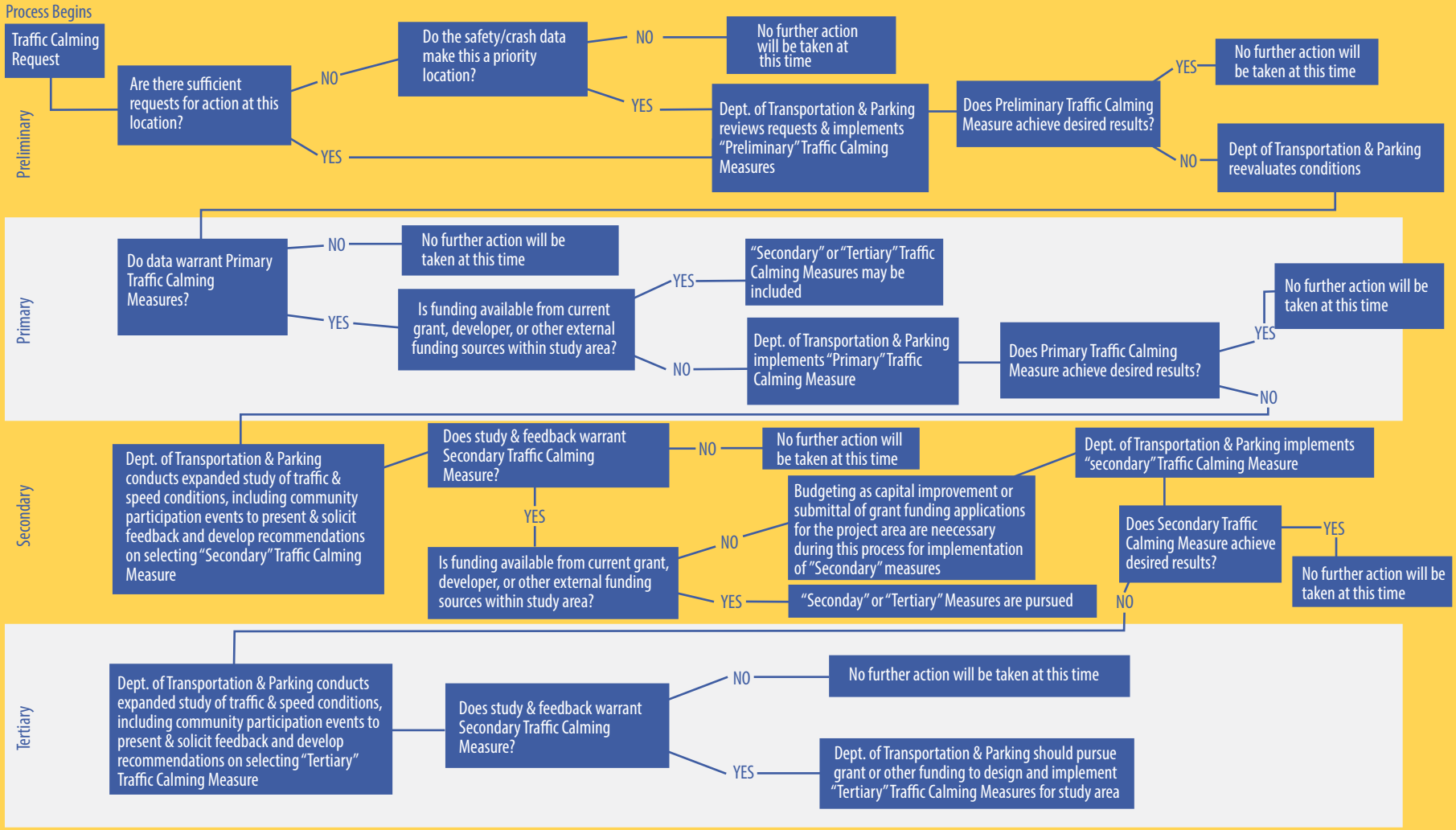
Step 2 — If poor conditions are found, the Department of Transportation and Parking will consider implementation of "**Preliminary**" *(enforcement operations, general education campaigns, repainting pavement markings, lane narrowing striping, signs)* or "**Primary**" *(changes to speed limits, informational signs, bike lanes)* Traffic Calming measures.

Step 3 — If after further evaluation poor conditions continue to persist, the Department of Transportation and Parking will conduct an expanded study of traffic and speed conditions, including community participation events, to present and solicit feedback and develop recommendations for "Secondary" *(changes to lane and/or parking configurations, speed humps, mini roundabouts)* Traffic Calming measures. Budgeting as capital improvement or submittal of grant funding applications for the project area is necessary during this process for implementation of "Secondary" measures.

Step 4 — If the above efforts do not result in desirable results, the Department of Transportation and Parking will pursue grants or other funding sources to design and implement "Tertiary" *(raised crosswalks, curb extensions, chicanes)* Traffic Calming measures for the project area.

The following flow chart below represents the steps in the City's traffic calming decision making process.

Hoboken's Traffic Calming Toolkit



Speed Humps

Description: Speed humps are rounded, raised areas across the roadway that cause vehicles to reduce speeds. They are usually found on neighborhood streets (low-volume), not on major roadways or primary emergency vehicle routes. Speed humps should terminate before the gutter pan, so as to not interfere with proper storm water drainage. They are sometimes broken up to allow a clear path for bicyclists, and include signage and paint markings so that they are visible.
Benefits: Speed reduction. Relatively low-cost. Easy to test.
Drawbacks: Increased roadway noise. Increased maintenance costs. Requires additional costs for signage. Extra care is required when snowplowing.
Costs: Varies depending on material ($1,000 - $12,000 each)

Speed hump in front of an elementary school in West Orange, NJ. Image: The RBA Group

Raised Crosswalks

Description: Raised crosswalks are elongated speed humps that feature a marked crosswalk at the same elevation as the adjacent sidewalks. Crosswalk markings or contrasting crosswalk materials (pictured) show this element is also a crosswalk. As both a marked crosswalk and a traffic calming element, raised crosswalks provide a superior safety advantage to pedestrians. They can be found at intersections or mid-block and should only be used in high pedestrian travel areas. They are most appropriate on streets with only moderate traffic (<10,000 trips/day). This type of facility is particularly effective where heavily used trails cross roadways.
Benefits: Speed reduction. Increase visibility of and for pedestrians.
Drawbacks: Noise. Maintenance. Need for signage
Costs: Moderate ($2,000 - $15,000 each)

Raised crosswalk at Somerville School in Ridgewood, NJ. Image: The RBA Group

Raised Intersections

Description: Raised intersections are raised areas of roadway, including crosswalks that are higher than the surrounding roadway approaches. Like speed humps, they deflect both the wheels and frame of traversing vehicles. The entire intersection is at sidewalk grade, putting pedestrians and vehicles on the same plane.
Benefits: Speed reduction. Improved safety. Reduction in cut-through traffic. The gentle ramps that lead to the intersection are designed to avoid damage to large vehicles and emergency response vehicles.
Drawbacks: Increased roadway noise. Higher maintenance costs. Required signage costs and aesthetics.
Costs: High ($50,000 - $200,000 each)

Raised intersection, Haddonfield, NJ. Image: VTC

Mini Roundabouts / Mini Traffic Circles

Description: Another variation used in residential traffic calming is the mini traffic circle, which is a raised circular islands constructed in the center of residential or minor street or intersections. These are generally not intended for use where one or both streets are arterial streets. Motorists must reduce speed to maneuver around the circle, which helps reduce the frequency and severity of crashes. Mini-circles are commonly landscaped, most often at locations where the neighborhood has agreed to maintain the plants. In locations where landscaping is not feasible, traffic circles can be enhanced through specific pavement materials. Mini-circles are an intersection improvement as well as a traffic-calming device and can take the place of stop or yield signs.
Benefits: Slows traffic. Reduces cut-through traffic. Can provide a gateway or identity to a neighborhood. Does not alter the path of pedestrians or bicyclists.
Drawbacks: In some cases, design techniques may be employed to mitigate impacts on emergency access, for example, by providing mountable curbs or aprons at the edges of traffic circles or medians. A single roundabout used in isolation will not significantly calm traffic. A coordinated system of multiple traffic circles or other calming measures is preferred.
Costs: $6,000 - $12,000 each

Mini traffic circle in Westfield, NJ. Image: The RBA Group

Chicanes

Description: A chicane is a set of two or more alternating curb extensions or islands that narrow and realign the roadway for short segments. Since the street is no longer straight, drivers must slow down to negotiate the roadway. Two-way traffic and full access for larger vehicles and emergency services can be maintained. A chicane effect can be created using various methods, including concrete curbs, landscaped areas or alternating diagonal and parallel parking.
Benefits: By creating a slalom effect, chicanes reduce vehicle speeds and discourage cut-through traffic. These methods can improve the appearance and function of the street.
Drawbacks: Concrete chicanes complicate street maintenance and storm water drainage. Must be able to maintain required clearances for emergency vehicle and bus access.
Costs: $10,000 - $30,000 (paint versus physical diverter)

Roadway with a chicane. Image: VTC

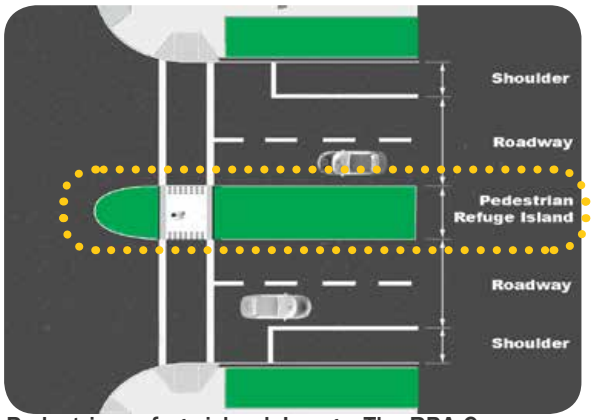
Curb Extensions / Bulb Outs

Description: Curb extensions or bulb outs narrow the roadway by extending the curb at key intersections and mid-block locations.
Benefits: Slows traffic. Reduces turning speeds. Increases pedestrian safety by reducing crossing distance and increasing pedestrian visibility. Can be lengthened to create landscaped areas or transit stops.
Drawbacks: Relatively high initial costs. Potential loss of on-street parking. Increased maintenance costs. Complicates plowing and street sweeping operations. Can hinder drainage.
Costs: $2,000 - $20,000 each, depending upon size and material

Curb extension in front of the middle school in Maplewood, NJ.
Image: The RBA Group

Pedestrian Refuge Islands

Description: Concrete or landscaped islands typically located down the center of a roadway or at a roadway entrance.
Benefits: Landscaped or concrete traffic islands and medians can reduce speeds by narrowing drivable travel lane widths. They can improve pedestrian accommodation by providing a mid-block pedestrian refuge at crossings. They complement improved crosswalks and reduce pedestrian crossing width. They can be used to provide a visual enhancement or gateway to promote neighborhood identity.
Drawbacks: Traffic islands and medians may reduce parking and driveway access, and the narrower road may also increase motor vehicle/bicycle conflicts.
Costs: Varies depending on length, materials and right-of-way availability ($4,000 - $30,000)



Pedestrian refuge island. Image: The RBA Group

Roadway Closures

Description: The most extreme form of traffic diversion, a permanent roadway closure interrupts the traffic grid pattern by creating dead-end or cul-de-sac street segments. A street closure is accomplished by installing a physical barrier that blocks a street to motor vehicle traffic and provides some means for vehicles to turn around. Full street closures should be used only in the rarest of circumstances. Neighborhoods with cul-de-sac streets require extensive out-of-the-way travel, which is not a mere convenience issue, but has serious implications for impacts on other streets. If a street closure is done, it should always allow for the free through movement of all pedestrians, including wheelchair users, and bicyclists. Local emergency services should be consulted when planning a roadway closure.
Benefits: This treatment works very well where all other calming attempts have failed.
Drawbacks: Street closures divert all through traffic onto other nearby roadways in the network.
Costs: High ($30,000 - $100,000), varies depending on materials, landscaping

This permanent roadway closure in Ocean City, NJ preserves bicycle and pedestrian access. Image: The RBA Group

Diverters

Description: Several types of diverters, such as semi-diverters and diagonal diverters, may be used to restrict traffic flow and discourage cut-through traffic. Diagonal diverters, also called turning movement diverters, can be installed at the intersection of a neighborhood street with a major street or collector to prevent cut–through traffic. They prevent straight–through movements and allow right turns only into and out of the neighborhood.
Benefits: Diverters reduce through traffic without preventing pedestrian access. They can also be designed to allow bicycle and emergency vehicle traffic.
Drawbacks: Do not work well on arterials, highways, other main roadways and transit routes.
Costs: $15,000 - $45,000, depending on the type of diverter and the need to accommodate drainage

This landscaped median along Haven Avenue in Ocean City, NJ allows right turns only for motor vehicles. Image: The RBA Group

Turn Restrictions

Description: This treatment uses signage to restrict certain turns at intersections to influence travel patterns. For example, a "No Left Turn" sign at an intersection is intended to prevent left turns. This measure is applicable on streets where cut-through traffic exists. This method can be tailored to be applicable during the most problematic times by defining a time period for the restriction.
Benefits: Low cost.
Drawbacks: This treatment does not work well for high-volume intersections with many turning movements, because it is difficult to enforce.
Costs: Low

Turning right on red is restricted during school hours at this intersection. Image: The RBA Group

Temporary Circulation Changes (Street Closures and One-Way Streets)

Description: Temporary street closures during student arrival and departure times can improve the efficiency and safety of the drop off and pick up of students at school. Temporary closures eliminate motor vehicles in areas congested with pedestrians, bicyclists, and perhaps buses. Another similar technique is to designate a street as one-way during arrival and departure time. Signs are essential for this method.
Benefits: Work well at densely developed neighborhood schools.
Drawbacks: This treatment may create traffic problems on other streets.
Costs: Low

Temporary roadway closure in front of the Bullock School in Montclair, NJ. Image: The RBA Group

Summary Matrix: Traffic Calming Measures for School Zones

This summary matrix lists the traffic calming measures described in this chapter and provides a brief description of each measure, the issue it is intended to address, what it is best used for and not intended to be used for, an idea of cost (where available), and other considerations regarding the measure.

Measure	Description	Issue	Best For	Not Used For	Costs	Considerations
Gateway	A signing and/or landscaping treatment to alert motorists they are entering a special area. Gateways are typically supplemented with other traffic calming measures.	Speed Reduction	Entrances to school zones, neighborhoods, commercial areas, town centers, or busy places of activity.	Isolated higher-volume arterials and highways	Varies	Generally expensive and can require routine maintenance.
Stationary Radar Sign / Speed Display Board / Speed Feedback Sign	Radar signs are interactive signs that draw motorists' attention to their speed and the road's legal speed limit. They work by informing motorists when they're exceeding the speed limit. They can be used in residential areas, school zones, construction zones, or other safety zones. Radar signs can be permanently mounted on signposts or temporary installations using self-contained trailers.	Speed Reduction	High volume and high speed arterials and highways; Residential areas, school zones, construction zones, or other safety zones	Streets where speeding is not a concern	$5,000 - $15,000 each	Radar signs do not slow traffic as much as physical measures. Motorists' compliance is voluntary. Enforcement is still necessary.
Pavement Marking/ Stencil	Painted lines and symbols need to be selected and placed in accordance with the Manual on Uniform Traffic Control Devices (MUTCD). Some examples include: The word "SLOW" can be painted on a travel lane to encourage motorists to drive slowly and painted white edgelines can be used to visually narrow streets. Crosswalks can be used to alert motorists of pedestrian activity.	Speed Reduction	Roadways with wide rights-of-way that would benefit from slower speeds and improved pedestrian safety	Isolated higher-volume arterials and highways	Low	Pavement markings are typically used in conjunction with signs and other measures. Require regular maintenance and may not be consider visually aesthetic. Not visible with snow-covered roads.
Textured and Colored Pavement	Paving materials such as brick, cobbles, or concrete pavers can be used to identify a traffic-calmed area. The variety of color and texture signal to drivers that they are traveling in a pedestrian-centric zone. Bricks or blocks are sometimes also used to provide the same traffic calming benefits as rumble strips, delineating crosswalks and pedestrian zones.	Speed Reduction	Residential and neighborhood shopping areas	Isolated higher-volume arterials and highways	Moderate to High. Costs vary depending on materials used and size of paving area.	Some materials, particularly cobblestones, present a hazardous riding surface to bicyclists. Loose or uneven installations of paving stones pose a tripping hazard to pedestrians and should be regularly inspected, increasing maintenance costs over ordinary asphalt or concrete pavement.

Measure	Description	Issue	Best For	Not Used For	Costs	Considerations
Landscaping	Landscaping defines pedestrian and vehicle areas, reduces the visual width of the roadway, and provides a more pleasant street environment for all. Landscaping can include trees, bushes and/or planters which can be planted in the buffer area between the sidewalk and the street. Landscaping is often used in conjunction with other traffic calming measures.	Pedestrian Safety Speed Reduction	Residential and neighborhood shopping areas	Isolated higher-volume arterials and highways	Moderate to high - varies depending on scale and materials/ plantings	Depending on the design, the installation and maintenance costs can be high. Right-of-way impacts may be significant as well.
Rumble Strip	Rumble strips are raised buttons or grooves closely spaced on roadway surface to create noise and vibration. They are typically installed to alert drivers of an upcoming curve or speed change. They are also commonly placed in shoulders of freeway to alert drivers who veer off the road.	Speed Reduction	Isolated higher-volume arterials and highways; Areas with high pedestrian activity and safety concerns	Residential areas; Bicycle paths / lanes	$7 - $10/ foot	Rumble strips are effective only through the noise and vibration they create. This same noise and vibration are their biggest detraction, particularly in residential areas. Drivers can more easily ignore rumble strips than other calming methods that vertically or horizontally deflect vehicles. Without adequate signage, rumble strips could startle motorists, potentially creating a hazardous condition. They also require increased maintenance; particularly during roadway re-paving.
Signage	Traffic signs can be used to alert or inform motorists of a condition or a potential situation. Signs need to be selected and placed in accordance with the Manual on Uniform Traffic Control Devices (MUTCD). Speed limit signs, pedestrian/bicycle/school crossing signs, and in-street pedestrian crossing signs have been used by municipalities to warn motorists of high pedestrian activity, and can help to reduce speeds.	Speed Reduction	All types of roadways (in moderation)	–	Varies, depending on type and amount of signage	Signs are also used in conjunction with other measures such as pavement markings. Can be considered to clutter the roadway especially on a residential street. In-street signs may get hit or may need to be removed at night and placed back during the day. Overall effectiveness can vary.
Narrowed Lane	Studies have shown that wider travel lanes allow for faster vehicular travel speeds. Conversely, drivers naturally go more slowly when navigating narrow travel lanes, providing a more subtle calming effect than other physical calming methods.	Speed Reduction	All types of roadways	–	Varies depending on method of narrowing the roadway. Low if striping only.	Excess right-of-way can be shifted to providing wider sidewalks, bicycle lanes, or on-street parking. Simple roadway restriping to achieve roadway narrowing is inexpensive.

Measure	Description	Issue	Best For	Not Used For	Costs	Considerations
Speed Hump	Speed humps are rounded raised areas across the roadway that causes vehicles to reduce speeds.	Speed Reduction	Neighborhood streets	Arterials, highways, other main roadways	$1,000 - $12,000 each	Can interfere with transit, snow plow, and emergency vehicle operations. Speed humps increase roadway noise and wear on vehicle suspensions. Highly visible warning signage required.
Raised Crosswalk	Raised crosswalks are elongated speed humps that feature a marked crosswalk at the same elevation as the adjacent sidewalks. Crosswalk markings or contrasting crosswalk materials (pictured) show this element is also a crosswalk.	Pedestrian Safety; Speed Reduction	Areas where pedestrian traffic takes priority over vehicular traffic	Arterials, highways, other main roadways	$2,000 - $15,000 each	As both a marked crosswalk and a traffic calming element, raised crosswalks provide a superior safety advantage to pedestrians.
Raised Intersection	Similar to raised crosswalks, except the entire intersection is at sidewalk grade	Pedestrian Safety; Speed Reduction	Areas with heavy pedestrian traffic, such as shopping areas and college campuses.	Arterials, highways, other main roadways	$50,000 - $200,000 each	Raised intersections provide a barrier-free crossing for pedestrians and slow all vehicles, including emergency vehicles and transit buses.
Mini Roundabout	Motorists must reduce speed to maneuver around the circle, which helps reduce speeds and the frequency of crashes.	Speed Reduction	Neighborhood streets that have a history of high speeds and high crash rates at intersections	Intersections with dis-proportionate volume on approaches	$6,000 - $12,000 each	Can provide a gateway or neighborhood identity.
Chicane	Sets of two or more alternating curb bulb outs or extensions that narrow and realign the roadway	Speed Reduction and Cut-Through Traffic	Neighborhood streets that experience high speeds or heavy cut-through traffic volume	Arterials, highways, other main roadways	$10,000 - $30,000	Concrete chicanes complicate street maintenance and drainage and may require additional right-of-way to construct. Chicanes created through pavement striping are cost-effective and easy to implement. On-street parking can be alternated from side-to-side along the street.
Bulb Out/Curb Extension	Briefly narrow the roadway by extending the curb at intersections or mid-block locations	Pedestrian Safety; Speed Reduction	Areas with pedestrian traffic and wider roadway cross sections; Village environments	Arterials; Narrow streets	$2,000 - $20,000 each, depending upon size and material	May require eliminating some on-street parking and may hinder street plowing and sweeping operations.

Measure	Description	Issue	Best For	Not Used For	Costs	Considerations
Pedestrian Refuge Island	Concrete or landscaped islands and medians slow travel speeds by narrowing lanes and also improve pedestrian accommodation by providing a pedestrian refuge at crossings.	Pedestrian Safety; Speed Reduction	Roadways with wide rights-of-way that would benefit from slower speeds and improved pedestrian safety	Already narrow roads, or roadways with frequent driveways	Varies depending on length, materials, and right-of-way availability	Islands and medians can provide a visual enhancement or gateway to promote neighborhood identity. They may reduce parking and driveway access and may increase motor vehicle conflicts with bicycles.
Roadway Closure	The most extreme form of traffic diversion, roadway closures interrupt the traffic grid pattern by creating dead-end or cul-de-sac street segments.	Cut-Through Traffic	Neighborhood streets where all other calming attempts have failed	Arterials, highways, other main roadways, transit routes, and anywhere street continuity is desired	Low, varies depending on materials, and land-scaping	Street closures divert all through traffic onto other nearby roadways in the network.
Diverter	Several types of diverters, such as semi-diverters and diagonal diverters, may be used to restrict traffic flow and discourage cut-through traffic.	Cut-Through Traffic	Neighborhood streets that experience high cut-through traffic volume	Arterials, highways, other main roadways and transit routes	$15,000 - $45,000	Diverters reduce through traffic without preventing pedestrian access. They can also be designed to allow bicycle traffic.
Turn Restriction	Restricting certain turns at intersections to influence travel patterns.	Cut-Through Traffic	Low-volume turning movement	High-volume intersections and turning movements	Low	Can be difficult to enforce.
Temporary Circulation Changes	Temporary street closures during student arrival and departure times can improve the efficiency and safety of the drop off and pick up of students at school. Temporary street closures eliminate motor vehicles in areas congested with pedestrians, bicyclists, and perhaps buses.	Cut-Through Traffic; Congestion during school arrival/ dismissal	Low volume neighborhoods with comprehensive grid network; High cut-through neighborhoods	Isolated higher-volume arterials; Transit routes or major emergency response routes	Low	Circulation changes will have secondary impacts on adjacent roadways that must be considered.

Chapter 8: Students and Bicycling

Bicyclists have unique characteristics. They operate as vehicles yet are as vulnerable as pedestrians when involved in crashes. Student bicyclists have varied levels of ability, depending on age and skill level. Some will feel comfortable riding in the street, while others prefer riding on sidewalks or paths. Bicycling can help students who live too far from school to walk comfortably to participate in active transportation.

The *Safe Routes to School Guide* maintained by the National Center for Safe Routes to School at saferoutesinfo.org recommends that schools encourage more bicycling by teaching bicycle safety, offering bicycle repair classes, and providing adequate bicycle parking facilities that shield bikes from inclement weather and discourage theft. This chapter discusses some ways that bicycling to school can be encouraged and made safer including providing:

- bicycling accommodations to and from school,
- bicycle storage at school,
- bicycle safety education, and
- programs and special events to encourage biking to school.

Bicycle Accommodations

Children often have minimal riding skills, little experience and limited physical capabilities. Children also often have an inappropriately high level of confidence, or at least fearlessness, in their riding skill and lack judgment regarding safe bicycling practices. To support bicycle use rather than auto travel for short local trips by students and others, enhanced bicycle accommodations must be provided. On-street facilities, such as bicycle lanes, are more appropriate for upper elementary school and older children who have sufficient bike-handling skills and knowledge of bicycle and traffic safety rules. Off-street or separated facilities such as trails and cycle tracks are more appropriate for younger elementary school children.

The benefits, drawbacks and typical use of the following bicycle accommodations are discussed in this section:

- On-Street Facilities
- Cycle Tracks
- Off-Street Facilities
- Intersection Treatments
- Signing and Striping
- Bicycle Boulevards

Design Guidelines

The American Association of State Highway and Transportation Officials (AASHTO) *Guide for the Development of Bicycle Facilities,* the Manual on Uniform Traffic Control Devices (MUTCD), the NJDOT *Pedestrian and Bicycle Compatible Design Guidelines,* the Federal Highway Administration (FHWA) *Designing Sidewalks and Trails for Access, Best Practices Design Guide,* and the National Association of City Transportation Officials (NACTO) *Urban Bikeway Design Guide* should be followed during planning, design, and construction projects to ensure that appropriate bicycle facilities are provided.

Conventional Bicycle Lane

Description: A portion of the roadway that has been designated by striping, signage, and pavement markings for the preferential or exclusive use of bicyclists. Most common bicycle facility in use in the United States.

Benefits: Enables bicyclists to ride at their preferred speed without interference from motor vehicle traffic conditions; facilitates predictable behavior and movements between bicyclists and motorists; visually reminds motorists of bicyclists' right to the street.

Drawbacks: Not all users will be comfortable in a bike lane; when next to on-street parking there is a risk of bicyclists getting 'doored'; greater enforcement is required to prevent motorists from parking in the bike lane.

When to Use/Typical Application: Bike lanes are most helpful on streets with ≥ 3,000 motor vehicle average daily traffic, a posted speed ≥ 25 mph, or high transit vehicle volume; they should typically be provided on both sides of two-way streets to prevent wrong-way riding; the preferred width for young cyclists is 5 feet.

A bike lane along Route 45 in Woodbury, NJ.
Image: NJDOT

Buffered Bicycle Lane

Description: A buffered bicycle lane is a conventional bike lane paired with a designated buffer space separating the bike lane from the adjacent motor vehicle travel lane and/or parking lane.

Benefits: Provides greater shy distance between motor vehicles and bicyclists; provides space for bicyclists to pass another bicyclist without encroaching into the adjacent motor vehicle travel lane; encourages bicyclists to ride outside of the door zone when buffer is between parked cars and bike lane; appeals to a wider cross-section of bicycle users.

Drawbacks: Reduces the natural "sweeping" effect of passing motor vehicles, potentially requiring more maintenance.

When to Use/Typical Application: Buffered bike lanes should be considered on streets with high traffic volume, regular truck traffic, high parking turnover and a speed limit > 35 mph.

A buffered bike lane in Philadelphia, PA.
Image: The RBA Group

Contraflow Bicycle Lane

Description: A contraflow bicycle lane is a bike lane designed to allow bicyclists to ride in the opposite direction of motor vehicle traffic. It converts a one-way traffic street into a two-way street: one direction for motor vehicles and bikes and the other for bikes only. A contraflow lane is separated from opposing traffic with yellow center-line striping.

Benefits: Decreases trip distance, the number of intersections encountered, and travel times for bicyclists by eliminating out-of-direction travel; limits dangerous wrong-way riding by allowing cyclists to safely ride in the opposite direction of cars; reduces sidewalk riding.

Drawbacks: May introduce additional conflict points as motorists may not expect on-coming bicyclists.

When to Use/Typical Application: Where it would provide substantial savings in out-of-direction travel and/or direct access to high-use destinations; where there will be fewer conflicts when compared to a route on other streets; when there are few intersecting driveways, alleys, or streets on the side of the street with the contra-flow lane; where bicyclists can effectively and conveniently make transitions at the termini of the lane.

A contra-flow bicycle lane in Chicago, IL.
Image: NACTO

Advisory Bicycle Lane

Description: An advisory bike lane is similar to a conventional bike lane, but is used on low-volume streets that are narrow. An advisory bike lane is marked with a solid white line on the right (next to parked cars) and a dotted line to the left. These markings give bicyclists a space to ride, but are also available to motorists if space is needed to pass oncoming traffic. These are also known as "suggestion lanes."

Benefits: Provides bicyclists a designated place to ride while also allowing motorists to use the space to pass oncoming traffic; reminds people that the road is a shared space; directs bicyclists where and how to ride; reduces motorist encroaching on bicyclists.
Drawbacks: Unfamiliarity with the treatment can lead to confusion.
When to Use/Typical Application: Roads that are too narrow for conventional bike lanes; roadways with low traffic volume; only used on roads without marked centerlines; used in both rural and urban areas.

Advisory bicycle lanes in Minneapolis, MN. Image: BikeWalkTwinCities.org

Cycle Track

Description: A cycle track is a separated bicycle facility that runs alongside a roadway. Unlike bike lanes, cycle tracks are typically separated from automobile traffic by a physical barrier, such as parked cars, bollards, a landscaped buffer, or a curb. Raised cycle tracks are bicycle facilities that are vertically separated from motor vehicle traffic. Cycle tracks may be one-way running with traffic, one-way running against traffic, two-way on the same side of the road, or two-way on both sides of the road. Though much more prevalent in European countries, several US cities have recently incorporated cycle tracks as a component of their bicycle facilities. Cambridge, Massachusetts, New York City, Portland, Oregon, and Washington, DC, have all constructed cycle tracks.
Benefits: More attractive for bicyclists of all levels and ages; dedicates and protects space for bicyclists; eliminates risk and fear of collisions with over-taking vehicles; reduces risk of 'dooring' compared to a bike lane; prevents double parking; keeps motorists from easily entering the cycle track.
Drawbacks: Snow removal and street sweeping may require special equipment; requires considerations at crossings of driveways and intersections.
When to Use/Typical Application: Cycle tracks may be appropriate along roads that have high vehicle speeds and high traffic volume, but few intersections, driveways, and other junctions; along streets with high bicycle volumes; the desirable one-way cycle track width is 5 feet and a two-way cycle track width is 12 feet. Minimum width for a two-way cycle track in constrained locations is 8 feet.

Two-way cycle track buffered by on-street parking. Image: NYC.gov

A raised cycle track in Ocean City, NJ. Image: The RBA Group

Off-Street Bicycle Facilities

Shared Use Path or Multi-Use Path

Description: A shared use path is physically separated from motorized vehicular traffic by an open space or barrier and either within the highway right-of-way or an independent right-of-way. Shared use path facilities accommodate a variety of non-motorized users, most often bicycle and pedestrian traffic. Shared use paths are an addition, and complementary, to the roadway network.
Benefits: Completely separated from motor vehicle traffic; can provide users with shortcuts; can provide an enjoyable recreational opportunity; have few intersections and as a result is safer for bicyclists than facilities located alongside or on roadways; appeals to users of all ages and abilities.
Drawbacks: Rarely the most direct means of transportation; shared use paths attract a variety of user groups who often have conflicting needs.
When to Use/Typical Application: 10 feet is the recommended minimum width for a two-way, shared use path on a separate right-of-way; 2 feet of graded area should be maintained adjacent to both sides of the path and 3 feet of clear distance should be maintained between the edge of the trail and lateral obstructions; shared use paths fall under the accessibility requirements of the Americans with Disabilities Act (ADA).

The Henry Hudson Trail in Monmouth County, NJ is an example of a shared use path. Image: The RBA Group

Sidepath

Description: A sidepath is a specific type of shared use path that runs adjacent to the roadway.
Benefits: Provides an element of separation from motor vehicles; appeals to a wide variety of users.
Drawbacks: A two-way sidepath on one side of the road may need additional road crossings; bicyclists using the roadway may be harassed by motorists who believe bicyclists should be on the sidepath; there are potential conflicts with motorists at driveways and intersections.
When to Use/Typical Application: Where right-of-way or other physical constraints prohibit path alignment in independent rights-of-way and there are no practical alternatives for improving the roadway or accommodating bicyclists on nearby parallel streets; when the sidepath can be built with few street and/or driveway crossings; when the adjacent roadway has relatively high-volume and high-speed traffic; the minimum recommended distance between a path and the roadway curb is 5 feet. When the separation is less than 5 feet, a physical barrier or railing should be provided; utilizing or providing a sidewalk as a shared use path is undesirable.

Example of a sidepath. Image: VTC

Intersection Treatments

Grade Separated Crossing

Description: A grade separated crossing provides continuity of a bicycle/ pedestrian facility over or under a barrier. There are two main types of grade-separated crossings: overpasses (bridges) and underpasses.
Benefits: A grade-separated crossing is a safe way for bicyclists and pedestrians to cross rivers, streets, and railroads.
Drawbacks: Many bicyclists and pedestrians will not use an overpass that is inconvenient. Instead, they may choose a time-saving, and sometimes more hazardous crossing. Fencing or other controls may be required to reinforce the safe crossing point.
When to Use/Typical Application: A grade separated crossing should be considered when a bicycle facility meets a barrier, such as an active railroad, stream, or freeway, and continuity of the route is desired. When a heavily utilized multi-use pathway intersects with a high volume multi-lane roadway, it is desirable to provide an overpass or an underpass to separate multi-use pathway users from conflicts with motor vehicle traffic.

A pedestrian bridge provides access from Immaculata High School in Somerville, NJ to the Bridgewater Commons Mall over Route 202/206. Images: Arterial

Crossbike

Description: A crossbike intersection treatment is a set of pavement markings adjacent to the crosswalk indicating space for bicycles to cross major intersections. They increase the visibility of bicycles at intersections and encourage motorists to yield right-of-way to bicyclists waiting to cross.
Benefits: Provides greater visibility for bicyclists at intersections; informs all roadway users of where bicyclists should cross; separates modes to reduce conflicts.
Drawbacks: Crossbike markings will have higher than normal wear based on the level of crossing auto traffic.
When to Use/Typical Application: Where main bicycle routes cross relatively minor collectors; where cross traffic has to yield right-of-way to crossing bicyclists; not appropriate where speeds exceed 30 mph unless signalized.

A crossbike in Berkeley, CA. Image: IBPI, Alta Planning

Shared Lane Marking or Sharrow

Description: A shared lane marking or "sharrow" is a road marking used to indicate a shared lane environment for bicycles and automobiles. It is not a facility type but is used to support a complete bicycle network. Shared lane markings are most appropriate for lower volume, lower speed streets.

Benefits: Reinforces the legitimacy of bicycle traffic on the street; assists bicyclists with lateral positioning away from the door zone and other hazards; may be configured to offer directional and wayfinding guidance; requires no additional street space; reduces the incidence of sidewalk riding and wrong-way riding.

Drawbacks: Does not dedicate exclusive use for bicyclists.

When to Use/Typical Application: When there is insufficient width to provide bike lanes; on a steep downgrade; shared lane markings are not a preferred treatment on streets with posted 35 mph speeds or faster and motor vehicle volumes higher than 3,000 AADT; sharrows shall not be used on shoulders or in designated bicycle lanes; they should be placed immediately after an intersection and spaced at intervals not greater than 250 feet thereafter.

Sharrows on a residential street in Maplewood, NJ. Image: Google Streetview

A student riding a bicycle over a sharrow in Maplewood, NJ. Image: The RBA Group

Wayfinding Signs and Markings

Description: A bicycle wayfinding system consists of comprehensive signing and/or pavement markings to: designate a system of routes; designate a continuous or preferred route; provide location specific guidance.

Benefits: Indicates to bicyclists and motorists that they are on a designated bikeway; identifies the best routes to destinations; pavement markings can be installed to help reinforce routes and directional signage and to provide bicyclist positioning and route branding benefits; under urban conditions, pavement markings may often be more visible than signs to users of the route.

Drawbacks: When used alone, bike route signs convey little meaning. They should include destinations and distances.

When to Use/Typical Application: Signs are typically placed at decision points along bike routes – typically at the intersection of two or more bikeways and at other key locations leading to and along bicycle routes; signs should be oriented so bicyclists have sufficient time to comprehend the sign and change their course, when needed.

Bike route signs in Philadelphia show distance to destination. Image: Bicycle Coalition of Greater Philadelphia

Bike Dots are pavement markings for signed bicycle routes. They are a tool to provide wayfinding. Image: TucsonVelo.com

BICYCLES MAY USE FULL LANE Sign (R4-11)

Description: The BICYCLES MAY USE FULL LANE sign may be used in locations where it is important to inform road users that bicyclists might occupy the travel lane.
Benefits: Reinforces the law to both motorists and bicyclists that bicyclists may occupy the travel lane.
Drawbacks: Fear that the sign could mislead inexperienced bicyclists into operating in situations that are beyond their ability.
When to Use/Typical Application: The BICYCLES MAY USE FULL LANE sign may be used on roadways where no bicycle lanes or adjacent shoulders usable by bicyclists are present and where travel lanes are too narrow for bicyclists and motor vehicles to operate side by side; the sign may be used in addition to or instead of the Shared Lane Marking.

R4-11

SHARE THE ROAD Sign (W11-1 & W16-1P)

Description: A SHARE THE ROAD sign assembly is intended to alert motorists that bicyclists may be encountered and that they should be mindful and respectful of bicyclists.
Benefits: Fast, inexpensive and effective way of educating bicyclists and motorists, leading ultimately to greater safety for all.
Drawbacks: The sign is not a substitute for design measures that can improve the quality of service for bicyclists; the sign says nothing about where on the road bicyclists are expected to ride.
When to Use/Typical Application: At the end of a bike lane, or where a shared use path ends; in work zones where bicyclists may need to share a narrower space than usual; the sign should not be used to address reported traffic operational issues, as the addition of this warning sign will not significantly improve bicycling conditions; the sign should not be used to indicate a bike route.


W11-1

W16-1P

WRONG WAY RIDING Sign (R5-1B)

Description: The bicycle WRONG WAY and RIDE WITH TRAFFIC signs are used to remind bicyclists that bicycles are vehicles and when operated on a roadway they should travel in the same direction as other roadway traffic.
Benefits: Reinforces the legal requirement of bicyclists to ride with traffic.
Drawbacks: Can contribute to sign clutter if not mounted back-to-back with other signs.
When to Use/Typical Application: For locations where wrong-way riding by bicyclists is frequently observed; this sign and plaque may be mounted back-to-back with other signs to minimize visibility to other traffic; The RIDE WITH TRAFFIC plaque should be used only in conjunction with the Bicycle WRONG WAY sign, and should be mounted directly below the Bicycle WRONG WAY sign.

R5-1b

R9-3cP

Bicycle Boulevard

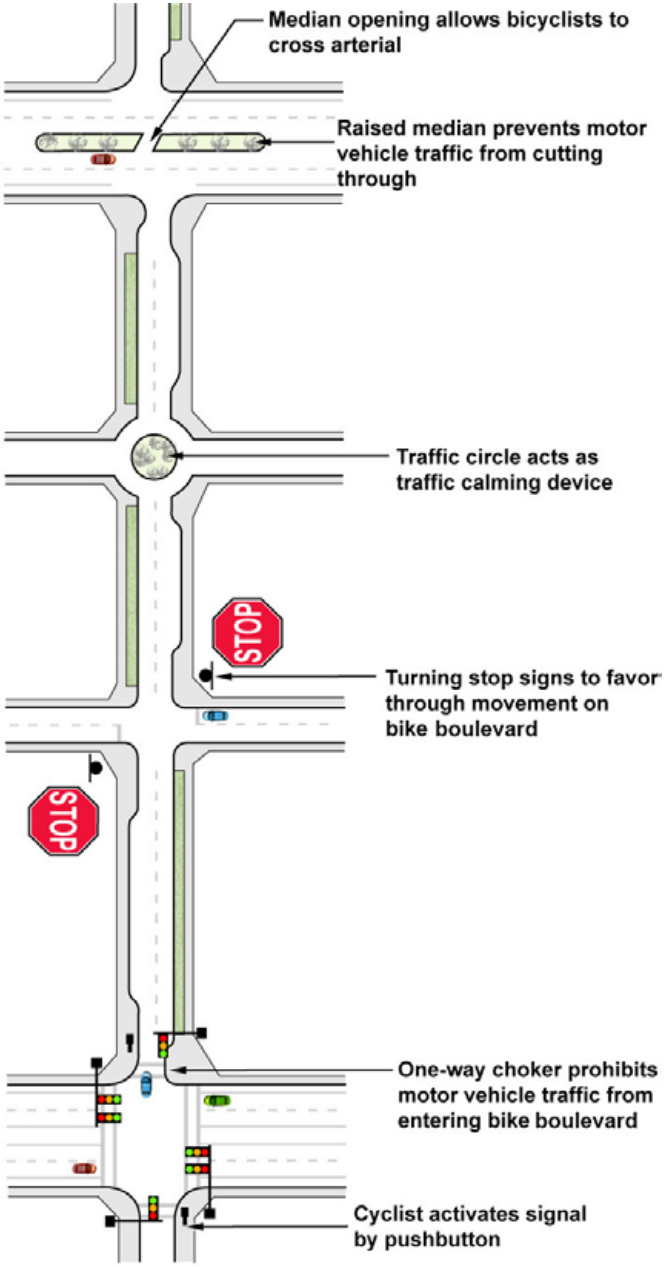
Description: A bicycle boulevard is a low-volume and low-speed street that has been optimized for bicycle travel through treatments such as traffic calming, signage and pavement markings, and intersection crossing treatments. These treatments allow through movements for cyclists while discouraging similar through trips by non-local motorized traffic. Motor vehicle access to properties along the route is maintained.

Benefits: Bicycle boulevards are effective at increasing cycling levels and perceptions of safety and can be accomplished with minor changes to street configuration; slower vehicle speeds accomplished with traffic-calming measures reduce risk of serious collisions; since they are shared facilities, no additional street width is needed; bicycle boulevards can be combined with neighborhood greening efforts to enhance street closures and traffic circles with trees and landscaping.

Drawbacks: Residents and officials often raise concerns related to traffic reduction and calming such as access to property, impact on traffic patterns, enforcement issues with motorcycles and mopeds, and emergency response.

When to Use/Typical Application: Bicycle boulevards are best suited for two-lane residential streets where vehicle traffic can be restricted to low volumes and slow speeds. Ideally they are parallel to major streets and provide an alternative without lengthy deviation.

Elements of a Bicycle Boulevard



Graphic: The RBA Group

Examples of Bicycle Boulevards

Example of a raised median along a bike boulevard. Image: NACTO

Mini traffic circles may be used to lower motor vehicle speeds near intersections with bike boulevards. Image: NACTO

The signal at this crossing is actuated from an in-pavement loop detector. Image: NACTO

Bicycle Storage at Schools

Students must have a secure place to park their bikes once they reach school. Not having a well-planned bicycle parking option can lead to several undesirable outcomes such as theft, damage, and locked bikes becoming an obstacle to critical safety infrastructure (like emergency exits, hand rails, and fire hydrants) or damaging fragile trees or landscaping. In terms of bike racks and bicycle storage, the *Safe Routes to School Guide* maintained by the National Center for Safe Routes to School at saferoutesinfo.org uses the *Bicycle Parking Guidelines* from the Association of Pedestrian and Bicycling Professionals (APBP):

- **The Rack Element** is the part of the bike rack that supports one bicycle. A good bike rack element holds the bike frame without bending the wheel and should have no moving parts. Rack elements are typically constructed of metal in an inverted u-shape, which allows for a variety of bicycle sizes and locks.
- **The Rack** is one or more rack elements joined on any common base or arranged in a regular array and fastened to a common mounting surface. It should be anchored so that it cannot be stolen with the bikes attached and so that it provides easy, independent bike access. Inverted u-shaped rack elements mounted in a row should be placed on 30-foot centers, allowing two bicycles to be secured to each rack element (one per side).
- **The Rack Area** is a bicycle parking lot where racks are separated by aisles. It may contain one or more racks. If possible, the rack area should be protected from the elements using any combination of structures, like a wall and awning. Avoid locating a bike rack area on grass or dirt as a rainy day can turn the bicycle parking lot into a mess. A preferred solution would be to locate the bike rack area on a concrete pad.
- **The Rack Area Site** is the relationship of the rack area to a building entrance and approach. Locate the bike rack area within visibility of the building entrance it serves and consider the route bicyclists' use to approach that entrance. Bike rack areas should be sited in a space that discourages vandalism and maximizes use, while avoiding conflicts with driveways, buses, and large numbers of pedestrians.

Ideally, rack areas should be sited as close, or closer, than the nearest car parking space and provided near all high traffic building entrances. It is preferable to choose multiple locations that are more convenient to users than one large rack area.

Bicycle parking at Somerville School in Ridgewood, NJ is located on a concrete pad which is visible from within the building. Image: The RBA Group

Covered bicycle parking at Egg Harbor's Spragg Elementary School. Image: NJDOT

The ribbon rack on the left is preferred because unlike the comb rack on the right, it allows both the frame and wheels of the bike to be locked. Image: The RBA Group

Bicycle Safety Education

A comprehensive, on-bike program can be an ideal method for teaching bicycle skills and safety, but finding time to conduct the program can be a challenge. With the busy schedules of today's families, holding classes after school and on the weekends may not lead to high levels of participation. To reach the greatest amount of children, bicycle education can be incorporated into the regular school day. Fitting bicycle education within the curriculum of physical education (PE) classes is a cost-efficient way to teach bike safety to a large cross section of area youth. The following are examples of on-going programs:

- At Seaview Elementary School in Linwood (Atlantic County), class time is devoted to bicycle education each year. During school hours, a teacher runs the annual 4th Grade Bicycle Rodeo. During the rodeo, children receive detailed instruction on how to ride their bikes properly and then take a bicycle safety test.
- Class time is also devoted to bicycle education in Medford Lakes (Burlington County) where pupils receive instruction as part of the school's physical education program.
- In Wharton (Morris County), bicycling to school is encouraged through annual bike rodeos. The rodeos offer bicycle inspections and helmet giveaways to children that do not have access to a proper bike helmet.
- A police-sponsored bike rodeo is also an important part of the bicycle program in Fair Haven (Monmouth County). School staff regularly remind children about bike safety during their lunch periods. In addition, Fair Haven police hand out "tickets for good behavior." Under this program, when an officer spots a child who is bicycling correctly, the rider is issued a prize.

Spotlight: NJ BIKESChOOL Program

NJBIKESChOOL is an on-bike, on-road bicycle safety program aimed at youth in grades 4-6 to create knowledgeable cyclists who confidently ride to school and elsewhere. In the summer of 2009, staff at the NJ SRTS Resource Center held NJ BIKESChOOL classes through the Camden Summer Recreation Program. The program was funded by FHWA through the NJDOT and the Division of Highway Traffic Safety. As part of the program, 25 youth bicycles were acquired and transported to summer camps for on-bike skills drills and a short ride through the neighborhoods. Through the help of partners such as the NJ Alliance for Health, Physical Education, Recreation, and Dance (NJAHPERD), the NJ BIKESChOOL program was also taught in Hanover and Pemberton and during PE classes in Ocean and Hudson Counties.

NJBIKESChOOL in Camden, NJ. Image: VTC

The program is currently being managed by Hudson TMA. This program can become part of a school's physical education program at no cost to the school district. Staff from the Hudson TMA will train physical education teachers and provide the curriculum. A fleet of bikes will also be loaned to the school for a period of three weeks for the children to use as part of their gym class. Many school districts in Hudson County have been participating in the NJ BIKESChOOL program and reports indicate that the children love it. To learn more about this program or request that it be presented at your school, contact Hudson TMA at (201) 792-2825 or info@hudsontma.org

Bike-to-School Programs and Special Events

There are several activities or events that could be held to focus attention on biking to school:

- Participate in National Bike to School Day in May in coordination with the League of American Bicyclists' National Bike Month.
- Make Earth Day a "Bike-to-School Day"; this could also be used to help encourage walking to school. After Earth Day, each Wednesday for the rest of the school year celebrate walk- or bike-to-school Wednesday. In Linwood, for example, school officials take part by meeting children at a local park one half hour before classes begin and walking with them to school.

The "zap" machine tracks participants as they arrive at Montclair's Edgemont School as part of the Boltage Program. Image: Joy Glenn Photography

- At Montclair's Edgemont Elementary School, the "Boltage at Edgemont" Program was introduced in 2011 to encourage more biking and walking to school. Each participant receives a Boltage radio frequency identification (RFID) tag to attach to her or her backpack, which parents register online at Boltage.org. Each time the student bikes or walks to school and passes by the solar-powered Boltage machine located near the entrance to the school, it flashes a green light and beeps signifying that the student tag has been "zapped" or recorded. Parents and students can then log into individual accounts to see how many trips have been logged and track progress. Students are able to track their number of trips, miles traveled, number of calories burned and pounds of CO2 saved by replacing a car or bus trip with walking or biking. Edgemont further publishes overall school progress in the PTA newsletter to parents and recognizes exceptional student achievement. While this is a not a mandatory program, all students have been encouraged to register – even if they typically take cars and buses to school. Each student who registers receives a wrist-band and as they clock more trips, they are eligible for further prizes.
- Another example of a special event is "Transition Day" in Fair Haven. On the last day of classes, school officials and graduating 3rd graders, take a ceremonial ride from Viola L. Sickles Elementary School to the Knollwood Middle School to mark the transition to 4th grade. Parents, police, and the school superintendent all take part in this annual event. Along the route, parents hold up signs to celebrate their child's completion of the 3rd grade and at Knollwood School 4th graders welcome the arriving group.

Students bicycling from elementary to middle school on "Transition Day" in Fair Haven, NJ. Image: NJDOT

Model Bicycling to School Policy

The NJ SRTS Resource Center at the Alan M. Voorhees Transportation Center (VTC) at Rutgers University - with NJDOT and the National Policy and Legal Analysis Network to Prevent Childhood Obesity (NPLAN) - developed a model bicycling to school policy that can be adopted by school districts around the state to encourage bicycle safety and bicycling to school. The model policy, along with a model walking to school policy, is available from the SRTS Toolbox on the NJ SRTS Resource Center website (http://policy.rutgers.edu/vtc/srts/toolbox/). The model bicycling policy includes the following safety guidelines:

For children in 3rd grade and below:

- Students should be accompanied by an adult when bicycling to or from school, as well as complying with the other conditions below.
- Parents are strongly cautioned to exercise great care and supervise carefully since children in 3rd grade and below are unlikely to have the developmental and judgment skills for unsupervised bicycling.

For children in 4th grade and above:

- The District should provide bicycle education to teach traffic skills and rules as well as improved judgment in individual and group bicycling. Every child should take this training or a similar bicycle safety course before riding in traffic.
- Students who ride bicycles to and from school should have written consent from a parent or legal guardian and agree to the conditions listed below.

Students should follow state law and safety guidelines for bicyclists:

1. According to N.J. state law, anyone under 17 that rides a bicycle or is a passenger on a bicycle must wear a helmet (N.J.S.A 39:4-10.1). Any student without a helmet will have their bicycle confiscated by the Building Administrator until a parent or guardian picks it up. Noncompliance with this rule will result in disciplinary action.
2. In New Jersey, bicycles are defined as vehicles under the state motor vehicle code contained in N.J.S.A 39:4-10, et.seq. Parents and students should be aware of these state bicycling laws and follow them at all times. Riders should follow the rules of the road including but not limited to:
   a. Obeying all traffic lights and signals (N.J.S.A. 39:4-14.1),
   b. Using hand signals before making turns,
   c. Only one rider per seat – never let a friend ride on the handlebars or wheel pegs (N.J.S.A. 39:4-12),

Model Bicycling to School Policy (cont'd)

d. Stopping and looking left, right, then left again before leaving driveways or entering any street,
e. Riding with traffic (N.J.S.A. 39:4-14.2) and not too close to parked cars – doors can open suddenly,
f. Riding where drivers can see you and not swerving between cars,
g. Equipping the bicycle with a bell or other audible device that can be heard at least 100 feet away, but not a siren or whistle (N.J.S.A. 39:4-11), and
h. Using headlights and tail lights visible at 500 feet – white in the front and red in back - if you must ride at dawn, dusk or after dark (N.J.S.A. 39:4-10).

3. Bicycles ridden to school should be roadworthy and regularly maintained. Students should test tires for air before riding. Additionally, the brakes must be functional (N.J.S.A. 39:4-11.1).

While at school, all students must comply with these rules:

- Bicycles may not be ridden on school grounds during arrival and dismissal; they must be walked.
- Bicycles must be parked in the racks provided. Students must bring and use bicycle locks.
- Helmets must be stored in locker, backpack, or attached to bicycle.
- Students are not to interfere with any bikes, helmets, or other equipment (steal, unlock quick releases, bounce helmets, etc.).

Resources

Design Guidance

- National Center for Safe Routes to School Guide, *On-street Bicycle Facilities,* guide.saferoutesinfo.org/engineering/on-street_bicycle_facilities.cfm
- MUTCD 2009 Edition Part 9. Traffic Control for Bicycle Facilities, mutcd.fhwa.dot.gov/htm/2009r1r2/part9/part9_toc.htm
- NACTO Urban Bikeway Design Guide, nacto.org/cities-for-cycling/design-guide/
- APBP Bicycle Parking Guidelines, www.apbp.org/resource/resmgr/publications/bicycle_parking_guidelines.pdf

Education

- NJ SRTS Resource Center has links to lesson plans and bike assembly program information, www.saferoutesnj.org/resources/education/

Encouragement

- Bike to School Day, www.walkbiketoschool.org/
- League of American Bicyclists, National Bike Month, bikeleague.org/bikemonth

Chapter 9: The School Site and School Grounds

There are two elements pertaining to school location – the school site and the school grounds. The school site refers to the location of the school within the community. The school grounds refer to the placement of buildings, facilities, and circulation on the school property. Both the location of the school within the community and the design of the school grounds should support the safe arrival and departure of all students, especially pedestrians and bicyclists. Everyone should remember that even children arriving by school bus, transit, or private automobile will be entering the school building on foot.

School Site

Schools often serve as a community center, providing neighborhood playgrounds and meeting space. Site selection is critical if these community functions are to be served. Ideally, schools should be centrally located in a community. Important elements of a school location identified by the American Association of State and Highway Transportation Officials (AASHTO) *Guide for the Planning, Design, and Operation of Pedestrian Facilities, 1st Edition* include:

- The school site is centrally located in the community; most children live within one mile.
- Pedestrian and bicycle access is available from all directions.
- Sidewalks, bike lanes, and trails on adjacent streets or through neighborhoods connect to the school property.

The NJ School Development Authority (NJ SDA) Real Estate Practices Manual

Developed in 2009, the Real Estate Practices Manual represents a culmination of lessons learned in addressing many of the land acquisition and development challenges faced by New Jersey in its school construction program. The manual explains the typical site planning, site selection, preconstruction and land acquisition steps and processes that the NJ SDA follows before a project is funded for design and construction by the State. It describes the roles and responsibilities of the various stakeholders in school site selection and development, and the interdependent decisions required of them.

The manual is available for download at www.njsda.gov/Business/Doc_Form/PDFsForms/RE_Manual.pdf

U.S. EPA School Siting Guidelines

U.S. EPA's school siting guidelines can help local school districts and community members evaluate environmental factors to make the best possible school siting decisions. Their website, www.epa.gov/schools/guidelinestools/siting/, includes an overview for the guidelines, as well as links to resources and additional information.

Key Considerations in School Site Selection

There are no minimum acreage criteria for schools in New Jersey. In many of New Jersey's older cities, land parcels are small, and it usually requires the assemblage of numerous parcels to accumulate sufficient land to build a school. New Jersey law only requires that the land be of sufficient size to meet the educational needs of the student enrollment and the faculty.

According to the NJ SDA Manual, specific land requirements for building size, outdoor physical recreation space and parking need to accommodate the school's educational model and unique circumstances. This is best managed through a partnership between the school district, design professionals and the local community that the school serves. Some of the site-specific factors that are considered by the SDA in site selection and that also effect safe pedestrian and bicyclist accessibility are listed to the right.

The entrance to the Nishuane School in Montclair, NJ.
Image: The RBA Group

Selection Criteria Evaluated by NJ SDA for Proposed School Sites

Location Considerations

- Sustainability is considered in site selection
- Site encourages safe pedestrian access for the community
- Centrally located to balance transportation options
- Compatible with current and probable future zoning regulations
- Close to libraries, parks, and other community services
- Favorable orientation to wind and natural light
- Sensitive to open space needs of the community

Accessibility Considerations

- Access and dispersal roads
- Natural obstacles, such as creeks and rivers
- Access for emergency response vehicles, sanitation vehicles
- Road widening and traffic improvements are minimized

Safety Considerations

- Highway proximity, in particular highway ramps (see page 112)
- Railroad proximity
- Airport proximity
- High-voltage power line proximity
- High-pressure utility lines
- Proximity to dumps, junkyards, landfills, chemical plants, refineries, fuel storage tanks, nuclear plants
- Proximity to gasoline stations, automobile repair shops, dry cleaners, nail salons
- Proximity to metal manufacturers, hazardous air pollution emitters, incinerators, prisons
- Social hazards in the neighborhood, such as bars, high crime incidence

Evaluating Adaptive Reuse Options

Older school buildings located in established neighborhoods often offer easy accessibility for students walking or biking to school and can serve to sustain established neighborhoods by providing a center for community activity. Because of these health and community benefits, the NJ SDA Manual recommends careful consideration of refurbishing existing school properties before deciding to demolish and build a new school elsewhere.

Since 1928, neighborhood children have walked to Cochran Elementary School in Williamsport, PA, which was renovated and expanded in 2001. It is generally less expensive to renovate an existing school than build a new one, especially considering the cost of land acquisition and development. Image: *Renovate or Replace?* by the Pennsylvania Dept. of Education

Surrounding Land Use

Studies have shown that land use conditions surrounding a school can affect the learning environment within the school in either a beneficial or detrimental way. Sometimes adjoining land uses can pose hazards to students walking or bicycling to school. An example of such an incompatible use is an industrial area which generates a high level of truck traffic during the hours students commute to and from school. In undeveloped areas, the potential for future development of residential communities close to the school should be ascertained, along with the connections to other school related sites such as athletic fields and after-school program sites.

Air pollution around schools is linked to poorer student health and academic performance. The location of children's schools can increase their exposure. Image: Kresge Foundation

American Planning Association (APA)

The APA identifies Smart Growth as that which supports choice and opportunity by promoting efficient and sustainable land development, incorporates redevelopment patterns that optimize prior infrastructure investments, and consumes less land that is otherwise available for agriculture, open space, natural systems, and rural lifestyles.

Smart Growth

The NJ SDA Manual recommends the integration of Smart Growth principles into educational facility planning. Smart Growth is defined the United States Environmental Protection Agency (U.S. EPA) as a development that serves the economy, the community and the environment. The USEPA recognizes a number of key attributes of Smart Growth, including:

- mixed land uses,
- compact building designs,
- walkable neighborhoods,
- development of communities with a strong sense of place,
- integration of open space,
- use of infill development strategies, and
- consideration of balanced transportation options.

School Grounds

The following information has been adapted from the *Safe Routes to School Briefing Sheet 6 – School On-Site Design* by the Institute of Transportation Engineers (ITE). The briefing sheet is available at www.saferoutesinfo.org/program-tools/srts-ite-briefing-sheets.

A well-designed school site should support the safe arrival and departure of all students, including pedestrians and bicyclists. According to ITE, some of the key elements that should be considered to promote the safety of bicyclists and pedestrians are:

1. separation of pedestrians, bicycles, parent cars, and buses
2. bicycle access and storage
3. location of school entrances
4. design and operation of drop-off/pick-up zones
5. design and operation of bus zones
6. driveways and internal roadway networks
7. parking
8. traffic control devices.

1. *Separation of Pedestrians, Bicyclists, Parent Cars, and Buses*

Separating or eliminating conflicts between students arriving on foot or bicycle from those arriving by buses and motor vehicles is necessary to reduce a student's exposure to traffic. Adequate physical space should be provided for each mode by which students arrive at school.

2. *Bicycle Access and Storage*

Secure and effective bike parking is a crucial factor in encouraging children to bike to and from school. Bike racks should be designed to enable both wheels to be secured with a U-lock or padlock and cable. Racks should be covered by shelters when possible to protect bikes from the elements. All bike parking areas should be easily accessible and conveniently located in well-lit areas near school building entrances. It is advantageous to provide secure bike parking at more than one location, especially if there are multiple entrances or exits, so that bicyclists do not have to cross campus to access a bike rack.

Bike parking at the Orchard School in Ridgewood, NJ is easily accessible but low security and unprotected from the weather. Image: The RBA Group

NJ Definition of School Grounds

The definition of "school grounds" as described in N.J.A.C. 6A:16-1.3 includes land, portions of land, structures, buildings, and vehicles, when used for the provision of academic or extracurricular programs sponsored by the school district or community provider and structures that support these buildings, such as school district wastewater treatment facilities, and other central service facilities including, but not limited to, kitchens and maintenance shops. School grounds also includes other facilities as defined in N.J.A.C. 6A:26-1.2, such as playgrounds, and recreational areas owned by local municipalities, private entities, or other individuals during those times when the school district has exclusive use of a portion of such land.

3. *Location of School Entrances*

Building entrances should be located with consideration for pedestrian desire lines. This entails determining the directions and points from which pedestrians are likely to approach the building and then identifying whether the design has inadvertently placed any unacceptable traffic conflicts or obstacles in the pedestrians' routes. For safety, the location of the front door to the school should face a traffic-calmed street. However, this is not always possible. An example of such an undesirable conflict is a school entrance that funnels pedestrians toward an uncontrolled midblock location, a road with sidewalk gaps, a roadway with nearby ramps or jughandles, or across a busy driveway. The location of school entrances should be adjusted to direct pedestrians towards preferred street crossings and avoid unnecessary driveway crossings.

Fencing funnels pedestrians to the signed and well-marked mid-block crosswalk in front of the Watchung School in Montclair, NJ. Image: The RBA Group

4. *Design and Operation of Drop-off/Pick-up Zones*

Students arriving and departing in private motor vehicles should exit and enter cars in designated zones to minimize pedestrian/vehicle conflicts. Well-designed drop-off and pick-up zones can minimize illegal standing or parking near schools and help prevent problems such as blocking bus driveways and traffic flow on adjacent roadways. Drop-off/pick-up zones should be one-way in a counter-clockwise direction so that students are loaded and unloaded directly to the curb/sidewalk.

Motor Vehicle Drop-off Zone at the Orchard School in Ridgewood, NJ. Image: The RBA Group

5. *Design and Operation of Bus Zones*

School bus operations function best when they are separated from all other transportation activities. Signs, pavement markings, gates, and/or orange cones may be used to provide this separation, but some education and enforcement will also be needed. Enforcement of drop-off and pick-up policies and procedures can be performed by a variety of people. Schools around the country have had success utilizing law enforcement officers, school personnel or parent volunteers.

When new drop-off and pick-up plans are implemented, assistance may be requested from law enforcement officers to make sure traffic flows smoothly during the first few days. Implementing a new plan may also require more volunteers or monitors to regulate parent activity in the first few days. Drivers who are not following proper procedure can receive warnings from school personnel, parents or law enforcement officers.

A sign is used to separate the bus zone at the Somerville School in Ridgewood, NJ. Image: The RBA Group

6. *Driveways and Internal Roadway Networks*

School driveways should conform to local design and access management guidelines for number, spacing, location, and layout. According to the ITE School On-site Design Guidelines, directives specific to schools include the following:

- Separate driveways should be used for bus traffic and other motor vehicle traffic.
- The predominant direction of traffic and student origins should be considered when selecting the location of driveways so that most drivers will turn right when exiting the school grounds.
- Students should not be required to cross busy driveways to access the school building.
- The roads within the school site should have a maximum grade of five percent to avoid configurations that could impair a motorist's vision.
- Buildings, landscaping, fences, block walls, and school signs should always permit adequate sight distances for drivers and pedestrians.
- Driveways should be located so as to avoid interlocking left turns with other streets or bus driveways.

Bus traffic should have separate driveways from other motor vehicle traffic. Image: The RBA Group

7. *Parking*

General parking guidance for schools is to separate parking areas (student, staff, visitors, and buses) from student loading/unloading areas and delivery loading zones, and to separate student pedestrians and bicyclists from both.

The NJ SDA Real Estate Practices Manual considers adequate parking for teachers, staff, and visitors as part of the site selection, but generally parking is regarded as subordinate to the need for adequate outdoor educational space where constraints in available land do not allow for the optimal creation of both play space and parking. When this situation arises, the Manual recommends creative parking alternatives such as cooperative agreements with the municipality for on-street parking, off-site parking, or the use of underground parking options.

8. *Traffic Control Devices*

In addition to physical layout, schools can use traffic cones and other channelizing devices to control on-site traffic patterns. Examples of practices include the following:

Cones are used to create a single-lane queue in the car drop-off/pick-up zone at Kilmer School in Trenton, NJ. Image: The RBA Group

- Placing traffic cones for traffic control or access restriction. Cones can be used to create a single-lane queue in the drop-off/pick-up zone. This practice is desirable because it minimizes the potential for pedestrian/vehicle conflicts; however, it can be used only if there is enough capacity to process the queue efficiently using only one through lane.
- Placing cones or a traffic gate to restrict vehicles, typically parent vehicles, from accessing a zone designated for other uses (for example, parking, bus loading, pedestrian/bicycle zone).
- Replacing faded or discolored traffic cones with new orange cones.

Other Safety Considerations on School Grounds

Student Safety Patrols

Student safety patrols enhance enforcement of drop-off and pick-up procedures at school by increasing safety for students and traffic flow efficiency for parents. Such efforts allow students to participate in promoting traffic safety where they learn skills they can use in their everyday lives. Having a student safety patrol program at a school requires approval by the school and a committed teacher or parent volunteer to coordinate the student trainings and patrols. Before beginning a program, school officials should be contacted for approval of the program and to determine how liability issues will be addressed. Safety patrol members are typically selected by teachers and principals and are usually students in the fourth, fifth and sixth grades.

AAA Mid-Atlantic and the Mid-Atlantic Foundation for Safety & Education support the program by providing safety patrol materials and equipment worn by all AAA School Safety Patrols. In addition, the Mid-Atlantic Foundation for Safety and Education sponsors five AAA School Safety Patrol Officers' Training Camps in conjunction with local police departments each summer.

Each year, AAA School Safety Patrols are recognized with an Outstanding AAA School Safety Patrol Awards Luncheon throughout the AAA Mid-Atlantic territory. Selection criteria for choosing an Outstanding AAA School Safety Patrol include leadership, sound academics, promptness, neatness and industriousness. Recent New Jersey honorees have included students from Lafayette Township School, Ogdensburg School, Wenonah Elementary School, and McFarland Intermediate School (Bordentown).

A student safety patrol member assists during morning drop-off. Source: heraldonline.com

Student safety patrol members provide crossing assistance at a signalized intersection in Cleveland Heights, OH. Image: NJDOT

No Idling Zones

Diesel emissions include fine particles commonly called soot. These pollutants are known to cause asthma, bronchitis, lung cancer, heart disease, and premature death. Diesel exhaust ranks among the air pollutants that pose the greatest risk to public health. Research has shown that fine particles are harmful because they bypass the body's natural defense mechanisms and penetrate deep into the lungs.

The "Stop the Soot" campaign (www.stopthesoot.org) was started by the New Jersey Department of Environmental Protection's (NJ DEP) Bureau of Mobile Sources to bring attention to the problem of poor air quality caused by the idling of motor vehicles (i.e., automobiles, trucks, buses, school buses, construction vehicles and equipment, etc.). New Jersey regulation (N.J.A.C. 7:27-14) prohibits engines, including those in cars, vans and school buses, from idling for more than three minutes in most instances; however, NJ DEP is urging school districts and school bus drivers to go beyond the minimum and implement best practices to reduce harmful diesel emissions. These best practices include turning off engines when waiting to load and unload students, replacing old buses in the fleet first as they often release the most emissions, and using new buses for long routes.

New Jersey has pledged to reduce harmful soot by 20 percent during the next decade. One way to help achieve this goal is by eliminating all engine idling. NJ DEP's anti-idling awareness campaign encourages school districts, school bus companies, and parents to sign a no-idling pledge and to eliminate idling within designated school and no idling zones. To date, more than 100 individual schools, charter schools, and school districts throughout the state have signed the "No Idling Pledge" as a way of demonstrating that reducing idling is important to the health of their students, drivers, and school employees.

Signs can remind drivers to turn off their engines during pick-up and drop-off. Image: The RBA Group

Image: myparkingsign.com

Why is it bad to idle vehicles?

Idling vehicles contribute to air pollution and emit air toxins, which are pollutants known or suspected to cause cancer or other serious health effects. Monitoring at schools has shown elevated levels of benzene, formaldehyde, acetaldehyde and other air toxics during the afternoon hour coinciding with parents picking up their children. Children's lungs are still developing, and when they are exposed to elevated levels of these pollutants, children have an increased risk of developing asthma, respiratory problems and other adverse health effects. Limiting a vehicle's idling time can dramatically reduce these pollutants and children's exposure to them.

For more information visit www2.epa.gov/region8/idle-free-schools

Spotlight: JFK Elementary School in Jamesburg, NJ

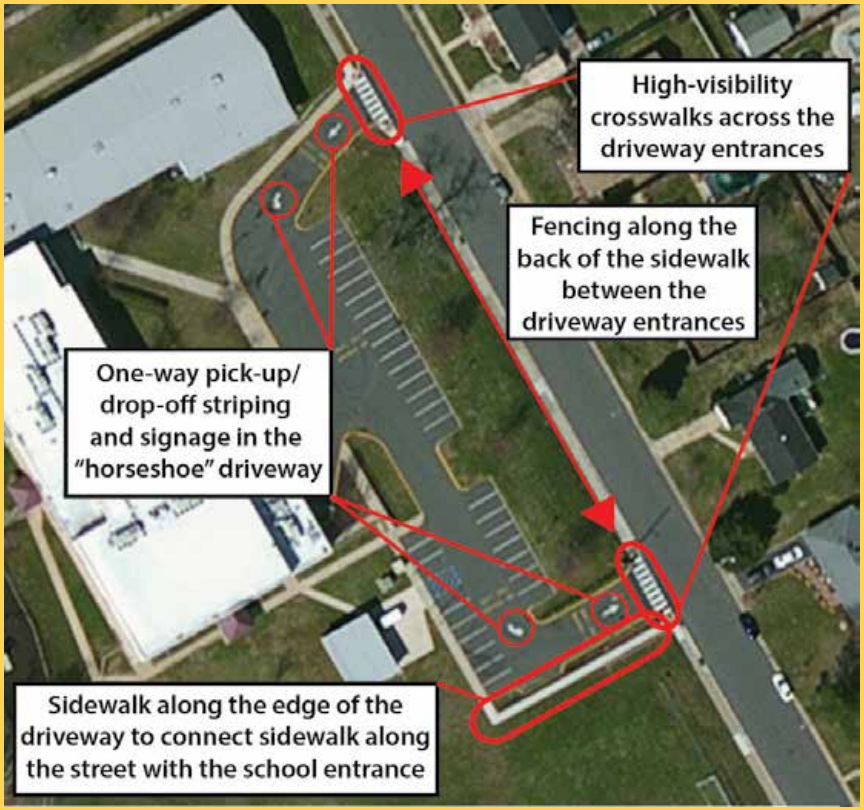
In 2005, the JFK School and the Borough developed an Action Plan with support from NJDOT, Keep Middlesex Moving TMA, and a consultant team. During the development of the plan, congestion and motorist-pedestrian conflicts at JFK School's Davison Avenue horseshoe entrance during arrival and departure times were identified as issues that led to unsafe conditions for pedestrians and cyclists. The Plan recommended implementing the following design elements in and around the horseshoe driveway:

- one-way pick-up/drop-off pattern striping,
- high-visibility crosswalks across the driveway entrances, and
- fence along the back of the sidewalk between the entrances to deter children from crossing Davison Avenue mid-block or at the middle of the horseshoe.

Before

In 2007, Jamesburg was awarded a SRTS grant to make improvements to the school zone around JFK School including the redesign of the horseshoe driveway drop-off and pick-up area. One-way pick-up and drop-off arrows were striped, high-visibility crosswalks across the driveway entrances were installed and the curb ramps were made ADA compliant. Fencing was also installed between the entrances to funnel pedestrians towards the safest routes.

After

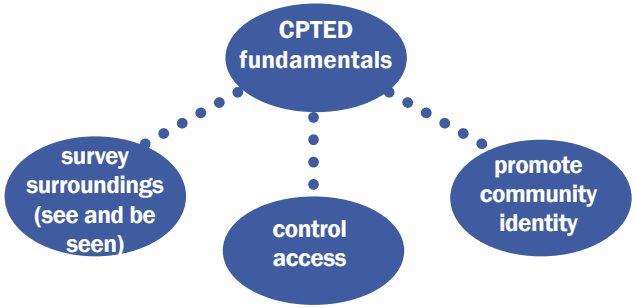


Chapter 10: Crime Prevention Through Environmental Design

Careful design and manipulation of the physical environment around and at the school site have the potential to reduce crime concerns, both real and perceived. Such manipulation is referred to as Crime Prevention Through Environmental Design (CPTED).

Introduction

With roots in city planning, architecture, criminology, and sociology, CPTED emphasizes design of outdoor school spaces based on the application of three fundamental concepts believed to reduce the occurrence and fear of crime: (1) the ability to survey surroundings (to see and be seen), (2) the ability to control access, and (3) the creation of a sense of ownership and school community identity. Through the utilization of these concepts, CPTED has the potential to reduce both the real and perceived dangers associated with walking and biking to school, while bolstering community identity and creating a safe and welcoming environment.



The Ability to Survey Your Surroundings

How important is it to see and be seen? As we move through the environment, we are constantly surveying our surroundings. Whether deliberate or unconscious, our ability to observe the environment around us contributes to our personal perceptions of safety and danger. For schools, the pursuit of safety is paramount. In order to maintain a safe outdoor environment, school administrators, teachers, parents, students and security cameras, if installed, should have the ability to clearly survey their surroundings at all times. This includes opportunities to see from adjacent properties or the site perimeter onto the site, and opportunities to see parking, walkways and other areas of the site. Examples of design elements that support our ability to survey our surroundings include:

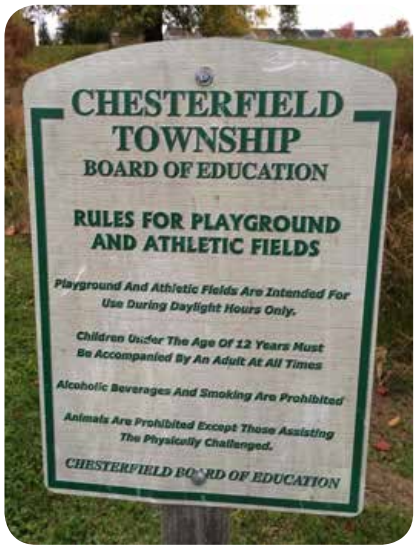
- lighting that improves the ability to observe activity and identify individuals,
- building location and orientation that creates views, and
- judicious selection and location of trees, shrubs and other plant species, combined with regular maintenance, which can minimize the conflict between lighting and landscaping and ensure that views on, off and around the site are preserved.

Common Environmental Elements of Schools

- Pedestrian and Bicycle Access
- Vehicular Access
- Trees and Shrubbery
- Topography
- Fencing
- Lighting
- Maintenance
- Signage
- Gathering Space
- Activity Space

The Need to Control Access

Access to the school begins in the landscape well before anyone has reached the front door. It includes the sidewalks, paths and driveways as well as the fences, trees, hedges, and signs around the school. Parents and teachers, and possibly crossing guards and students, can also serve as access control by paying attention to the people and activities around them. By offering cues about who belongs in a place, when they are supposed to be there, where they are allowed to be while they are there, what they should be doing, and how long they should stay, CPTED measures can be employed to control access to school grounds by authorized users on foot, bicycle, or in cars. It can also create opportunities to deny access to unauthorized users. In essence, by controlling access to the school environment, not just the school building, school safety can be increased while the opportunities for unwanted activities and behaviors are diminished.



Creating a Sense of Ownership and Identity

This wall mural at Hawthorne Elementary School school in Newark creates a unique visual identity for the school community. Image: The RBA Group

Schools have an identity created by the students, faculty, staff and surrounding community. CPTED practices encourage this community identity to be physically expressed and present in the landscape through clear signage, clear boundaries and other indicators of territorial ownership. In other words, CPTED recognizes the potential to augment safety and discourage crime by clearly marking the school community's territory. The consistent use of colors or materials, in buildings, paved surfaces, light fixtures, and landscaping,can be used to create an identity. This sends the message that the school is a place with an identity, an active community, and a purpose, reducing the likelihood of vandalism and incivility within the school environment.

Broken Windows Theory: A Link between Environmental Quality and Crime

Crime Prevention Through Environmental Design is not the only body of knowledge to link factors of environmental quality with the occurrence of crime. The Broken Windows Theory, as proposed by social scientists James Q. Wilson and George L. Kelling, suggests that as the physical environment deteriorates, through lack of maintenance, wear and tear, or the accumulation of trash, debris, and graffiti, residents become more concerned with personal safety and spend more time indoors avoiding outdoor and public spaces. As fewer residents engage in outdoor activities, outdoor spaces become less supervised and offer a better opportunity for crimes to occur. The positive correlation between environmental degradation and occurrence of crime is a trend which can be reversed through the application of Crime Prevention Through Environmental Design fundamentals.

Application of CPTED to Common Environmental Elements

In broad terms, most of our school environments are composed of a number of similar elements: a school building; a series of pedestrian access elements (including sidewalks, pathways, stairways, and ramps); a series of vehicular access elements (including driving lanes, parking lots, emergency lanes, and delivery access); a schoolyard (consisting of recreational facilities and gathering spaces defined by topography, trees, shrubbery, benches, fences, and retaining walls); and signage that tells users and visitors the accepted ways to move through and use this combination of elements. These physical elements are at work creating the overall school environment at day and night, on weekdays and weekends, in summer and during the school year. The following list considers such elements from the perspective of CPTED, in which the design and configuration of these elements can be employed to reduce the likelihood of crime while enhancing safety and school identity.

Pedestrian and Bicycle Access

Walking and bicycling should be a viable means of transportation for students in a range of settings: urban, suburban or rural. This means that schools must understand the pedestrian and bicycle networks that lead to their doors in a manner consistent with CPTED principles. In urban settings, students using these means of travel will likely access their school building from the street or sidewalk. Bike lanes and sidewalks should maintain high levels of visibility and clear sight lines and should be well-signed, well-lit, and well-maintained (free from cracks, debris, trash, puddles, and other obstacles). In more rural and suburban settings, the schoolyard may cover several acres and adjoin many other parcels of land, from which potential pedestrian and bicycle paths may have access. To encourage pedestrian and bicycle travel to and from the school, it is important to maintain these access points. The schoolyard, however, should not become a through-way for pedestrian and bicycle travelers not affiliated with or approved by the school. Pedestrian and bicycle access points should be clearly marked as part of the school territory.

Poor example: The slope in front of this school does little to control or enhance pedestrian access. As a result, it becomes both a safety concern (for the potential to slip and fall) as well as a maintenance concern (for the potential to track mud into the school). Image: The RBA Group

Good example: The system of retaining walls, stairs, and ramps creates clearly defined access for pedestrians, allowing them to move safely, efficiently, and cleanly. Image: The RBA Group

Vehicular Access

Cars, trucks, and buses that enter the school environment should be visible to school administrative personnel when school is in session and the building is accessible. This means that vehicular access is likely to be limited and placed within the view of the school office. The number and size of driveways should be limited and sidewalks should continue across driveway aprons.

Trees and Shrubbery

Trees and shrubs are an important part of the school site, contributing to environmental quality in a number of ways such as reducing air and noise pollution, providing protection from the rain and sun, and encouraging wildlife and plant diversity. Trees also create safer walking environments by forming and framing visual walls and by providing distinct edges to sidewalks and streets. In consideration of CPTED, trees and shrubbery should be employed to create spatial boundaries for the school site without inadvertently creating hiding spaces or limiting sight lines. For instance, a line of trees or a low hedge can create a spatial boundary at the edge of school property. However, shade trees should be "limbed up" and shrubs should be removed when they have been planted in a way that creates hiding places in the landscape. Weeping-branched trees should be avoided for their natural tendency to create a hiding space.

Poor example: The shrubbery adjacent to this sidewalk is overgrown and blocks this student's view into the school yard. Image: The RBA Group

Good example: The trees along the left-hand side of this sidewalk create a visual boundary between the sidewalk and the road. The tree canopy is maintained high enough that eye-level views are not impeded. Image: The RBA Group

Topography

Topography, or the act of grading the land to a desired configuration, is a part of most construction processes that relate to building schools, recreational, and transportation facilities. Therefore, the manipulation of topography in consideration of CPTED would prioritize the creation of clear site lines and perimeter boundaries, while eliminating the potential for hiding spaces.

Poor example: The site lines of these two students from the sidewalk to the school yard are blocked by the height of the grassy slope. Image: The RBA Group

Good example: This configuration creates a clear site line from the sidewalk to the school entrance. Image: The RBA Group

Fencing

Fencing can be used to define the spatial boundary of the school site, to control access, and to guide school users to a desired point of entry. However, fencing school property in such a way that prohibits the public from accessing outdoor school facilities like ball fields, walking tracks or playgrounds may be detrimental to the health of local residents. Fencing is available in a wide variety of materials and colors and should maintain a high level of visibility, clearly delineate school boundaries, and physically express the presence of the school community. Solid stockade or wall-style fencing should be avoided in favor of more pervious styles like wrought iron or chain link. Long stretches of fencing should be addressed from an aesthetic perspective to avoid creating the impression of the school building as a prison-like facility or as a fortress intended to keep community members out.

Poor example: Although this chain link fencing is visually permeable, the unfortunate side effect of its height, configuration, and barbed wire holders is an impression of the school as a prison-like facility. Image: The RBA Group

Good example: This painted aluminum fencing mounted on brick piers is both visually permeable and visually appealing. Its integration with the school's sign helps to underscore the importance of the school as an institution and a community. Image: The RBA Group

Shared Use Agreements

The SRTS National Partnership encourages schools districts and local government entities to utilize shared use agreements (SUA) to set forth the terms and conditions for the shared use of school property after regular hours. With SUA schools can continue to provide students and the local community with the facilities needed to maintain active and healthy lifestyles, while minimizing concerns about costs, vandalism, security, maintenance, and liability. For more on SUA, visit www.saferoutespartnership.org/state/bestpractices/shareduse

Lighting

Lighting is widely perceived to create a safe environment out of a dangerous one. Lighting improves the ability to observe activity and identify individuals as well as the ability to survey one's surroundings. However, the provision of lighting in a school environment when school activities are not in session may attract unauthorized users. Therefore, it may be wise to employ motion-sensitive technology in lighting the school grounds. Motion-sensitive lighting around the school environment would achieve the following: the dark environment would discourage unauthorized nighttime usage; authorized users would be provided with sufficient light as a result of their movement; and unauthorized users would be highly detectable as a result of their movement.

Maintenance

Proper maintenance is a sign of guardianship and territoriality which reinforces community identity. By properly maintaining the school environment through mowing and edging; removal of dead trees, trash, and debris; and upkeep of fences, benches, and painted, paved, and mulched surfaces, the school will be less likely to incur vandalism and other unwanted activities. Graffiti should always be removed in a timely manner to discourage further incidents. Well-maintained trees and landscape will create a pleasant environment, including the environmental benefits of cooling shade, progressive storm-water management and inviting outdoor spaces. Well-maintained sidewalks and bicycle routes will also encourage walking and bicycling.

Poor example: This poorly maintained sidewalk is a hazardous impediment for pedestrians and is likely impassable for a wheelchair. It sends the message that this space is not cared for. Image: The RBA Group

Good example: This well maintained sidewalk, which shows a recent repair, is safe for passage on foot or in a wheelchair. It sends the message that this space is highly cared for. Image: The RBA Group

Signs

Signs are an excellent tool for communication. From signs, we learn how to move spatially ("SLOW DOWN") and how to behave culturally ("NO TALKING IN THE LIBRARY"). We learn where things are located, who is in charge of them and what type of environment we are in. Signs around schools, therefore, represent a major opportunity not only to control access and direct arrivals, but to communicate territoriality and community values. Signs around the school should be clear and coherent: they are a profound visual cue that can be used to encourage a safe environment.

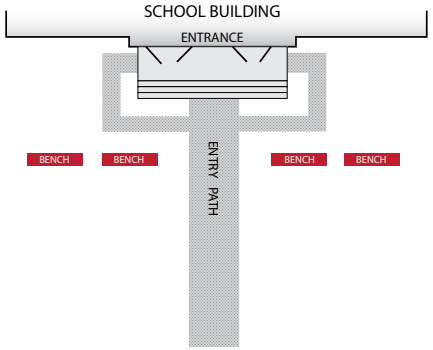
These signs clearly identify Ivy Hill Elementary School in Newark. Image: The RBA Group

The signs placed on this school building in Montclair communicate a set of values associated with the school building. Image: The RBA Group

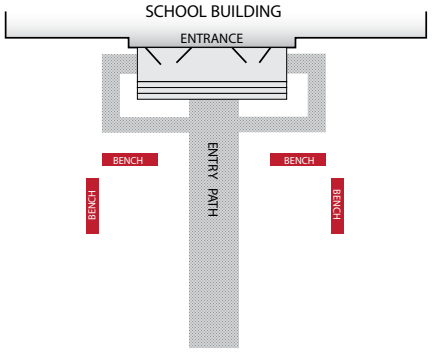
This 'Safe Corridor' sign in Camden expresses the importance of keeping children safe as they make their way to and from school. Image: The RBA Group

Gathering Space

The more eyes there are on the environment, the more likely people will feel safe walking and bicycling. By creating outside gathering spaces that encourage interaction, people are more likely to be engaged in the outdoor environment, reducing the threat of crime. A simple consideration of this point is the way that benches can be arranged in outdoor spaces. A linear bench arrangement encourages solitude rather than interaction. In contrast, a pair of benches opposed to ninety degrees creates a space for interaction.



Poor example: The benches in this diagram are placed in a parallel configuration. This does not encourage interaction and it is likely that the benches will see little use. Image: The RBA Group



Good Example: The benches in this diagram are opposed in a perpendicular relationship. This configuration forms a space which encourages interaction. These benches are likely to be used by students, energizing the space and the school yard, and increasing safety through "eyes on the street." Image: The RBA Group

Activity Space

One of the most effective ways to prevent crime is to encourage, support and engage in positive activity. At its best, the school is a place for safe and positive activity, including organized and pick-up sports, school gardening programs, arts and crafts programs, and music and theater performances. By creating an environment in which such activities take place, the likelihood of crime is likely to decrease.

Poor example: This space adjacent to a school building shows signs of wear and offers little in the way of positive activity. Image: The RBA Group

Good example: This space adjacent to a school building shows signs of care and creates the opportunity for positive activity. Image: The RBA Group

Resources

For more information on CPTED, please review the following sources:

- National Crime Prevention Council: www.ncpc.org/training/training-topics/crime-prevention-through-environmental-design-cpted-
- National Clearinghouse for Educational Facilities: www.ncef.org/rl/cpted.cfm
- National Institute of Justice Research Report, Physical Environment and Crime, by Ralph B. Taylor and Adele V. Harrell, www.ncjrs.gov/pdffiles/physenv.pdf
- Centers for Disease Control and Prevention: www.cdc.gov/violenceprevention/youthviolence/cpted.html

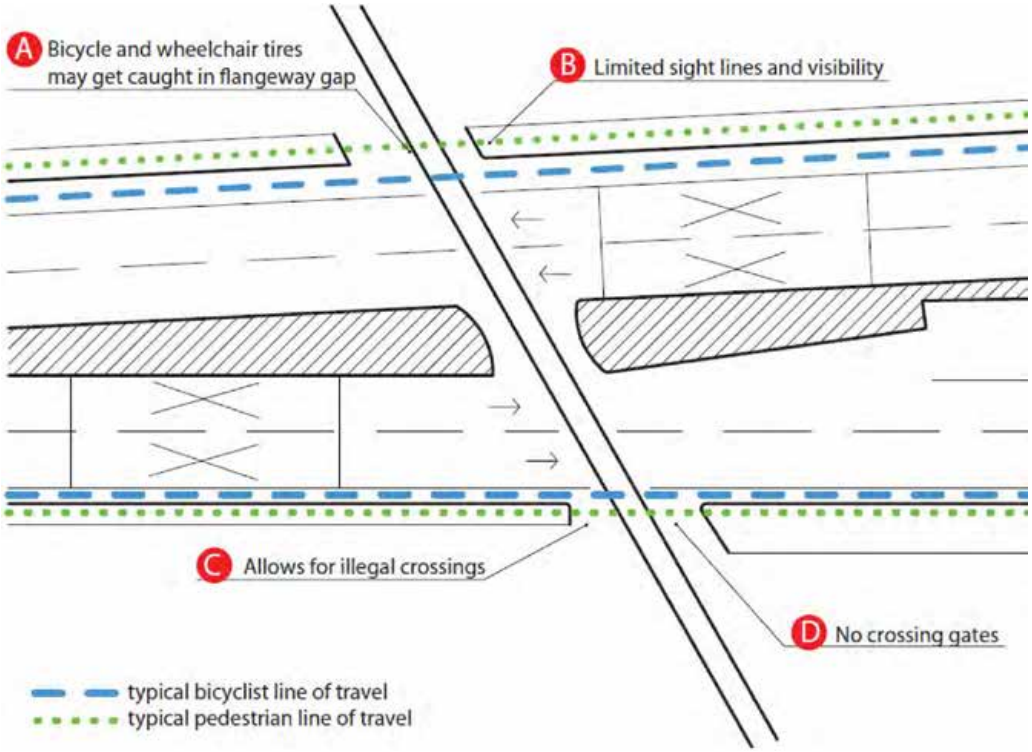
Chapter 11: Schools near Railroad Crossings

There are over 1,000 miles of light and commuter railroad tracks and 2,400 miles of freight railroad tracks crisscrossing New Jersey. These tracks run throughout the state, in major cities, small towns, residential and commercial areas and near parks and schools. Almost 44% of the 3,765 schools in New Jersey are located within a half mile of either active freight or passenger rail. Many students attending the 1,644 schools located within a half mile of an active rail line must cross rail tracks while walking or bicycling to and from school.

Common Issues at Railroad Crossings

Common issues at railroad-highway grade crossings include:[1]

A. Bicyclists and pedestrians in wheelchairs may catch a wheel in the flange way gap if the crossing is not perpendicular to the roadway.
B. Limited sight lines and visibility may not allow pedestrians and bicyclists to see approaching trains.
C. Some pedestrians cross tracks illegally.
D. Crossing gates for pedestrians or bicyclists may not be provided.



Graphic: Caltrans, *Complete Intersections: A Guide to Reconstructing Intersections and Interchanges for Bicyclists and Pedestrians*

[1]California Department of Transportation (Caltrans), *Complete Intersections: A Guide to Reconstructing Intersections and Interchanges for Bicyclists and Pedestrians* (2010). www.dot.ca.gov/hq/traffops/engineering/investigations/docs/intersection-guide-bicycles-pedestrians.pdf

Safety at Highway-Grade Pedestrian Crossings

A wide variety of passive and active devices may be used to supplement highway-related active control devices to improve pedestrian and bicyclist safety at highway-rail crossings. All pedestrian and bicyclist facilities should be designed to minimize crossing time, and devices should be designed to avoid trapping pedestrians and bicyclists between sets of tracks. The following devices should be considered at crossings within school zones as well as areas with high pedestrian traffic volumes, high train speeds, frequent rail service, extremely wide crossings, complex highway-rail grade crossing geometry, inadequate sight distance, and/or multiple tracks.

Passive Traffic Control Devices

Passive traffic control devices do not indicate the approach or presence of a train. Rather, their purpose is to identify and direct attention to the location of a crossing and provide static messages of warning or guidance to permit drivers and pedestrians to take appropriate action. Passive traffic control devices consist of regulatory signs, warning signs, guide signs, and supplemental pavement markings.

Passive devices include:

- **Sidewalks** should lead pedestrians to designated railroad crossings. Lack of sidewalks at rail crossings can be hazardous to pedestrians. This often results in pedestrians either walking over the rails outside the paved crossing, which could result in tripping, or walking in the roadway which presents the risk of collision with roadway traffic.
- **Fencing** and other barrier materials, such as landscaping, are recommended by the Federal Railroad Administration (FRA) to funnel pedestrian traffic to the desired crossing point where grade crossing warning devices are located.

Fencing at NJ TRANSIT's Aberdeen-Matawan Station. Image: The RBA Group

Example of a clear, concise warning message communicated by this pavement marking. Image: FRA, *Guidance on Pedestrian Safety at or Near Passenger Stations*

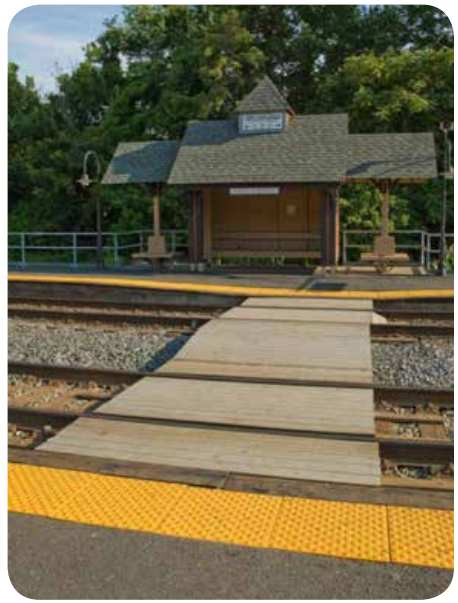
- **Pavement markings** can be used effectively to remind pedestrians of the need to be aware of trains approaching on any track and in either direction. When pavement marking messages are used, FRA recommends that the pavement marking should extend the full width of the pathway or sidewalk, so as to maximize the conspicuity and applicability of the warning message.

- **Swing gates** (sometimes used in conjunction with flashing lights and bells) alert pedestrians to the tracks they will cross and force them to pause. Swing gates deter people from continuing unimpeded across the tracks without unduly restricting their ability to exit from the railroad right-of-way. The swing gate requires pedestrians to pull the gate to enter the crossing and push the gate to exit the protected track area; therefore, a pedestrian cannot physically cross the track area without pulling and opening the gate. It is recommended that the gates be designed to return to the closed position after the pedestrian has passed. Swing gates should be supplemented with proper signage mounted on or near the gates.

Example of a swing gate. Image: California Public Utilities Commission, *Pedestrian-Rail Crossings In California*

An emergency exit swing gate is used in conjunction with an automatic pedestrian gate. It is designated for use only as an escape route for a pedestrian that remains between the track and a lowered automatic pedestrian gate. Image: FHWA

- **Detectable warnings** consisting of raised, truncated domes that comply with ADA Accessibility Guidelines (ADAAG) should be installed at pedestrian crossings on either side of the tracks to indicate to a pedestrian when they have entered and exited the track area. A detectable surface in advance of the crossing provides warning to visually impaired individuals of the presence of a crossing. The detectable warning should extend 24 inches in the direction of travel covering the full width of the designated pedestrian pathway.



Example of visually contrasting surface materials at a pedestrian crossing. Image: FRA, *Guidance on Pedestrian Safety at or Near Passenger Stations*

- **Standard Signs** notify pedestrians and bicyclists of regulations and provide warning and needed guidance at crossings. According to the MUTCD, the minimum mounting height for post-mounted signs on pathways is four feet (Section 8D.03).At light rail crossings used by school children, NJDOT has installed lowered warning signs (at three and a half feet) along with signs at the regular height.[2]

Examples of MUTCD Standard Signs

R15-1

The Grade Crossing (R15-1) sign, commonly identified as the Crossbuck sign, requires road users to yield the right-of-way to rail traffic at a grade crossing. At a minimum, one Crossbuck sign shall be used on each approach to every highway-rail grade crossing, alone or in combination with other traffic control devices.

R15-2P

If automatic gates are not present and if there are two or more tracks at a grade crossing, the number of tracks shall be indicated on a supplemental Number of Tracks (R15-2P) plaque.

R15-8

At grade crossings, the LOOK (R15-8) sign may be mounted as a supplemental plaque on the Crossbuck support, or on a separate post in the immediate vicinity of the grade crossing on the railroad or light rail track (LRT) right-of-way.

[2] Metaxatos, P., & Sriraj, P. S. (2013).*Pedestrian/bicyclist warning devices and signs at highway-rail and pathway-rail grade crossings*. Informally published manuscript, University of Illinois, Chicago, IL, Retrieved from www.utc.uic.edu/research/projects/GradeCrossingSafety.html

- **Nonstandard Signs**– There is a wide variety of nonstandard signage in use near stations and along the railroad right-of-way. These nonstandard signs are intended to discourage pedestrians from trespassing on the railroad right-of-way, encourage pedestrians to utilize designated crossing points, and warn pedestrians of the possibility that trains may be approaching.

Example of a nonstandard sign in Garfield, NJ. Photo also shows how the sidewalk leads pedestrians up to the designated, desired crossing point. Image: The RBA Group

Younger Pedestrians

Studies have found that younger pedestrians are more likely to pay attention to active signs (flashing lights and gates that activate or change upon the approach or presence of a train)[3] while older pedestrians notice passive signs more frequently (signs, pavement markings and other devices that do not indicate the approach or presence of a train). Another study examining violations at gated highway-rail grade crossings found that children younger than eight years old were more likely to violate gated highway-rail grade crossings and cross in the absence of older children and adults. However, the presence of more people increased the likelihood of a violation for individuals older than eight years old.[4]

[3] Metaxatos, P., & Sriraj, P. S. (2013).*Pedestrian/bicyclist warning devices and signs at highway-rail and pathway-rail grade crossings.* Informally published manuscript, University of Illinois, Chicago, IL, Retrieved from www.utc.uic.edu/research/projects/GradeCrossingSafety.html

[4] Khattak A., and Z. Luo (2010). Pedestrian and Bicyclist Violations at Highway-Rail Grade Crossings. Transportation Research Board Annual Meeting, Paper 11-1443. http://trb.metapress.com/content/vph5x824407160x8/

Active Traffic Control Devices

Active traffic control devices inform pedestrians, bicyclists and motorists of the approach or presence of a train. Audible and visual warnings should be used at or near passenger stations, where appropriate, to guide pedestrians to proper crossing points and also to indicate when it is appropriate to cross the tracks in order to get to the correct station platform to board the desired train.

Active devices include:

- A **flashing light signal assembly** can be used in conjunction with entry/exit swing gates or alone. An **audible warning device** (mechanical or electronic bell) is required with a flashing light signal assembly warning device. The audible warning device is sounded while the warning device (flashing light signals) is activated to provide notice to pathway users and bicyclists. Flashing-light signals shall operate for at least 20 seconds before the arrival of any rail traffic (MUTCD Section 8C.08).

Figure 8C-4. Example of Flashing-Light Signal Assembly for Pedestrian Crossings

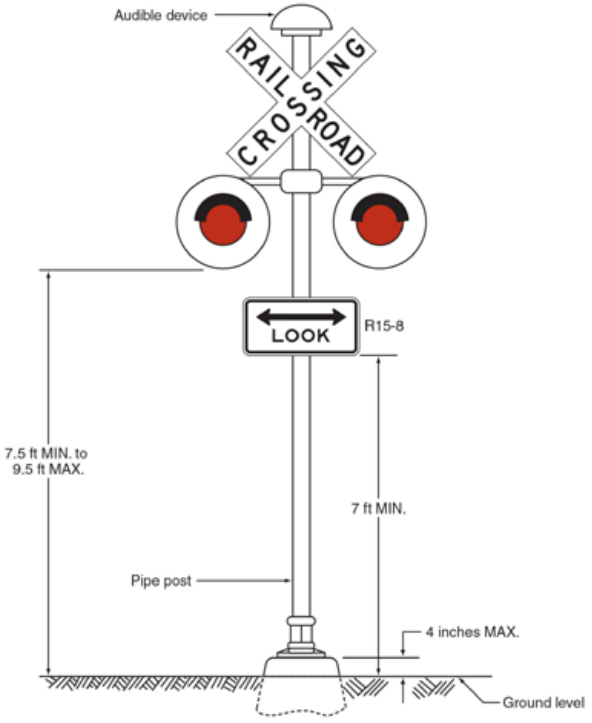


Image: MUTCD

Railroad – Highway Engineering Standards and Guidelines

FHWA's *Railroad-Highway Grade Crossing Handbook* (2007) provides guidance on pedestrian crossings. Additional guidance is provided by the MUTCD (USDOT/FHWA 2009b, Part 8), and Code of Federal Regulations 49. Crosswalks at intersections where pedestrians cross light rail tracks in mixed-use alignments are covered by the provisions of MUTCD Section 3B.18 rather than by the provisions of Chapter 8. New Jersey follows the MUTCD and FHWA's *Railroad-Highway Grade Crossing Handbook* for engineering standards and guidelines.

- A **pedestrian gate** is an automatic gate that offers an active, positive barrier to discourage pedestrians from entering the rail right-of-way during train movements. When used at pedestrian-rail at-grade crossings, each automatic gate should be approximately three feet above the pathway when in the horizontal position. NJ TRANSIT is currently evaluating the effectiveness of "gate skirts," which create an additional barrier below an activated grade-crossing gate to deter pedestrians from "ducking" under. Gate arms should be fully retro-reflectorized on both sides and should have vertical stripes alternately red and white at 16-inch intervals measured horizontally.

  In the normal sequence of operation, unless constant warning time detection or other advanced system requires otherwise, the flashing-light signals and the lights on the gate arm (in its normal upright position) shall be activated immediately upon detection of approaching rail traffic. The gate arm shall start its downward motion not less than 3 seconds after the flashing-light signals start to operate, shall reach its horizontal position at least 5 seconds before the arrival of the rail traffic, and shall remain in the down position as long as the rail traffic occupies the grade crossing. When the rail traffic clears the grade crossing, and if no other rail traffic is detected, the gate arm shall ascend to its upright position, at which point the flashing-light signals and the lights on the gate arm shall cease operation (MUTCD Section 8C.04).

Students waiting behind a pedestrian gate to cross the tracks in Garfield, NJ. Image: The RBA Group

Pedestrian gate with "gate skirt" being tested at the Aberdeen-Matawan Train Station. Image: The RBA Group

Spotlight: "Another Train Coming" Warning System at Plauderville Rail Station in Garfield, NJ

In September 2012, NJDOT and NJ TRANSIT installed the "Another Train Coming" warning system at the Outwater Lane grade crossing adjacent to the Plauderville Rail Station as part of a pilot safety program.

The warning system consists of active signs in all four quadrants of the rail crossing, with an LED text message that reads, "DANGER, Another Train Coming," as well as an audio component that repeatedly sounds the same message. The "Another Train Coming" warning system is activated whenever two trains are in the immediate vicinity of the crossing. For example, if one train is already in the station, and another is approaching on the other track (out of view), the system will provide a warning to pedestrians who might consider crossing the tracks illegally with the gates in the down position. The system reinforces the fact that just because one train is leaving the station does not mean it is "safe" to walk around the downed crossing gates. The system is designed to provide an additional warning to pedestrians to remain behind the crossing gates even after the one train they may be aware of has left the station.

NJDOT and NJ TRANSIT are conducting the "Another Train Coming" pilot program at Plauderville Station to test the effectiveness of the signs and determine whether this type of system should be used on other grade crossings in the NJ TRANSIT rail system.

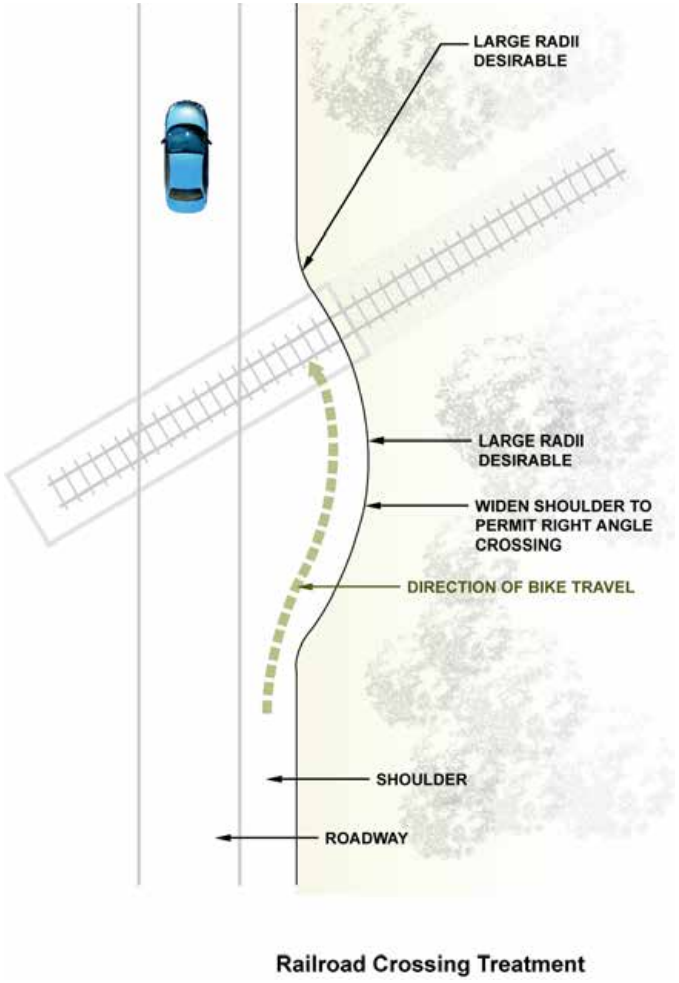
In addition to the "Another Train Coming" signs, NJDOT and NJ TRANSIT have made several other enhancements to the Outwater Lane grade crossing at Plauderville Station, including an additional pedestrian gate, a delineated sidewalk and 300 feet of additional fencing along the railroad right of way.

The pilot program is a result of the *New Jersey Safety Along Railroads: Short-Term Action Plan* created in February 2012.

"Another Train Coming" system installed at Plauderville Station. Image: Marco DeSilva, Volpe Center

Modifying the Intersection

Crossing rail tracks on a bike or in a wheelchair can often be tricky, especially with narrow wheels that can get caught between the rails. Bicyclists and pedestrians in wheelchairs can be accommodated at an at-grade railroad crossing by modifying the intersection to provide for a close to 90-degree crossing. This will help keep a front wheel from getting caught in the tracks.



Railroad Crossing Treatment

Image: The RBA Group

Green pavement markings in Tuscon, AZ indicate where cyclists may cross streetcar tracks at as close to perpendicular as possible. Image: bicycletuscon.com

Kansas City has installed signs warning of track hazards. Image: BikeWalkKC.org

Bicycle tires can get stuck on the grooves between tracks. The safest way to cross rail tracks is as close as possible to a 90 degree angle. Image: BicycleGermany.com

National Center for SRTS Position on Railroad Crossings

In keeping with NHTSA and other federal guidelines, the National Center for Safe Routes to School does not advise students to avoid crossing railroad tracks, but recommends that if the need for crossing the tracks does arise, that to the greatest extent possible, the following conditions be met:

1. appropriate at-grade crossings are implemented in accordance with relevant federal, state, and local guidelines;
2. appropriate supplemental safety devices (e.g., pedestrian signals, pavement markings) be incorporated into the project; and
3. that children be accompanied by a responsible adult and use extreme caution when traveling over such areas.

How are recommendations for pedestrian and bicyclist safety improvements made?

The appropriate traffic control system to be used at a pedestrian-rail at-grade crossing should be determined by an engineering study performed by a diagnostic team. The diagnostic team should include representatives from the railroad companies, the roadway authority, and the regulatory authority (state and/or federal). In general, the railroad is responsible for the crossbucks, flashing light signals, and gate mechanisms and the roadway authority is responsible for all advance warning signals and markings, and other supplemental signs.

Diagnostic teams are typically convened when:

- there has been a federal or state grant allocated,
- there are proposed or imminent changes to the physical or operating characteristics of the railroad or roadway,
- there have been complaints/requests for safety evaluations (railroad, local agencies, school districts, citizens), or
- it has been recommended by routine inspections.

Criteria used to Select Warning Devices

There is no commonly accepted method to quantify the risk to a pedestrian of being struck by a train at a highway-rail crossing with pedestrian access. However, the Federal Railroad Administration promotes utilizing a risk-based analysis approach.[5] This means looking for potential hazards or undesired events that may involve pedestrians walking in or near passenger rail stations. Hazard identification is a "What if?" activity that looks for potential causes and results of incidents.

The hazard management team "brainstorms" to come up with as many credible hazards as possible for use in a risk-based hazard analysis. The multidisciplinary team should consider the physical characteristics of the station area and associated walking paths in or near the station when identifying these hazards. This includes pedestrian attractors. Destinations include schools, train stations, bus stops, retail/commercial centers, and residential communities. Planned development and zoning should be considered as indicators of future pedestrian activity with special consideration to accessibility needs for individuals with disabilities.

Criteria for selecting warning devices are usually determined on a case-by-case basis. In New Jersey, the diagnostic review process examines several criteria to determine the need for safety upgrades including:[6]

- train speed;
- number of trains;
- railroad traffic patterns;
- surface conditions;
- pedestrian volumes;
- proximity to schools;
- sight distance for pedestrians approaching the crossing;
- pedestrian collision experience at the crossing;
- skew angle of the crossing relative to the railroad tracks; and
- surrounding land use.

[5] **USDOT FRA (2012).Guidance on Pedestrian Crossing Safety at or Near Passenger Stations.**
[6] **Metaxatos, P., & Sriraj, P. S. (2013).*Pedestrian/bicyclist warning devices and signs at highway-rail and pathway-rail grade crossings*. Informally published manuscript, University of Illinois, Chicago, IL, Retrieved from** www.utc.uic.edu/research/projects/GradeCrossingSafety.html

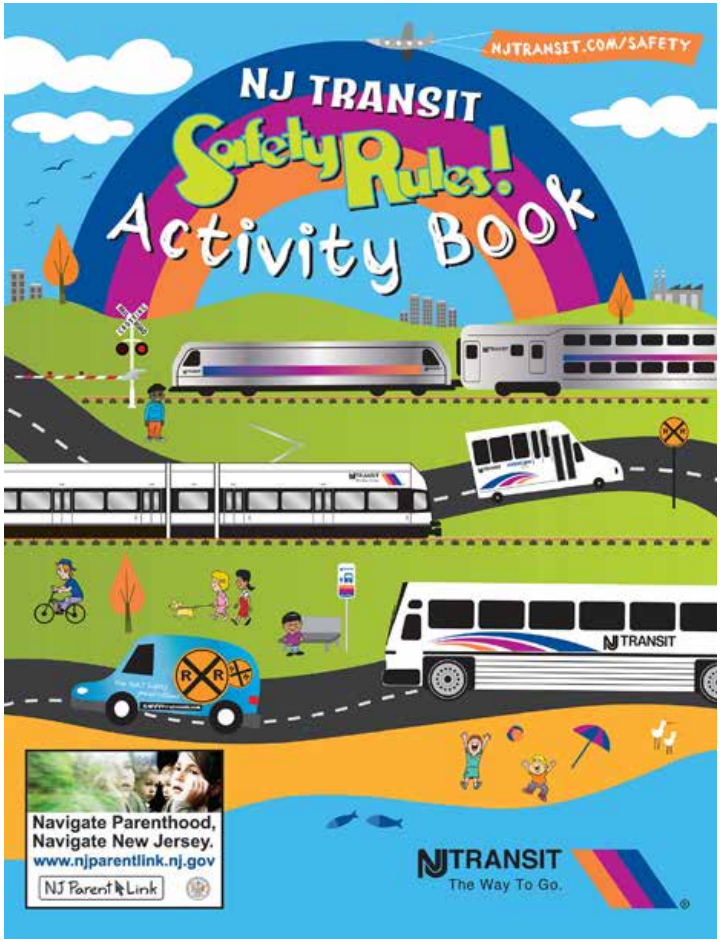
Resources: Rail Safety Education Programs

Operation Lifesaver

Operation Lifesaver is a non-profit, international, public education program. Educational brochures and videos, coloring books for children and other materials are available on the Operation Lifesaver Web site. In addition, every state has an Operation Lifesaver coordinator who can provide information about highway-rail grade crossing safety and trespass prevention activities, including scheduling a free safety presentation at your school. If you are interested in arranging a presentation, please visit Operation Lifesaver's Web site at oli.org/state_coordinators/

NJ TRANSIT's School Safety Program

Schools and community groups can take advantage of NJ TRANSIT's free statewide safety education presentations for all age groups. High school driver education teachers can request a free program package for the classroom developed to help teen motorists safely share the road with trains, buses and light rail. Contact the NJ TRANSIT Safety Education Program to learn more about the program. E mail safety@njtransit.com or visit www.njtransit.com/rg/rg_servlet.srv?hdnPageAction=SafetyTo



Chapter 12: Schools near Highway Ramps

Highway ramps are locations where motor vehicles enter or exit a limited-access roadway from a secondary roadway. Ramps are often designed to encourage high-speed, free-flow turning movements and can be a major barrier to providing safe pedestrian and bicycle access along the secondary or local roadway. Other types of roadway approaches which present challenges to pedestrians and bicyclists similar to those posed by ramps include traffic circles, right-turn slip lanes or "pork-chops," and "jughandles." The design treatments presented in this chapter can be utilized to address safety hazards associated with ramps as well as other types of roadway links which carry traffic, often at higher speeds, between intersecting roadways.

Common Issues at Highway Ramps

Ramps are in effect intersections and pose threats to pedestrians and cyclists similar to 'at-grade' intersections. They can be dangerous places for pedestrians and bicyclists to travel, especially in places where the motorized traffic travels at high speeds or when the crossing is wide and unprotected. Even highly skilled pedestrians and bicyclists can find that negotiating high-speed, free-flow jughandle locations and ramps is challenging. Less experienced pedestrians and bicyclists, such as children, may face particular difficulty. More than 10% of New Jersey schools are located within 1,000 feet of a highway entrance or exit ramp.[1]

The crosswalks are unmarked and curb ramps absent at this ramp, located one block from an elementary school in Camden. Image: Cambridge Systematics

Terrell James' Law

A 856, signed into law on January 13, 2008 as P.L. 2007, Chapter 308, prohibits construction of a highway entry or exit ramp within 1,000 feet of a school, grades kindergarten through 12, or construction of a school within 1,000 feet of a highway ramp, unless there is no "feasible or prudent alternative." The bill is named "Terrell James' Law," in memory of an 8-year-old who was hit and killed by a motor vehicle in 1997 in front of his elementary school which was located near a playground and two highway ramps in Newark, NJ.

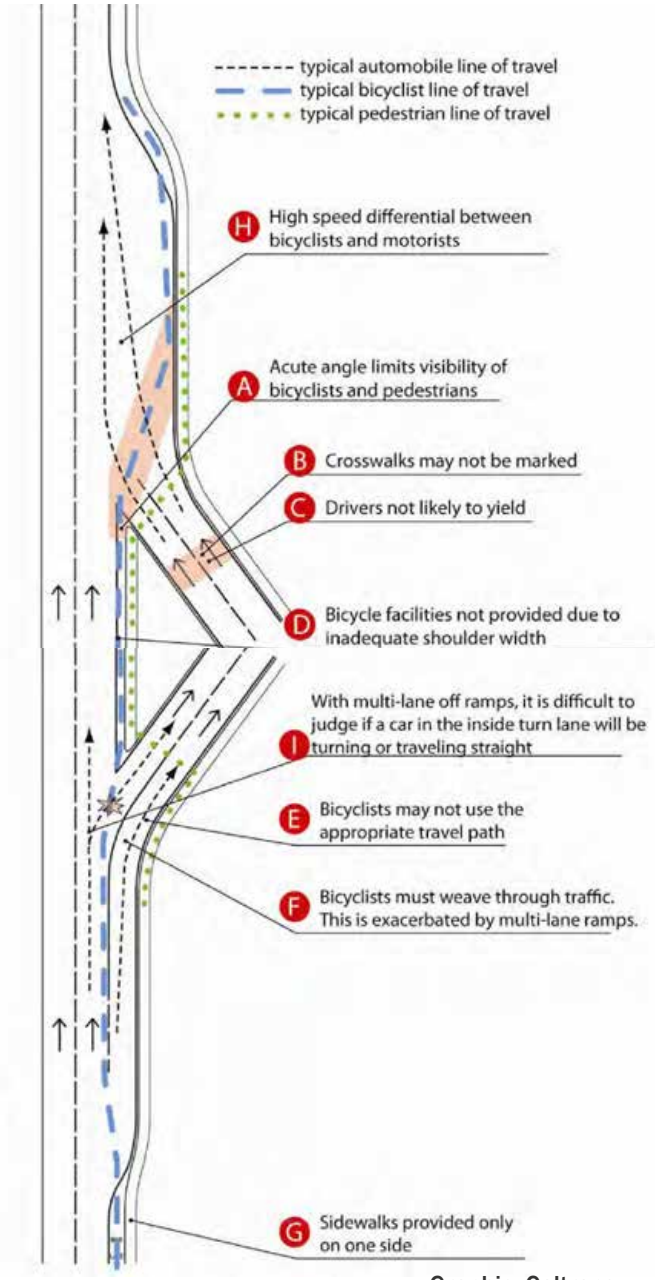
[1] Cambridge Systematics for NJDOT (2009). *Developing a Toolbox to Address Pedestrian and Bicyclist Safety Near Highway Ramps and Schools*.

Common issues at highway on- and off-ramps include:[2]

A. Poor sight distance often exists due to an acute intersecting angle that leads drivers to focus primarily on other motor vehicle traffic, as well as other factors such as the placement of guardrails, poles and signal boxes and overgrown vegetation.
B. Crosswalks are not usually marked across ramps.
C. Ramp traffic is not controlled, and motorists traveling at high speed are not likely to yield to bicyclists or pedestrians.
D. If the outside lane or shoulder is not wide enough, bicycle facilities are often not provided through an interchange area.
E. Bicyclists may not use the best travel path when navigating through the intersection.
F. Bicyclists must weave through free-flow turning traffic traveling at a much higher speed. This interaction is exacerbated with multi-lane ramps.
G. Sidewalks are sometimes not provided or only provided on one side of a crossroad.

Common issues associated with multi-lane free-flow on-and off-ramps:

H. Motor vehicles travel at high speeds, resulting in a large speed differential with pedestrians and bicyclists.
I. With multi-lane ramps and lanes with dual destinations, pedestrians and bicyclists have difficulty judging when a vehicle in the inside lane will be turning or traveling straight.



Graphic: Caltrans

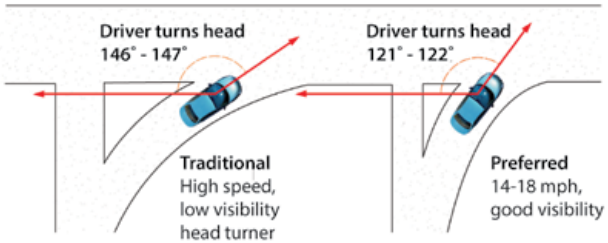
[2] ***Common issues based on Complete Intersections: A Guide to Reconstructing Intersections and Interchanges for Bicyclists and Pedestrians*, 2010 by Caltrans.** www.dot.ca.gov/hq/traffops/engineering/investigations/docs/intersection-guide-bicycles-pedestrians.pdf

Design Features that Improve Safety at Highway Ramps

Many of the safety issues in the vicinity of highway ramps and schools in New Jersey can be resolved or lessened by implementing design features that **reduce vehicular travel speeds, improve visibility and reduce pedestrian exposure to vehicular traffic**.

Methods to **reduce vehicular travel speeds** include:

- reconfiguring the ramp intersection (eliminating free-flow ramps or modifying the ramps to intersect the crossroad at or close to a 90-degree angle);
- designing the exits for 20 mph at the ramp-street intersection in urban situations;
- adding traffic calming configurations, such as reduced curb radii and adding landscaping features; and
- adding rumble strips on the off-ramp remind drivers through sound and physical vibration how fast they are traveling and the need to slow down.



Designing right turn slip lanes with tighter angles reduces vehicular travel speeds and improves visibility. Image: The RBA Group

Design features that **improve visibility include**:

- striping high visibility crosswalks where ramps intersect with local roads;
- utilizing reflective or illuminated pavement markings;
- installing pedestrian scale lighting, warning signs and pedestrian-actuated beacons;
- placing a crossing guard at the location during school hours; and
- adjusting signal phases to include Right Turn on Red (RTOR) restrictions or a lead signal phase for pedestrians and bicycles.

Providing bicycle facilities leading to and through the ramp improves visibility. Image: Cleanairpartnership.wordpress.org

Methods to **reduce pedestrian and bicyclist exposure** to vehicles improve safety by lessening the time that these travelers are in the likely path of a motor vehicle. This includes:

- constructing physically separated facilities such as sidewalks, raised medians, refuge islands, and off-road paths and trails; and
- reducing the width of the traveled way (narrow lanes, use only single right-turn lanes).

Seattle DOT installed a refuge median and curb extension at this right turn lane which narrows the travel way and forces motorists to slow down. Image: SeattleBikeBlog.com

Spotlight: Speedway Elementary School in Newark, NJ

Opened in 2010, the new Speedway Elementary School (named after its former home on Speedway Avenue) was built at the intersection of two busy roads, South Orange Avenue and Oraton Parkway, near ramps for the Garden State Parkway. Initial plans for the school included a pedestrian bridge across South Orange Avenue to help students safely cross to Vailsburg Park for recess, but the cost of the bridge, as well as Green Acres regulations, prevented the bridge from being built.

In the long run, more active traffic calming measures may be the ideal solution. In the short term, parents and members of the Safe Streets, Safe Kids coalition worked with: Speedway administrators to develop a safety plan; with the city to ensure that crossing guards will be present; and with county freeholders on basic infrastructure improvements, such as additional signage and high visibility crosswalks.

The aerial shows the location of the Speedway School in relation to South Orange Avenue, Oraton Parkway and the Garden State Parkway. Image: Google

A crossing guard has been stationed at the intersection of South Orange Avenue and Oraton Parkway. Image: The RBA Group

High visibility crosswalks have been installed in the area. In addition, there is no tight turn on red (RTOR) allowed from South Orange Avenue to Oraton Parkway. Image: Google Streetview

New signs have been installed along South Orange Avenue. Image: The RBA Group

Best Practice: Right Angle Intersections

Unless unusual circumstances exist, in urban and suburban environments, and other areas where significant numbers of pedestrians are expected or desired, free flow turning movements should be avoided. Instead, right angled intersections should be constructed where the exit or entrance ramp meets the cross street. The intersection should also be controlled by a stop sign or signal.

These characteristics cause motorists to at least slow down before turning, increasing the likelihood that they will see and stop for pedestrians and bicyclists. If an impact occurs, severity is lessened because of slower vehicular speeds.

This high-speed ramp has been replaced with a 90-degree intersection. Image: California Department of Transportation

NJDOT Roadway Design Manual

The *NJDOT Roadway Design Manual* sets the standard for state roadway design, and is frequently adopted as the de facto standard by county and local governments. Section 7 of the Manual addresses interchanges. The guidelines for interchange ramps (Sec. 7.04.5) include recommendations that consider the needs of pedestrians.

In the Ramps subsection titled "Location of Ramp Intersection on Cross Road," the Manual recommends avoiding sharp curves where an off ramp terminal intersects the local street and recommends that it **"is often better to provide a near 90 degree intersection with stop sign control."**

This recommendation agrees with the best practice to use stop signs or signals at ramp terminals and for ramp terminals to intersect local roads at right angles.

The NJDOT Roadway Design Manual is available at www.state.nj.us/transportation/eng/documents/RDM/

Resources

AASHTO's 2012, *Guide for the Development of Bicycle Facilities, 4th Edition,* and 2004, *Guide for the Planning, Design, and Operation of Pedestrian Facilities, 1st Edition*

FHWA, 2009, *Manual on Uniform Traffic Control Devices for Streets and Highways 2009 Edition*. http://mutcd.fhwa.dot.gov/htm/2009r1r2/html_index.htm

FHWA, 2006, *Federal Highway Administration University Course on Bicycle and Pedestrian Transportation*. http://www.fhwa.dot.gov/publications/research/safety/pedbike/05085/

TCRP, 2006, *Improving Pedestrian Safety at Unsignalized Crossings*, TCRP Report 112/ National Cooperative Highway Research Program (NCHRP) Report 562, http://onlinepubs.trb.org/onlinepubs/nchrp/nchrp_rpt_562.pdf

California Dept. of Transportation, 2010, *Common issues based on Complete Intersections: A Guide to Reconstructing Intersections and Interchanges for Bicyclists and Pedestrians.* www.dot.ca.gov/hq/traffops/engineering/investigations/docs/intersection-guide-bicycles-pedestrians.pdf

Chapter 13: Maintenance and Other Improvements

Proper maintenance is essential to promote user safety, to ensure ease of access, and to encourage the use of a designated route, especially in school zones.

Why is maintenance important?

All facilities require regular maintenance to reduce the damage caused over time by the effects of weather and use. However, many maintenance issues can be reduced if properly addressed in the planning and design phases before construction even begins. It is recommended that an overall plan/schedule for the continued maintenance, repair and replacement of pedestrian and bicyclist safety related infrastructure along school walking routes and within school zones be developed, adopted and implemented. The plan should include criteria and guidelines for the maintenance of pedestrian- and bicyclist-related facilities, such as sidewalks, crosswalks, bike lanes, shoulders, signs, signals, lighting, storm drains and multi-use paths. The extent and frequency of maintenance schedules will vary greatly depending on the location, amount of use, and resources available.

The plan should clearly specify the frequency of maintenance activities and how reported maintenance concerns will be addressed. The development of the plan should be coordinated between the Departments of Public Works, Engineering and Planning, the School District, and the agencies that have jurisdiction over the rights-of-way included within the school zone.

Installing high visibility crosswalks in Hoboken, NJ. Image: The RBA Group

Americans with Disabilities (ADA) Act

Accessible designs are useless if maintenance is neglected and sidewalks and paths are allowed to degrade to a condition where they cannot be used or must be avoided during travel. State and local government facilities should follow requirements of the 2010 ADA Standards for Accessible Design. This manual addresses sidewalks, walkways, and other pedestrian transportation routes that are located within a public right-of-way. The 2010 ADA Standards for Accessible Design require, to the maximum extent possible, that newly designed and constructed or altered State and local government facilities must:

- Provide a continuous, unobstructed path of travel that is accessible to and usable by individuals with disabilities.
- Maintain accessible routes from the public street, sidewalk and public transportation stops to the accessible building or facility entrance they serve.
- Keep walking surfaces cleared (of snow and any obstructions) to a minimum width of 36 inches.

Roadway Maintenance

In general, the school district is responsible for providing ongoing maintenance of pedestrian and bicycle facilities and traffic control elements on the school site; public and private property owners are typically responsible for repairs and reconstruction of the sidewalk within the street right-of-way adjacent to their property; local jurisdictions are responsible for maintaining facilities and traffic control elements at intersections and mid-block crossings; and the governmental entity with authority over the roadway is responsible for maintaining the roadway.

Elements that affect pedestrian and bicyclist travel to school should be inspected annually. Assessments should also be completed after a catastrophic event, such as a flood or storm.

This includes making sure:

- Signs are legible and information is current. Signs should be removed or replaced when messages are no longer needed, the content of the information has changed, or schools' walking routes or traffic patterns have changed. For example, all in-street crosswalk signs at mid-block crosswalks should reflect the State's Stop for Pedestrians law. Any remaining signs informing motorists to Yield to Pedestrians should be replaced.
- Traffic control devices, signals and lighting fixtures are functioning and meet current standards and guidelines.
- Pavement markings and crosswalks are clearly visible. Installing stencils with thermoplastic may cost more initially, but these materials will last longer than paint and reduce long-term maintenance costs. In addition, thermoplastic is less slippery than paint when wet.
- Sidewalks are smooth and in good repair. Concrete is more expensive than asphalt to install but it lasts longer and requires less maintenance, which may make it a better value in the long run.
- Landscaping and vegetation is not impeding pedestrian use and/or obstructing a pedestrian's or a driver's view.
- Roadway shoulders are clear of debris and potholes.
- Storm grates are removing storm water run-off from streets, in good working order, flush with the pavement, and are bicycle safe, with openings small enough to prevent a bicycle wheel from falling into the slots of the grate.

Image: The RBA Group

Image: BikePGH.org

Image: The RBA Group

Image: The RBA Group

Image: The RBA Group

How should roadway and sidewalk conditions be assessed?

Each municipality should have a current inventory and condition assessment of its roadways and sidewalks including information on the location of various deficiencies. Development of an inventory requires coordination with the County and State Departments of Transportation. This inventory can be used to set priorities for repair and replacement along with associated costs for budgeting and funding purposes.

In order to maintain accessible conditions, current and potential problems must be identified through an objective assessment process. There are many methods available for identifying maintenance needs on existing sidewalks. For example:

- larger municipalities may devote a branch of their public works department to sidewalk evaluation and roadway maintenance;
- a municipality may establish an improvement program that identifies sites requiring improvements, access or maintenance; and
- residents and visitors may identify and report maintenance problems.

Collaborative Approaches to Reporting Neighborhood Issues

For a maintenance program to be effective, it must identify all conditions that can impede pedestrian access or diminish safety and quickly respond with repairs. Residents living in an area can often identify issues more rapidly than a centralized agency. The following techniques have been used successfully by a variety of municipalities to obtain maintenance input from users:

- ***SeeClickFix.com*** - SeeClickFix allows anyone to file a public report online or via a mobile phone. The issue is then available for public view, comment and resolution. This enables citizens, community groups, media organizations and governments to take care of and improve their neighborhoods. Government entities responsible for the public space become more accountable to the public by acknowledging problems and providing effective communication about solutions.
- ***311 Non-Emergency System Call Centers*** - Operated by the municipality (public works, independent service agency, etc.) to field "city service" calls such as potholes, graffiti removal, fallen trees, broken street lights or disabled traffic signals, etc., 311 systems are in place in Chicago, New York, Houston and Dallas. There are also mobile applications being developed that allow residents to report issues as they see them.
- ***Online Forms*** – Many jurisdictions throughout the state have forms on their websites that allow residents to report roadway maintenance issues. For example, potholes and other maintenance concerns on a state highway can be reported to NJDOT through the Department's website, www.state.nj.us/transportation/commuter/potholeform.shtm
- Hotlines – All 21 counties in New Jersey have a number that residents can call to report issues on county routes. The phone numbers are available at www.state.nj.us/transportation/commuter/potholecounty.shtm

Who is responsible for sidewalk construction and maintenance in New Jersey?

The following information on sidewalk construction and maintenance comes from a 2006 report, *Constructing, Maintaining and Financing Sidewalks in New Jersey*, prepared by the Voorhees Transportation Center for the New Jersey Department of Transportation.

Sidewalk Management

Sidewalks provide an essential environment for safe, independent mobility, especially for children. However, sidewalks are a complicated issue due to multiple jurisdictions (local, county, and state), ambiguous responsibility for construction, reconstruction and maintenance, and contested liability. For sidewalks to be effectively maintained and properly repaired, responsibility for sidewalk management activities needs to be defined. Conversely, most of the problems involving sidewalk management result from ambiguity over responsibility or the lack of a responsible party. This combination of factors has led to a fragmented sidewalk network in New Jersey.

Sidewalk Maintenance

Municipalities play the most important role in assuring that sidewalks are constructed, inspected, properly maintained and repaired or reconstructed when needed.

Chapter 65 of Title 40 provides the broad structure for sidewalk law in New Jersey; N.J.S.A. 40:65-1 gives municipalities the authority to adopt ordinances providing for sidewalk improvements and repairs such as construction, paving, and curbing. This statute states that this work may be funded and performed by:

- the municipality;
- the adjacent property owner; or
- the municipality and the adjacent property owner.

Sidewalk closed for repairs. Image: VTC

Example of a discontinuous sidewalk. Image: VTC

The statute also authorizes municipalities to adopt standards for sidewalk construction and to inspect sidewalks. The law is worded to allow municipalities to construct, repair and improve sidewalks along all highways, whether the highway is a municipal street or a county or state highway. The statute requires municipalities to secure the approval of the county prior to constructing a sidewalk along a county highway; there is no similar requirement in this statute to require a municipality to first secure approval from the state before constructing a sidewalk on a state highway. As written, the statute appears to consider a sidewalk to be an appropriate element of a street that may be constructed at municipal expense or by the abutting property owner.

When homeowners and businesses are responsible for sidewalk maintenance, they might decide to hire a contractor, perform repairs on their own or have the city do the repair. Homeowner associations in some neighborhoods address right-of-way maintenance as a group to minimize the cost to individual members. In some areas, the city will subsidize sidewalk repairs for property owners. Local laws may also dictate whether or not a homeowner must hire a professional contractor to undertake sidewalk repair. Regardless of the approach for sidewalk maintenance, municipal inspectors should review and approve all repairs to guarantee that the improved sidewalk meets pedestrian access needs and the requirements of the ADA.

Sidewalk ready to be poured. Image: VTC

Sidewalk Construction

In New Jersey, the cost of constructing and reconstructing sidewalks is typically born by the landowner when it is required as part of a development, and by the State, county or local agency when constructed as part of road construction or reconstruction. Municipalities may assign all, a portion of, or none of the costs of constructing sidewalks to the abutting property owners. NJDOT Local Aid funding has also been used for municipal sidewalk-only projects. Sidewalks might not be constructed during development or road construction if the developer seeks an exception from the Residential Site Improvement Standards (N.J.A.C. 5:21-1.1, et.seq.) or local site plan requirements, or if the State or county has not identified a need in the project scoping process. As more municipalities and counties in New Jersey adopt Complete Streets Policies, sidewalks are more frequently recognized as essential elements of the public right-of-way and are being incorporated into the initial design of a project. For more on Complete Streets Policies visit NJDOT's Complete Streets web-page, www.state.nj.us/transportation/eng/completestreets/.

Development Review: Residential Site Improvement Standards (RSIS) and Municipal Master Plans

According to the RSIS, sidewalks shall be provided on both sides of the street when the minimum lot size in the development is smaller than two acres and the development is located within two miles of a school, regardless of road classification (N.J.C.A. 5:21-4.5). Since there is no comparable set of statewide standards establishing requirements for nonresidential developments, the circulation element to the municipal master plan can provide further guidance regarding where and when sidewalks and walkways should be constructed and how they should be designed. A municipality should identify locations for proposed sidewalks on the Circulation Plan Map within the municipality's adopted Master Plan.

New sidewalk. Image: VTC

Best Practices for Maximizing the Life Expectancy of Sidewalks

Sidewalks, like other transportation infrastructure, are a major public investment. It is less costly to maintain sidewalks than to undertake major repair and reconstruction. Also, regular preventive maintenance of a sidewalk can extend the lifetime of the facility and delay the need for more extensive repairs. The average service life of a sidewalk depends on a variety of factors including environmental conditions, materials, design standards, construction quality and maintenance standards. If best practices are undertaken throughout the life cycle of the sidewalk, the expected service life is 80 years for concrete and 40 years for asphalt. Best practices for maximizing the life expectancy of sidewalks include:

- Providing adjacent trees with adequate room for root growth. This includes selecting the appropriate tree species for the proposed planting space to avoid conflicts later with sidewalks and other infrastructure.
- Providing good drainage across the sidewalk.
- Care should be taken to keep a sidewalk, walkway, or trail ice-free once snow has been shoveled. Using rock salt to melt ice should be avoided. Rock salt can damage concrete sidewalks, especially when they may not have been installed correctly or sufficiently cured. Instead, municipalities should advise property owners to use an environmentally friendly ice-melt pellet or de-icer.

Winter Maintenance Practices (snow removal, sanding)

Winter maintenance of pedestrian facilities is both a safety and an accessibility issue. Icy or snow-covered sidewalks are dangerous, especially when pedestrians are forced to walk in the street.
In New Jersey, the responsibility of routine maintenance and snow and ice removal is typically assigned to the abutting property owner by local ordinance. Some cities and boroughs do operate programs to remove snow from downtown streets and similar areas that have inadequate space to store snow.

Winter Maintenance Management Plans

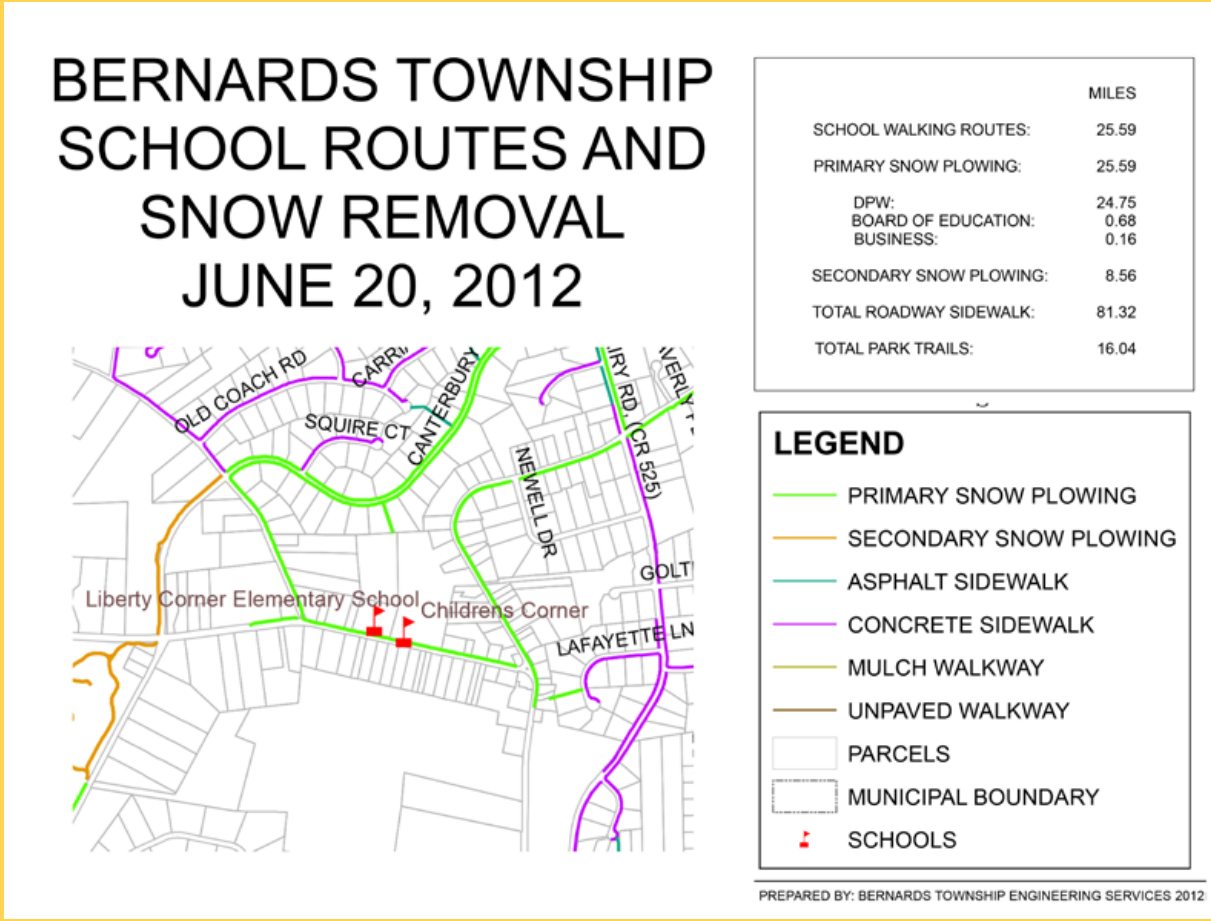
Local governments should adopt and routinely update winter maintenance–management plans or amend municipal emergency-operations plans to address and delineate responsibilities for snow/ice removal—including pedestrian and bicycle facilities. Having a plan for snow and ice removal can also help prevent and minimize exposure to liability.

While snow and ice removal is typically the responsibility of the abutting property owner in New Jersey, municipalities should consider taking on snow removal responsibility along identified routes to school. Municipalities should also inform residents of any designated school routes and give priority to helping those who need assistance with snow removal or other sidewalk repairs, such as elderly or disabled residents.

Snow blocks the child's path. Image: VTC

Spotlight: Township of Bernards School Routes and Snow Removal Policy

In August 2012, the Bernards Township Committee adopted a resolution delineating and formalizing the Township's Policy on Walking Routes to School, as well as setting primary and secondary priority status to the various routes to be cleared of snow and ice by the Township's Department of Public Works (Resolution #2012-0355). The Department of Public Works is responsible for snow and ice clearing of approximately 25 miles of primary sidewalks and approximately 8 miles of secondary sidewalks throughout the Township. The policy also dictates that the routes will be periodically re-evaluated and recommendations will be made if needed. The primary and secondary locations to be cleared are shown on the "Bernards Township School Routes and Snow Removal Map" dated June 20, 2012. A PDF of the full map is available at www.bernards.org/resolutions/2012/2012-0355Map.pdf



Example from Bernards Township School Routes and Snow Removal Map

Snow Removal Ordinances

Many local governments require property owners to remove snow/ice from an abutting sidewalk after a winter storm. The laws regarding snow and ice rules and regulations vary across the state. Municipalities may have different time limits on how long sidewalks can remain covered and where the snow can and cannot be shoveled. Often these ordinances and/or maintenance plans do not fully address the need to clear snow from other adjacent pedestrian facilities, such as curb ramps, crosswalks, pedestrian islands/medians, transit stops/shelters, walkways on bridges, and year-round trail systems. In addition, higher mounds of snow frequently develop at street intersections, blocking crosswalks and reducing intersection sight distance.

A pedestrian is stranded in the street by snow blocking the midblock crosswalk. Image: The RBA Group

Curb ramps are rarely shoveled out, severely restricting mobility for disabled persons and making street crossings hazardous for all pedestrians. Abutting property owners often fail to remove snow from this area, and usually ordinances requiring property owners to shovel snow do not address the crosswalk area. Local ordinances should be revised and updated to address all pedestrian facilities and not just the sidewalk.

Liability

New Jersey sets different standards of liability depending upon whether the abutting property is owned by a private individual or a public entity and, if private, whether the use of the abutting property is commercial or residential. While commercial property owners have a duty to inspect for and remove snow and ice on the adjacent sidewalk, in general, a residential property owner or occupant is not liable for damages resulting from a failure to clear ice or snow from the sidewalk in front of the property. However, if the hazardous condition was aggravated by the action of the owner or occupant when clearing the sidewalk of snow or ice, the owner (or occupant) may be held liable.[1]

Nevertheless, it is recommended that residents clear the snow and ice from the sidewalks and paths along their property. If being a good neighbor is not incentive enough,

It is important to clear all bicycle and pedestrian related facilities of snow. Image: The RBA Group

many local municipalities have ordinances that require property owners to remove snow and ice, and failure to comply with these ordinances can lead to a fine. It does not lead, however, to an imposition of liability for injuries sustained by pedestrians unless the property owner or occupant had done a poor job at clearing the sidewalk of snow or ice.

Enforcement of ordinances requiring private-property owners to clear adjacent sidewalks within a certain time period is often lax or non-existent. Local governments that fail to maintain accessible pedestrian facilities or enforce local ordinances may be at greater risk for liability or non-compliance with the ADA. To minimize risk and control this exposure, it is critical to ensure that if a jurisdiction has a sidewalk snow-removal ordinance, the ordinance is consistently enforced.

[1] VTC and Charles Carmalt, PP, AICP, **Constructing, Maintaining and Financing Sidewalks in New Jersey (2006), 63.** http://njbikeped.org/portfolio/constructing-maintaining-and-financing-sidewalks-in-new-jersey/

Examples of Winter Maintenance Management Plans

Bloomington, Minnesota

The City of Bloomington has a comprehensive Snow Response Program. As part of the program, city ordinances are referenced that address responsibilities for clearing snow from pedestrian facilities. While the city ordinance requires property owners to clear snow and ice from sidewalks, over 250 miles of sidewalks in the city are cleared by the city's Park Maintenance Department. The city code specifies a priority system that requires Park Maintenance to clear pedestrian facilities as follows (City of Bloomington, n.d.):

- **First priority:** School walking areas, heavily used wheelchair-accessible areas, and high use areas along main roads
- **Second priority:** Walks expanding out from a school and along major roads
- **Third priority:** Residential and industrial areas

It is clearly communicated that extreme weather events and long-term snowfall may cause the city to return to high priority areas before getting to the lower priority areas. Also, Bloomington's plan notifies citizens to keep obstructions—such as trash cans—off sidewalks so crews can complete their job more efficiently and quickly (City of Bloomington, n.d.).

www.ci.bloomington.mn.us/cityhall/dept/pubworks/mainten/strmain/snow.htm#notjust

Longmont, Colorado

The City of Longmont's Snow- and Ice-Control Plan provides guidelines for snow operations deployment, deployment levels, personnel responsibility, snow-plowing priorities, safety and training considerations, use of equipment, and environmental protection. The plan emphasizes the need to ensure motorist safety, cost effectiveness, environmental benefits, and operational logistics.

Deployment levels are based on factors such as expected accumulation, air and ground temperature, potential for back-to-back storms. Deployment levels consider the need for pedestrian accessibility in downtown areas and school zones. A snow team leader is assigned to each anticipated snow event and is responsible for deploying snow teams based on the category for four deployment levels as follows (City of Longmont, 2010):

- **Level 1** – Little or no accumulation is predicted; no back-to-back storm events predicted—limited deployment of on-call staff is on an as-needed basis.
- **Level 2** – 0- to 6-inch accumulation predicted; possible back-to-back storms—Entire maintenance staff required for 12-hour on and 12-hour off shifts. Fleet mechanics are placed on-call, and one sanitation truck is ready for deployment. Limited and/or targeted snow removal operations are possible along the Downtown area and school zones based on conditions.
- **Level 3** – 6- to 15-inch accumulation predicted; regardless of multiple storm events—Entire snow team is called on for duty. Other city staff assistance and private contractors may be required. School zones are cleared curb-to-curb; walk-to-school routes may be cleared by staff/contractors.
- **Level 4** – 15-inch or greater accumulation; additional accumulation expected—Entire snow team is called on for duty; additional city staff and private contractors are called for duty; school zones cleared curb-to-curb by staff/contractors and walk-to-school routes cleared by staff/contractors. A level 4 deployment is triggered by:
    - Declaration of snow emergency by city manager
    - Activation of city's emergency operations center where "incidence commander" takes charge of operations

http://longmontcolorado.gov/departments/departments-n-z/transportation/street-maintenance/snow-removal

Chapter 14: How to Start Improving Your School Zone

The safety, health and well-being of children are the concern and the responsibility of the entire community. Parents, school districts, city and county officials (including engineers, planners, public works and law enforcement) all play a role in student pedestrian and bicycle safety.

Community members must work together to develop and maintain walk and bike to school plans. This partnership approach to student pedestrian and bicycle safety benefits the entire community. Improving walk and bike to school routes with added sidewalks, widened shoulders, bike lanes or other improvements creates a safer environment for everyone —24 hours a day. Working collaboratively with community partners ensures that pedestrian and bicycle safety concerns can be addressed by a variety of solutions including engineering improvements, law enforcement efforts, and education. This section provides an overview of the steps involved in the creation of a comprehensive student pedestrian and bicycle travel plan.

Find a Champion

Start by taking the reins or finding an individual or group to take up the challenge to improve your school's travel environment.

Seek Out Your Regional SRTS Coordinator

Safe Routes to School Regional Coordinators from eight Transportation Management Associations (TMAs) throughout New Jersey are ready, willing and able to offer advice and assistance in kicking off Safe Routes to School programs in communities from all 21 counties. Find your SRTS Regional Coordinator at www.saferoutesnj.org/about/regional-coordinator-tmas/

Prepare a School Travel Plan

A key question to be answered before moving forward is: Does your school have a Safe Routes to School (SRTS) Travel Plan? If yes, collect as much information as you can based on previous SRTS efforts and build on those resources. You should also look to see what issues and solutions have been previously discussed and determine their status before moving forward. If you do not have a School Travel Plan, enlist your Regional Coordinator to help you create one.

Image: VTC

Host a Kickoff Meeting

Once your champions have been identified and taken on the commitment to making changes, host a kickoff meeting for the project. Invite others who feel the same to form a task force. Be proactive about including people or organizations that can positively contribute to the process of implementing your vision such as your local department of public works. Together, craft your vision, establish next steps and assign responsibility.

Kickoff Meeting for the JFK School Travel Plan in Jamesburg, NJ. Image: The RBA Group

Define your Goal

Creating a vision at the onset will lead to the setting of goals and determining strategies for implementing them. Use your vision statement as an expression of what you want to see in the long-term as a result of the task force's work. Your goals and strategies for implementation should be geared towards achieving that outcome.

Map the Issues

The first order of business for the task force should be to inventory the areas in the vicinity of the school, especially the primary access routes used by students. Task force members should walk the school neighborhood, identity the major issues and document all findings through photos or maps. There are many tools available to evaluate the walkability and bikeability of the school zone. Before completing any walking or bicycling assessment, you will need to obtain two maps: A School Neighborhood Map and a School Site Map. These maps can be easily generated online at www.saferoutesnj.org/resources/stp/maps/ .

Once your mapping exercise has been completed, identify high priority problem locations on a map and ask others in the community to contribute their thoughts on the issues.

Sample Vision Statement

The Anytown Safe Routes to School Task Force will strive to bring awareness of the Safe Routes to School Program to the schools, identify infrastructure improvements necessary to make walking and bicycling to school safer, encourage more students to walk or bike to school through activities and events, enforce traffic laws, and incorporate walking and bicycling education into the school curriculum.

Image: The RBA Group

Consult with Others to Generate Solutions

There are numerous ways to approach solutions to school zone design. Create one central list that starts with the high priority locations and works its way down to lower priority locations. Work with local experts, law enforcement or municipal, county and state engineers to identify strategies. Separate your strategies into short-term, low-cost solutions, and long-term, high-cost solutions.

After creating your prioritized list of improvements and locations, and discussing it with members of your community, you may find that some issues can be easily solved with either short-term or temporary fixes. For instance, if speeding is identified as an issue you may want to install a speed radar feedback sign in the school zone as one of your solutions. However, there are some solutions that will require going through a more in-depth process. If changing the speed limit within the school zone is proposed as a solution, speeding must be verified through a speed study initiated by the police department. The results of that study will determine, for example, if a change in the speed limit is warranted or if the introduction of traffic calming is necessary to support a lowering of the speed limit. If missing sidewalk is an issue, the municipal engineer will need to be contacted and included in the conversation (if they are not already on your task force). In general, anything that requires construction will require additional study and can take time to secure funding, create the design, and obtain the proper permitting necessary for construction.

Example of an Action Plan Matrix

Montclair Safe Routes to School Program

Safe Routes to School Travel Plan – Bradford Elementary School

Action Plan Matrix – Bradford School Neighborhood Specific

Timeframe Definition	Cost Definition
Short-term = less than 3 months	**Low** = Less than $2,000
Mid-term = between 3 to 6 months	**Medium** = between $2,000 and $10,000
Long-term = longer than 6 months	**High** = more than $10,000

No.	Action	Partners	Timeframe	Cost
Lead Entity: Principal				
1	Create a school pavement "quilt" to define the drop-off zone along College Avenue	Township/Board of Education/PTA	Mid-term	Low
2	Order and install "No Idling Zone" signs around the school	Township/NJDEP/ Board of Education	Short-term	Low
3	Install "Pull up" signage in the red zone to reinforce use of the entire curb length	Township/Board of Education	Short-term	Low
4	Invite NJ TRANSIT to give their SAFETY RULES! Assembly presentation every year	Board of Education	Short-term/ ongoing	Low
5	Utilize the school website to advance Safe Routes to School safety campaign/messages	Board of Education	Short-term/ ongoing	Low

Decide What, When and How to Collect and Measure

You will not be able to measure change in the school environment if you do not know what to look for and where to look for it. Set up mechanisms to establish your baseline so that you will be able to measure impacts before, during, and after changes have been made to the school zone. Information on traffic volumes, speeds, crashes, yielding percentage at crosswalks, and number of students walking or biking to school can all be relevant to measuring impact resulting from infrastructure improvements.

Pneumatic tubes can record speeds and volumes. Image: The RBA Group

Use the Results of Initial Efforts to Inform Next Steps

Take the results you have identified and interpret the findings to inform the next steps. For example: Since the implementation of the use of temporary in-roadway "Stop for Pedestrian" crossing signs, has there been an increase in the percentage of motorists who stop for pedestrians in that particular crosswalk? If your results show a dramatic increase, it may show that a permanent installation is warranted. If there is no change in the percentage of motorists stopping for pedestrians, then you may want to consider other solutions for this site.

Be an Original

Transportation and safety issues are unique to each school zone. It is important to recognize that while your school zone and its physical attributes (crosswalks, traffic control signs, etc.) may resemble that of many other neighborhood streets, they are not the same. Your school zone is distinctive and should be designed to be the place where the safety of student travel takes precedence over a roadway's functional classification. The solutions proposed and implemented should be customized to fit your school neighborhood, population and priorities.

Start Small

Creating any type of program that is volunteer-based or minimally funded is difficult. Instead of jumping in headfirst, take your time and start when and where you feel most comfortable. To build momentum, start with the little wins or the low-hanging fruit that you know can easily be attained in a short amount of time.

Bring in Reinforcements

Utilize available resources to build your program such as the TMAs and SRTS Resource Center. They currently offer assistance in hosting bicycle and pedestrian events such as a walk/bike to school day, organizing educational events such as bike safety lessons, and developing planning and policy documents such as a walkability assessment.

Keep Your Eyes on the Prize

All your planning efforts are intended to lead to one ultimate goal: improving the overall access and safety conditions for families walking and biking to school. If implemented in conjunction with other programmatic strategies, these physical improvements will elevate walking and/or biking as safe, healthy and convenient options to getting to school.

Spotlight: Montclair SRTS Engineering Improvements at the Renaissance at Rand School

In 2011, Montclair showcased new changes to the school environment around the Renaissance at Rand School just in time for the new school year. The improvements made to the intersection and school zone were the result of a federal grant received for the school (previously named Rand) neighborhood in 2007. The Rand School was one of the three schools to participate in the NJDOT Safe Routes to School (SRTS) Pilot Program (www.nj.gov/transportation/community/srts/demonstration.shtm) when it debuted in 2005. As a result of the program, the school developed a travel plan highlighting recommendations for a variety of engineering improvements and programmatic activities. Schools that have completed a school travel plan are eligible for extra points in the application for NJ SRTS infrastructure grant funding.

These infrastructure improvements included new sidewalk, concrete driveway aprons, corner handicap ramps, high-visibility crosswalk striping, in-pavement "Stop for Pedestrians" crossing signs, solar powered pedestrian-scale lighting and radar speed monitor signs, and installation of new fences.

This construction was the final phase of a three-part SRTS program grant at Rand School which included educational and encouragement programs for the students, increased police enforcement in the school zone during school hours, and enhancements to pedestrian safety along and across the streets within the school zone. In 2009, Montclair applied and received federal funding to make similar improvements to school zones throughout Montclair.

Newly installed solar powered lighting along North Fullerton Avenue. Image: Arterial

Newly painted high visibility, continental crosswalk and in-pavement "Stop for Pedestrian"crossing sign. Image: Arterial

Newly installed concrete pad and bike rack at the front entrance of the school. Image: Arterial

Where to Find Funding

There are several places to seek funding for SRTS infrastructure improvements including:

Federal Programs

There are several federal programs under which funding for infrastructure improvements would be eligible.

The Transportation Alternatives Program (TA or TAP) is the largest federal source for trail and greenway funding under MAP-21, the most recent federal transportation funding law. Transportation Alternatives is a combination of two core active transportation programs from SAFETEA-LU—Transportation Enhancements and Safe Routes to Schools (SRTS). While Transportation Alternatives projects are federally funded, the funds are administered by the New Jersey Department of Transportation and the state's three Metropolitan Planning Organizations (MPOs). Funding categories include: bicycle and pedestrian facilities; safe routes for non-drivers; abandoned railroad corridors for trails; environmental mitigation activity including storm-water mitigation; and community improvement activities including vegetation management, historic preservation, archaeological activities related to transportation projects, and boulevard construction.

To the right is a table listing possible infrastructure improvements and corresponding federal programs under which they would be eligible for funding. Note: All federal funding comes with specific procedures and requirements so be sure to check eligibility prior to completing the application.

Regulatory Process

In New Jersey, the creation of school-related traffic regulations pertaining to mid-block crosswalks, school speed limits, bike lanes, etc. must follow a regulatory process. This regulatory process is set forth in N.J.A.C. 16:27-4.1 through N.J.A.C. 16:27-5.1.

Desired Improvement	Program Eligible for funding under MAP-21
Crosswalk, new or retrofit	TAP, CMAQ, STP, HSIP, NHPP, UZA, 5310
Sidewalks, new or retrofit	TAP, CMAQ, STP, HSIP, NHPP, UZA, 5310
Traffic calming	TAP, STP, HSIP
Police patrol	TAP, UZA
Trail/highway intersection	TAP, CMAQ, STP, HSIP, RTP, NHPP
Bicycle parking facilities	TAP, CMAQ, STP, UZA, SGR, 5311, BBF
Spot improvement program	TAP, CMAQ, STP, HSIP
Bicycle lanes on roadway	TAP, CMAQ, STP, HSIP, NHPP, UZA,
Trail/highway intersection	TAP, CMAQ, STP, HSIP, RTP, NHPP
Signal improvements	TAP, CMAQ, STP, HSIP, NHPP
Curb cuts and ramps	TAP, CMAQ, STP, HSIP, NHPP, UZA, 5310
Paved Shoulders	TAP, CMAQ, STP, HSIP, NHPP, UZA
Safety brochure/book	CMAQ, STP, RTP, UZA, 402

Abbreviation	Program
402	State and Community Highway Safety Grant Program
5310	Enhanced Mobility of Seniors and Individuals with Disabilities
5311	Formula Grantsfor Rural Areas, Rural Transit Assistance Program, and Public Transportation on Indian Reservations
BBF	Bus and Bus Facilities
CMAQ	Congestion Mitigation and Air Quality Improvement
HSIP	Highway Safety Improvement Program
NHPP	National Highway Performance Program
RTP	Recreational Trails Program
SGR	State of Good Repair Grant Program
STP	SurfaceTransportation Program
TAP	Transportation Alternatives Program
UZA	Urbanized Area Formula Program

NJ SRTS Program

Federal funding is periodically made available for infrastructure projects through the NJ Department of Transportation. Infrastructure projects may include the planning, design and construction or installation of sidewalks, crosswalks, signals, traffic-calming and bicycle facilities. Visit the NJDOT website for more information, www.state.nj.us/transportation/community/srts/funding.shtm

County and Municipal Funding

Many low-cost engineering solutions such as new signs or fresh paint on crosswalks can easily be incorporated into the work plan for a local or County public works department. Do research to identify existing funds that are currently targeted to transportation, safety or health issues - like Capital Improvement Projects and operating budgets.

Health and Physical Activity Funds

Mini-grants from the health, transportation and environmental fields can also be a good potential source of funding. Given the sporadic nature of the solicitation cycle for these types of funds, subscribing to listservs such as the NJ Safe Routes to School e-mail discussion list may help to keep up with these types of opportunities. Sign up for the listserv at www.saferoutesnj.org/whats-happening/listservs/

Additional Funding Resources

- *Funding Pedestrian and Bicycle Planning, Programs and Projects* is a compilation of funding sources by the NJ Bicycle and Pedestrian Resource Center; bikeped.rutgers.edu/ImageFolio43_files/gallery/Funding/Documents/VTC_2009_Funding_Bicycle_Pedestrian_Projects_NJ.pdf
- The National Center for Safe Routes to School Funding Portal provides links to potential local, private, and federal funding information and a search-able database of federally funded SRTS programs; www.saferoutesinfo.org/funding-portal

Complementing Infrastructure Changes with Programmatic Efforts

International Walk-to-School Day in West Orange. Image: The RBA Group

Too often SRTS programs are limited to infrastructure improvements. Engineering solutions should be the result of a comprehensive planning process, such as a SRTS Travel Plan that follows the 5E approach (Engineering, Enforcement, Education, Encouragement and Evaluation). Any physical improvements to the school zone should be accompanied by programmatic improvements.

- Participate in International Walk to School Day and National Bike to School Day.
- Introduce bike, pedestrian and traffic safety into the curriculum.
- Utilize the school website to relay important information about changes to the school zone.
- Use the school handbook to include clear information about expected, safe behavior within the school zone for motorists, walkers, bikers, and bus riders. Ask that both the parent/guardian and the student sign-off that they have read the information.
- Create and hang banners near school entrances that include the rules of the school zone.
- Create a school-wide pledge that asks parents and students to walk, bike, drive, take the transit or the school bus safely.
- Ask the school board to pass a policy that supports walking and bicycling to school.
- Address walking and bicycling to school as a way to meet daily physical activity goals as part of your school wellness policy.
- Conduct school traffic counts.
- Host safety forums/presentations.

Complete Streets and Safe Routes to School - Perfect Together!

Complete streets are designed and operated to enable safe access for all users – pedestrians, bicyclists, motorists and transit riders of all ages and abilities. Instituting a Complete Streets policy ensures that agencies routinely design and operate the entire right of way to enable safe access for all users.

A community with a Complete Streets policy considers the needs of children every time a transportation investment decision is made. Roads near schools and in residential neighborhoods are designed and altered to allow children, the most vulnerable users of our streets, to travel safely. Complete Streets and Safe Routes to School have numerous synergies, so it is only natural for them to work together to advocate for and to strengthen the practice of safely walking and bicycling to and from schools and throughout our communities.

Ocean Avenue through Deal, NJ is an example of a Complete Street in a suburban setting with wide sidewalks and street lighting appropriate to the context. Image: Parsons Brinckerhoff

Main Street in Califon, NJ is an example of a Complete Street in a more rural setting. Image: Parsons Brinckerhoff

There are several organizations and resources in New Jersey that can help with developing and implementing local Complete Streets policies, including:

- The New Jersey Bicycle and Pedestrian Resource Center collects all adopted Complete Streets policies around New Jersey.
- A short video, The Complete Streets Movement in NJ, highlights municipalities that have embraced Complete Streets.
- The Making Complete Streets a Reality Guidebook includes information on developing Complete Streets policies, updating local policies and procedures and more.
- The New Jersey Department of Transportation Complete Streets website includes information on success stories, workshops, etc.