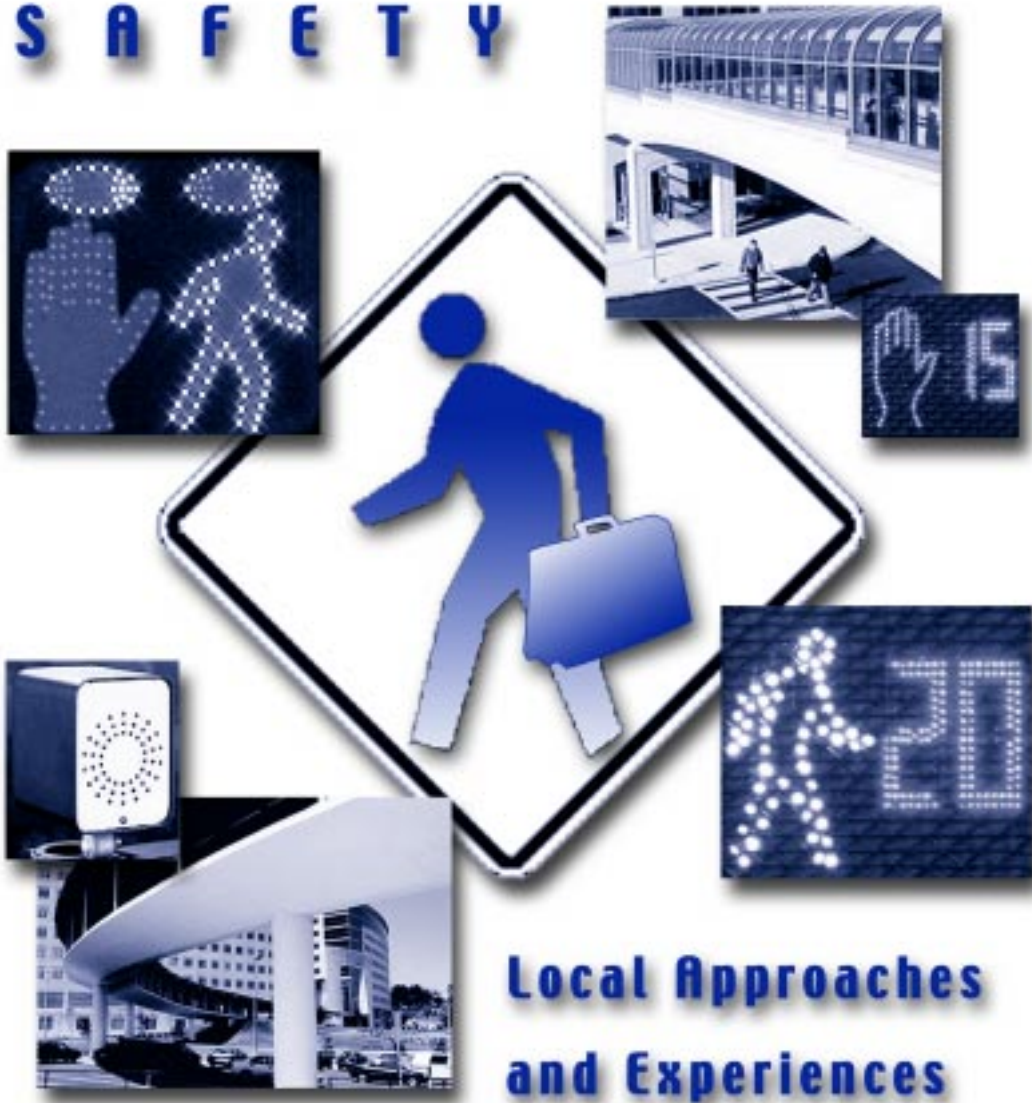


# P E D E S T R I A N S A F E T Y



## Local Approaches and Experiences

A Public Technology Incorporated White Paper



# P E D E S T R I A N S A F E T Y

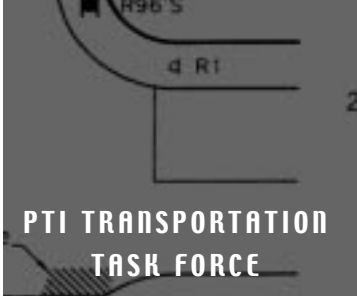


## Local Approaches and Experiences

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US Department  
of Transportation  
Federal Highway  
Administration



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Patti Boekamp, Chair  
Deputy Director, Engineering  
& Capital Projects Department  
City of San Diego, CA  
Albuquerque, NM  
Atlanta, GA  
Austin, TX  
Bellevue, WA  
Boston, MA  
Chicago, IL  
Cincinnati, OH  
Clark County, NV  
Columbus, OH  
Dallas, TX  
Denver, CO  
Everett, WA  
Fairfax County, VA  
Fort Worth, TX  
Hennepin County, MN  
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Lake County, IL  
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Miami-Dade County, FL  
Milwaukee, WI  
Monroe County, NY  
Montgomery County, MD  
New York, NY  
Overland Park, KS  
Philadelphia, PA  
Phoenix, AZ  
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Portland, OR  
San Antonio, TX  
San Diego, CA  
San Francisco, CA  
San Jose, CA  
Sarasota County, FL  
Scottsdale, AZ  
Seattle, WA  
Tucson, AZ  
Washington, DC

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# INTRODUCTION

The rate of pedestrian deaths in many American communities is on the rise. It is clearly a national problem. These deaths currently represent over 10 percent of all roadway fatalities annually. Pedestrian injury or death is rarely the sole fault of the pedestrian. Drivers drink. They speed. They fail to anticipate or adjust to densely trafficked areas, school zones, construction sites and

senior citizen locales. Too often, drivers have a sense of entitlement built into their expectation of speed and trip duration. There is "road rage." There is aggressive driving. Studies have shown that driver patience begins to deteriorate after a two-minute wait at a traffic signal. At some notoriously dangerous intersections, drivers wait for up to eight minutes for left-turn signals to turn green. Drivers ignore rules, laws and common sense.

While pedestrians and drivers are equally at fault for the high frequency of pedestrian-vehicle crashes, it is the pedestrian that suffers the most in these crashes. Pedestrians cross against traffic signals. They cross mid-block. Some drink and linger near roads. Children play along busy streets. Joggers run on the road. People ignore rules, laws and common sense. In 2001, more than 4,700 pedestrians were killed in crashes with vehicles in the U.S. Overall, for every eight vehicle accidents, there is one involving a pedestrian injury or death.

Pedestrian accommodations and safety may be minimally addressed in the design and construction of roads and streets in many locales. Those who design roads, as well as traffic engineers, share responsibility. Many streets lack sidewalks. For example, in Tampa, Fla., one study showed that for 3,000 miles of streets, there were only 1,800 miles of sidewalks. Where sidewalks exist on just one side of the street, excessive street crossing results, posing danger for the crossing pedestrian. Where no sidewalk exists, the pedestrian is forced to forego a trip, take a much longer route, or walk without buffer alongside vehicles where the posted speed may be excessive for the circumstances.



Photo - Todd Mansel Dailey News

**Horror on Corner** | A pedestrian lost her right leg yesterday after being hit by a sport-utility vehicle making and illegal turn on Park Ave. at 34th St. Thersa Cerlo, 40 was taken to Bellevue Hospital, where she was listed in critical condition after the 2:45 p.m. accident. The SUV driver, Jonathan Carrington of Pomona, N.Y., was charged with driving while impaired and vehicular assault, police said. He also hit a cab.

Pedestrians, including seniors, may be faced with the prospect of lengthy walks to the nearest controlled intersection. Mid-block crossing is rampant. A Florida traffic planner is quoted as saying, "Highway design encourages walkers to make bad choices."

Better choices with better outcomes are available. Throughout the United States, cities and counties from Tampa, Fla., to Seattle, Wash., are experimenting and deploying new methods and technologies to make streets safer. State and federal agencies often support these efforts through funding, research and information sharing.

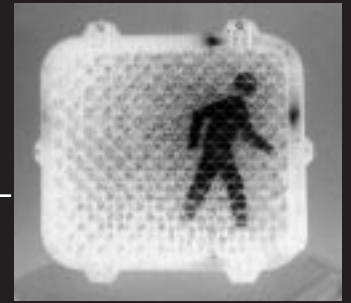
This white paper aims to facilitate the efforts of local government agencies and elected officials seeking to improve the pedestrian experience in their communities and/or reduce the risks, damage and loss associated with pedestrian-vehicular crashes. It highlights approaches, creative solutions and technologies being used and tested in localities from Tucson to Quebec City, from Pinellas County, Fla., to Los Angeles County, Calif. Local experiences, from what works to what does not, as well as programs in progress, are presented to help local officials better understand the path toward improvements in pedestrian safety. Thus, a realistic and accurate portrayal is provided.

While this paper provides brief descriptions of technologies in use in the highlighted cities and counties, it is not intended to be a compilation of technical data on available technologies. Several excellent summaries exist and they are referenced within the document.



# CHAPTER 1

## What is the Pedestrian Safety Problem?



If one believes the periodic newspaper article, the pedestrian safety problem is disturbingly large.

A recent headline in New York City's Daily News proclaimed "RUN FOR YOUR LIFE" in huge letters. In small print deep within the accompanying article about Gotham's pedestrian safety, the reader learns that "auto-related pedestrian deaths declined more than 50% in New York City between 1989 and 2001." While New York City's 183 annual pedestrian deaths are tragically high, the scale of the problem and the significance of recent progress in NYC and elsewhere needs to be brought into focus.

The following statistics and observations are provided to establish a common point of reference and focus. According to National Highway Traffic Safety Administration statistics compiled by the Center for Urban Transportation Research in Tampa, Fla.:

- Nationwide, a pedestrian is killed every 101 minutes in the U.S. and a pedestrian is injured every eight minutes.
- Most deaths occur in urban areas, at non-intersection locations, during normal weather conditions.
- The national rate for pedestrian fatalities is 1.9 per 100,000 population. The rate in Florida is 3.6 per 100,000, almost double the national rate.

According to Federal Highway Administration statistics available on the web at <http://safety.fhwa.dot.gov>:

- Fatal pedestrian-vehicle collisions occur most often between 6 p.m. and 9 p.m.; Friday and Saturday are the most common days for fatalities. More than half of pedestrians over age sixteen, killed in nighttime crashes, had blood alcohol levels at or above 0.1 percent. Male pedestrian deaths are double the number of female pedestrian deaths.
- Deaths among the elderly are high. FHWA statistics show that people aged 65 and over have twice the rate of pedestrian deaths per 100,000 population, as do younger people. At age 80 and older, the death rate for men is triple that of men 74 and younger.
- Since 1975, pedestrian deaths per 100,000 people decreased by 43% from 3.5 per 100,000 nationwide. Some argue that this positive result stems from lower levels of walking, while others argue that improvements have occurred.



Fatal pedestrian-vehicle collisions occur most often between 6 p.m. and 9 p.m.; Friday and Saturday are the most common days for fatalities.



People aged 65 and over have twice the rate of pedestrian deaths per 100,000 population as do younger people.

Statistics help focus the debate. They tell part of the story. They measure extremes and averages. They provide benchmarks. This report describes types of pedestrian crashes, approaches communities are taking toward reducing them and the technologies that are being deployed.

## What Crashes or Conflicts are Most Common?

**“Darting out”** into traffic is one of the most common and dangerous actions pedestrians take that result in pedestrian-vehicular crashes.

**Crossing at intersections** is often dangerous due to the risk from drivers turning right on red or on green without yielding.

Pedestrians are at great risk in mid-block crossings from what is termed a "multiple threat crash." This occurs on a multi-lane road when a vehicle in one lane yields to the pedestrian. The pedestrian begins to cross and is hit by a vehicle in another lane whose driver did not see the pedestrian.

**False sense of security**, a controversial matter, is considered a significant source of risk to the pedestrian. In several jurisdictions, including Seattle, Wash. and Los Angeles, Calif., markings are being removed from specifically delineated roadways after careful study. The strong belief of planners in these mostly western communities is that pedestrians enter these intersections insufficiently mindful of traffic. Drivers, too, are often unfamiliar with the pedestrian crosswalk laws or are not looking out for pedestrians. The belief is that without the markings and crosswalks, pedestrians would either cross elsewhere or be much more careful. In either case, planners argue, the intersection would be safer.

Many pedestrian crashes occur on unlit rural roads. Lighting, often missing in rural areas, is a key component of pedestrian safety. In addition, rural roads often lack proper sidewalks.

Many pedestrian crashes also occur in urbanized areas with inadequate shoulders or non-existent curbs. Sprawl and urbanization brings pedestrians into areas and along roads lacking the accommodations that properly allow for safety.



Rural roads often lack proper sidewalks.

## CHAPTER 2

# New and Not-So-New Technology Solutions



Despite the fact that pedestrian safety is one of most politically charged transportation issues in many communities, up until recently, technologies, particularly Intelligent Transportation Systems (ITS), have focused minimally on solving pedestrian safety problems. With congestion rates on the rise, pedestrian safety concerns are also growing. Applying the following technologies will not solve all pedestrian problems, but they can help communities rise to the challenge.

### Automated Pedestrian Detection Devices

FHWA conducted a preliminary study of automated pedestrian detection devices in Los Angeles, Calif.; Rochester, N.Y.; and Phoenix, Ariz. ("Automated Pedestrian Detection Used in Conjunction with Standard Pedestrian Pushbuttons at Signalized Intersections"), and found that such devices improve pedestrian safety. According to the study results, the addition of automated pedestrian control devices decreased by 81 percent the number of pedestrians crossing during a "Don't Walk" signal, and dramatically reduced conflicts between pedestrians and vehicles. Although the study was too brief to demonstrate a reduction in pedestrian crashes, it is logical to assume that an improvement in "safe behavior" would reduce crashes, fatalities and injuries.

### Animated Pedestrian Signals

Animated "eyes" are pedestrian signals used for parking garage exits, crosswalks with uncontrolled approaches, stop signs and passive railroad crossings.

The Institute of Transportation Engineers (ITE) Journal of February 1999 reported highly successful results from the placement on traffic signals of animated "eyes" that scan from side to side during the walk phase. Lab tests found that 200 out of 200 participants understood the purpose of these devices, i.e., that the signal had eyes and that their purpose was to remind pedestrians to look for traffic. Test results showed a marked decrease in the number of pedestrians who failed to look for vehicles in the intersections.

FHWA reviewed the tests and the field experimentation. In May 2002, FHWA proposed in the Federal Register that "the Animated Eyes be added to the MUTCD as an optional use device."

### Audible Signals

Audible signals that make "chirping" and "beeping" have been installed in Milwaukee and elsewhere. These signals are designed so that their volume will



Audible signals provide assistance to visually impaired pedestrians while their variable sound level enables a minimum of disruption for the neighborhood.

rise and fall with the ambient noise level of the intersection and vicinity. Vibrotactile devices are being developed that allow the visually impaired individual to detect the signal at an intersection through a handheld device. These signals provide assistance to visually impaired pedestrians while their variable sound level enables a minimum of disruption for the surrounding neighborhood.

### **Back-Up Beepers**

Highly urbanized, suburban Montgomery County, Md., has addressed a pedestrian safety issue with a noise pollution angle, according to County Department of Environmental Protection noise program director Tom Ogle. The county experimented with a number of alternatives to the noisy beepers presently in use for construction, fire, sanitation, rescue and other municipal and institutional vehicles.

Ogle's preferred solution is a military-grade video camera mounted at the rear of the vehicle. The camera is connected to a flat panel LCD monitor mounted in the cab. This gives the driver an unobstructed rear view (satisfying the OSHA requirement) without an audible alarm. Noise is reduced and, according to the manufacturer, "losses from backing and turning accidents are minimized."



Countdown Pedestrian Display – Quebec City

### **Blank-Out No Right Turn Signs**

This has been used in Burlington, Vt., and other cities to increase pedestrian safety. The No Right Turn symbol sign is illuminated only in certain portions of the signal cycle. This selectively prohibits right turns on red and also prohibits right turns on a portion of the green interval. Pedestrian crossing is facilitated without the necessity of posting a full-time No Turn on Red sign that would be likely to result in driver non-compliance.

### **Countdown Pedestrian Displays**

Jurisdictions throughout North America are using or experimenting with traffic cycle-defined countdown signals. The signals are included in the *Manual on Uniform Traffic Control Devices (MUTCD)*. The devices are now deployed in an experimental mode in Chicago, Boston, Montreal, Quebec, Washington, D.C., and many other locales. Most pedestrians surveyed find their message readily understandable. They have many proponents. In Chicago, concerns have been raised and answered about driver anticipation. In New York, there is concern that these devices would induce pedestrian crossing during the flashing Don't Walk phase.



Countdown signals have been added to the *Manual on Uniform Traffic Control Devices (MUTCD)* as an optional use device.

FHWA review of evaluations from Monterey, Calif., and other jurisdictions suggests no evidence of driver anticipation or speeding up. There was evidence of pedestrians being induced into the crosswalk during the flashing Don't Walk signal, however, there was also evidence showing that there were fewer pedestrians

in the crosswalks at the end of the flashing Don't Walk phase than there would have been at a typical signal.

FHWA reviewed the results of roughly thirty jurisdictions that have experimented with these signals and since then, countdown signals have been added to the *Manual on Uniform Traffic Control Devices (MUTCD)* as an optional use device.

### **Escalators and Bridges (Clark County, Nev.)**

Through corporate funding and generous space, Las Vegas has managed to have it both ways. Large volumes of pedestrians and enormous numbers of cars are moved along arteries and major streets at the same time in two levels. Cars travel at grades. In many places, pedestrians move at elevated levels through a system of escalators and pedestrian bridges that cross Las Vegas' major thoroughfares to connect one casino or hotel to another. Of course, many pedestrians continue to use sidewalks and attempt mid-block crossings.

### **Flashing Crosswalks – In-Roadway Warning Lights**

In the city of Kirkland, Wash., a Seattle suburb, there is concern that the pedestrian push-button activated In-Roadway Warning Lights (IRWL) do not allow the motorist sufficient time to adjust to the presence of pedestrians in the crosswalk. According to Gerry Wilhelm, formerly Seattle's City Traffic Engineer, the "runway light" system may not work adequately in all places. A clear line of sight and adequate distance between warning beacon and crosswalk is advised.

Los Angeles County has successfully installed an In-Roadway Warning Light system at City Terrace and Hicks Avenue. According to FHWA, evidence from a number of California locations shows that IRWLs are effective in increasing "the percentage of motorists stopping for pedestrians" and increasing "braking to slow down farther in advance of the crosswalk."

### **GIS Applications**

Though a high priority for pedestrian and bicycle planners, the mapping of all pedestrian crash locations through Geographic Information Systems (GIS) has been accomplished by only a few jurisdictions. Resource availability issues, inadequate police records, inter-agency data sharing issues and address matching problems have impeded efforts. The Surface Transportation Policy Project claims that useful pedestrian location data is lacking in 22% of the pedestrian deaths it analyzed.

In Milwaukee, Wisc., ALL pedestrian crashes are screened and analyzed by the Department of Public Works, though the threshold for a serious accident, according to the Milwaukee Police Department is an injury, a death or \$1,000 or more in



Large volumes of pedestrians and enormous numbers of cars are moved along arteries and major streets at the same time in two levels



Safety planning will be enhanced as more jurisdictions utilize Geographic Information Systems (GIS).

damages. Milwaukee's DPW is working with the Police Department to improve the usefulness of the data collected at the accident scene.

Other jurisdictions, including several high-crash counties in Florida, are working toward uniform police reporting of crash data and greater accuracy and precision in locating accident sites. Often police and emergency personnel record the closest intersection as the crash site. This can be misleading and unhelpful to traffic planners trying to assess mid-block accidents, risks and remedies. Police car-based Geographical Positioning System (GPS) devices can help rectify this.

Safety planning will be enhanced as more jurisdictions utilize GIS and as the existing GIS technology becomes more complete. Accurate accident location data will enhance engineering and policy efforts to improve pedestrian safety.

### **Intelligent Speed Adaptation**

This European-sponsored study which took place in Sweden sought to demonstrate that technology and properly designed vehicles can dramatically increase road safety. The Intelligent Speed Adaptation System (ISA) utilizes a combination of roadside transmitters, Geographical Positioning Systems (GPS) with a digital map, and specialized equipment on test cars designed to keep the driver from exceeding speed limits through active support. "Active support" is triggered when a driver tries to drive faster than the maximum permitted speed for a given stretch of road. A slight resistance is activated in the accelerator pedal.

The Swedish National Road Administration ([www.isa.vv.se](http://www.isa.vv.se)) conducted large scale trials in Bodange, Lidkoping, Lund and Utnea during 1999 and 2002, observing the testing of over five thousand vehicles on both urban streets and national highways. The project sought to test the concept that the "road transport system could be designed in such a way that the consequence of human error would not result in road accidents entailing death or serious injury."

Some of the survey results from the trial showed that drivers approached intersections at a somewhat lower speed, as well as a clear decrease in speed violations at all speed limits.

### **Leading Pedestrian Signals**

By delaying the green phase for turning motorists even a few seconds, pedestrians cross more easily and with greater safety. Rochester, N.Y., in Monroe County, has instituted a lead pedestrian phase at one intersection. In Milwaukee, Wisc., the delay chosen was 1-2 seconds, a duration that helps pedestrians but leaves cars idling longer. The limited duration was chosen to have a minimal effect on clean air standards in this non-attainment community. St. Petersburg, Fla., with a high number of senior citizens, uses a three-second start-up.

Many observers believe that using Leading Pedestrian Signals, combined with other signal or intersection treatments, is a highly successful approach to the reduction of pedestrian-vehicle conflict at intersections.

## Pedestrian Scrambles

Dubbed Pedestrian Scramble or Barnes Dance, these intersections have traffic signals with an all-direction crossing phase for pedestrians. This technology application elicits numerous and varied strong opinions.

They have been:

- Used in Las Vegas and removed due to "pedestrian confusion."
- Used in Pasadena, Calif. (Los Angeles County), where they are highly successful.
- Deployed in downtown Phoenix at three locations, but were removed "due to complaints from motorists about the resultant absence of synchronization and long delays, and from pedestrians about excessively long waits."
- Used in Cincinnati, Oh., at a three-way intersection with at least one two-way operation. The verdict is "delays and inefficiencies" from the regional traffic officers.
- Used in Montgomery County, Md., where a number of them were eliminated. Reasons given for these removals include both "capacity constraints" and pedestrian displeasure with waiting. One pedestrian scramble still exists. New pedestrian safety initiatives may prompt a return of these devices.
- Used in San Jose, Calif., at its heaviest pedestrian demand intersection in early 2002 with dynamic No Right Turn signs.
- Used in Boston, Mass., with pedestrian-only phase at many signalized intersections. Irregular street patterns in a crowded downtown result in heavy volumes of conflicting turning movements. Many complaints are received from area pedestrians when the Boston Transportation Department (BTD) periodically converts intersections to standard, concurrent, phasing.

## Red Light Cameras

Many U.S. jurisdictions that have state laws enabling them to deploy red light cameras use them to effectively reduce red light running at selected intersections through real and dummy camera installations. In most jurisdictions, the installation of red light cameras results in decreases in red light running as shown in before-and-after studies. The decreases exceed forty percent in many cases, and have also led to reduced numbers of intersection crashes and injuries.

Increased use of red light cameras is an important component of New York City's corridor-long strategy to reduce crashes on Queens Boulevard, dubbed "the Boulevard of Death."



Crossing at intersections is often dangerous due to the risk from drivers turning right on red or on green without yielding.



Decreases in red light running as a result of the installation of cameras exceed forty percent in many cases.

For extensive information on red light cameras and the overall issue of photo enforcement, please see the Public Technology, Inc. publication *Is Photo Enforcement for You? A White Paper for Public Officials*.

## **Resources for Technology Solutions**

A number of nationally recognized organizations have cogently summarized and described, in various media, the long list of possible technological applications pertaining to pedestrian safety. Listed here are a few:

1. In particular, the Pedestrian and Bicycle Task Force of the Institute for Transportation Engineers has published *Alternative Treatments for At-Grade Pedestrian Crossings*. On pages 11-18 of this 125-page publication, ITE identifies 71 treatments showing their estimated cost, effectiveness, and locations. Author Nazir Lalani classifies the treatments along the following categories:
  - a) Major street crossings at uncontrolled locations
  - b) Residential street crossings
  - c) Signal-controlled crossings for pedestrians
  - d) Signalized intersection crossings
  - e) School-related crossings
2. For technical specifics on pedestrian safety technologies, the Pedestrian Chapter (13) in the *ITE Traffic Control Handbook*.
3. FHWA's Pedsmart website, at [www.walkinginfo.org/pedsmart](http://www.walkinginfo.org/pedsmart).
4. FHWA-sponsored CD-ROMs. These are the *Pedestrian/Bicycle Safety Resource Set* and *Safer Journey: Interactive Pedestrian Safety Awareness*.
5. *The Pedestrian Facilities Users Guide* [www.walkinginfo.org](http://www.walkinginfo.org), edited by Charles Zeeger.
6. For planners and engineers seeking to improve roadway safety conditions through accurate categorization of crash data, there is a FHWA software program known as the *Pedestrian and Bicycle Crash Analysis Tool (PBCAT)*. Information on PBCAT is available through [www.walkinginfo.org/pc/pbcats.htm](http://www.walkinginfo.org/pc/pbcats.htm).

The six sources listed above, among numerous others, summarize and detail the technologies in use and "in experiment" aimed at increasing pedestrian safety. For technical detail, the ITE publications and the web site are highly recommended. The descriptions below should serve as a brief summary of the technologies referenced in the Community Response case studies.

## CHAPTER 3

# Non-Technological Solutions



The most common, non-technological approaches to pedestrian safety fall into three categories: engineering, enforcement and education.

### Engineering

Engineering approaches to pedestrian safety include a wide array of changes to the physical environment instituted by local jurisdictions and states. These changes are designed to enhance safety by:

- Separating pedestrians and vehicles in public spaces such as streets, roadways and curbs
- Establishing rules for who uses shared space and when
- Making it easier for both pedestrians and motorists to see objects, people or vehicles in and near the roadway.

**Sidewalks, curbs, medians and traffic islands** represent distinct components of the physical environment or streetscape. They serve to define and channel the use of the public space, distinguishing those parts of the physical environment that are the exclusive space of the pedestrian from those spaces that are primarily for vehicles. Striping, in yellow or white, in solid, dotted, double or zebra lines, serves to emphasize the physical boundaries. In doing so, striping is also designed to give the motorist and the pedestrian clear visual cues as to where he or she belongs.

**Signage**, usually a physical object providing safety-related information, is a hybrid of engineered pedestrian safety techniques and classic educational efforts to let street users know what to do.

Prevalent and improved **lighting** is a well-established technique for improving roadway and pedestrian safety. Statistics show a high rate of fatal accidents on unlit, rural roads. Improved lighting increases pedestrian safety by reducing numbers of pedestrian crashes while also potentially reducing street crime.

The introduction of **traffic circles** has reduced speed at intersections as well as collisions. Seattle, Wash., estimates a reduction of seventy crashes per year and major savings in loss and damage. Some estimates claim an eighty percent reduction in accidents.

Based on studies in San Diego, Calif., in the 1970s and in Los Angeles in the 1980s, the city of Los Angeles has become a national leader in the removal of



Striping is designed to give the motorist and the pedestrian clear visual cues as to where he or she belongs.



Improved lighting increases pedestrian safety by reducing numbers of pedestrian crashes while also potentially reducing street crime.

"unwarranted" crosswalks. The prevailing view supported by extensive investigation and evidence suggests that, in many cases, pedestrians are safer without crosswalks when traffic volumes, prevailing speeds and the number of lanes are insufficient for a traffic signal. In some case, crosswalks can increase the hazard by inducing a false sense of pedestrian security.



Enforcement is a key component of any safety program but it is often not available in the right place at the right time in the preferred volume.

## **Enforcement**

Enforcement is a key component of any safety program, but it is often not available in the right place at the right time in the preferred volume. In short, no jurisdiction can afford to have police officers at all hazardous crossings at all times. Few localities even try to post police officers at school crossings at school arrival and drop-off hours. Enforcement is a limited and expensive resource.

Still, jurisdictions seek to apply enforcement selectively. Where speed signboards are used informationally, they are often supplemented with police enforcement activities.

New York City, infamously, threatened for a while to have the police issue "jay-walking" tickets to reduce illegal pedestrian crossing in crowded intersections. Recently, the New York City Council approved laws aimed at enforcing prohibitions against bicyclists (over age 12) on city sidewalks.

Red light cameras are a tested means of location-specific, around-the-clock, enforcement of red light running laws. Cameras take pictures of offenders. Tickets are mailed to the violators. Though the voices of protest are loud, these devices generally reduce intersection crashes by forty percent and have eighty-plus percent community support.

## **Education**

Many experts and observers agree that educational efforts are the preferred long-term approach to overall pedestrian safety. Children, in particular, benefit from efforts aimed at their unique needs and understanding. In Tucson, Ariz. the city's DOT created the *Zack Rabbit and Lenny Lizard's Guide to Pedestrian Safety*. This coloring book teaches young children about the rules of the road through wild animals familiar to these southwestern kids.

Other educational efforts include the FHWA's extensive support for websites, information centers, CD-ROMs, roadshows and other means by which pedestrian safety statistics can be disseminated and communities can learn about pedestrian and bicycle initiatives. Congressional funding through the federal transportation spending acts, such as ISTEA and TEA-21, has allowed communities to create bicycle/pedestrian coordinator positions. These new positions have as their mis-

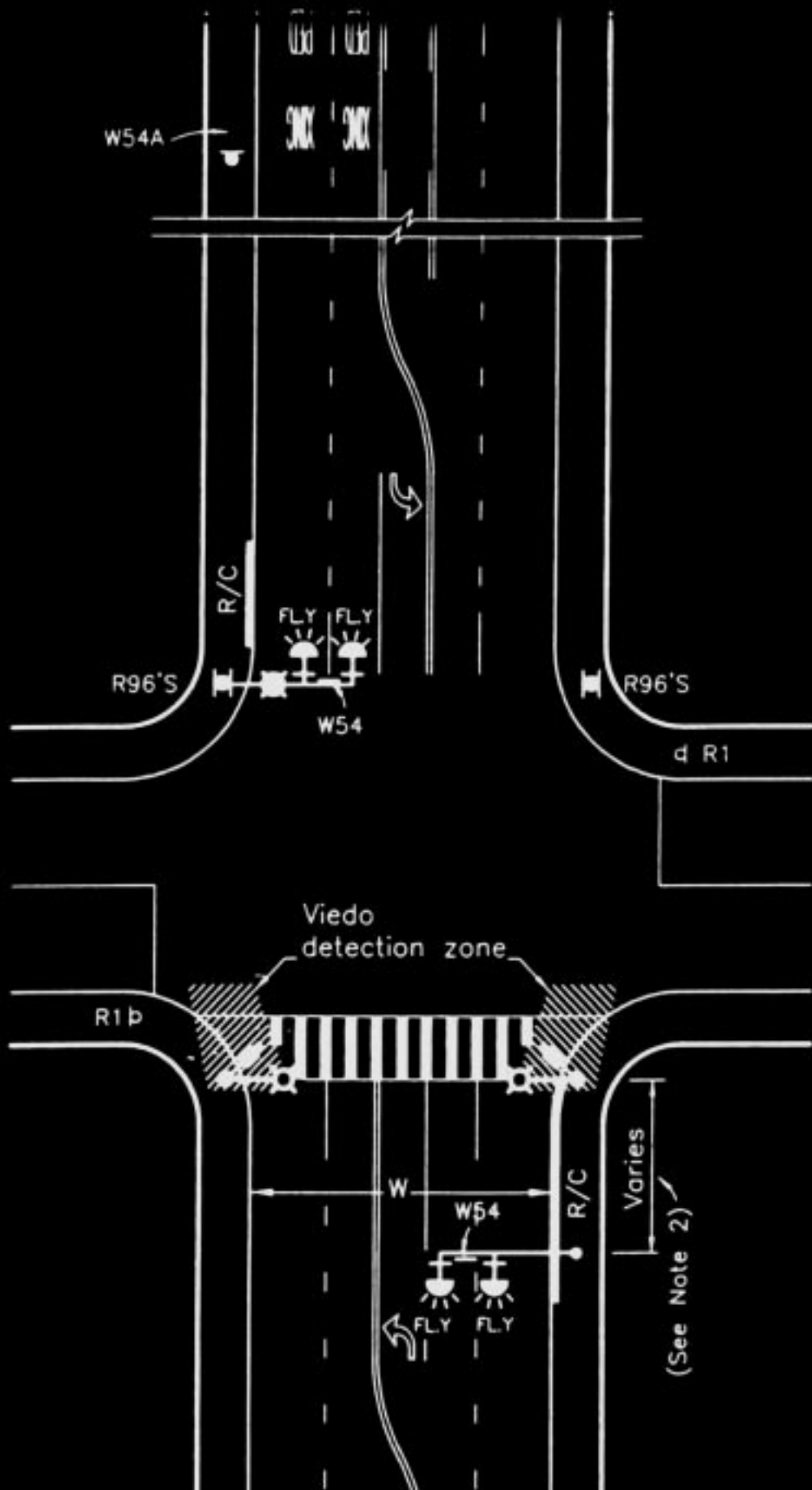
sion the expansion of knowledge and activity pertaining to pedestrian safety, accommodations and bicycle efforts.

Communities often try to enlist their local media in safety efforts. The unveiling of a red-light camera program in Washington, D.C., occurred with great publicity. San Jose's unveiling of its new countdown pedestrian signal also received much press. Media campaigns have their downside, however. The press can distort pedestrian safety "negatives" when they occur, just as they highlight pedestrian safety unveilings and ribbon-cuttings.

Many cities have established websites devoted to pedestrian safety efforts in their communities. In New York, Seattle, Boston, Orlando, Florida and elsewhere, citizens can go online to learn about traffic calming, safety efforts, streetscapes and other programs addressing neighborhoods streets and community interests.



DEF  
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Video pedestrian

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# CHAPTER 4

## The FHWA Approval Process



By Federal law, the *Manual on Uniform Traffic Control Devices (MUTCD)* is the national standard applicable to all traffic control devices used by states, cities, and counties. As the guardian and final arbiter of the MUTCD, the Federal Highway Administration oversees the testing and approval process for new or experimental devices. Transportation entities nationwide use "the Manual." According to the FHWA MUTCD Team, "it is the law of the land." MUTCD states that:

1. Federal law requires traffic control devices to conform to the MUTCD.
2. Jurisdictions wanting to try new devices or different applications of devices not contained in the MUTCD on public roads open to traffic are required to request experimentation approval from FHWA.
3. Jurisdictions that deploy non-MUTCD-compliant devices face the possibility of legal liability in lawsuits if an accident occurs.
4. Experimentation approval by FHWA is usually obtained within 2 months if the jurisdiction submits complete and accurate information and has developed a reasonable plan for how the new device is going to be evaluated to see if it is truly an improvement over existing devices.

The first jurisdiction to request FHWA approval to experiment with countdown signals, for example, was State College, Pa. The request was submitted in December 1995. Since that time, dozens of communities across the U.S. have initiated experiments with similar devices both with and without FHWA approval.

In the words of one federal official, "a good field trial requires several years to obtain statistically significant, before-and-after accident data, and then the results must be reviewed by FHWA to decide whether the new device should be proposed for inclusion into the MUTCD. Then the mandated rulemaking process for changes to be made to this national standard very often takes a year or two to reach issuance of a final rule."

The approval cycle time is often too lengthy to keep up with technological advances. Deployment of new devices by jurisdictions sometimes gets out in front of these processes, the potential liability notwithstanding. FHWA has recognized these problems and has taken two significant steps to improve them.

1. To improve the timeliness and comprehensiveness of evaluations of new devices, FHWA has proposed a "pooled funds study." This approach would

pool resources of FHWA, state and local governments, and other organizations, to review proposed new traffic control devices and conduct evaluations using methods other than field deployment on public streets.

2. To facilitate the deployment of devices "found to be worthy of being added to the MUTCD after evaluation," FHWA proposed that a new "Interim Approval" authority be given to FHWA. With the interim approval, jurisdictions could deploy the new devices without further experimentation or paperwork requirements while the formal federal rulemaking process to amend the MUTCD goes forward. Should the final rule result in non-adoption or some modification in the design of the device, the jurisdictions would have to make the necessary removal or changes to make their deployed devices comply with the final rule.



## CHAPTER 5

# U.S. Cities and Counties: Community Responses



Well-known former U.S. House Speaker Tip O'Neill once said, "all politics are local." So too are pedestrian safety issues and solutions. Communities across the nation have unique experiences with pedestrian safety linked to history, geography and culture. Technologies that work in some cities may not work in others. Crash rates acceptable in some towns would be deemed excessive and politically unsustainable in other locations. Time affects these matters as well. Rapid urban growth into formerly rural areas can have negative impacts on pedestrian safety. The revival of urban cores can change perception regarding the proper and safe balance of vehicle to pedestrian ratios.

Public Technology Inc., through its Transportation Task Force, views the cities and counties as laboratories and examples of efforts nationwide to understand and address the challenges posed to local and state government by the pedestrian safety issue. Cities and counties are the front line. The citizens are theirs, the streets are theirs, the accidents are theirs, the response is theirs and the political responsibility is theirs. This section highlights the challenges, the responses and the net experiences with technology of a dozen locales from coast to coast, from big to small and from growing to shrinking.

### **Boston, Massachusetts**

Boston is a historic city where, rumor has it, the streets of the old downtown were laid out by wandering cattle as they migrated each day from waterfront barns to their grazing area in the "Commons." In that old yet modern city, a team of engineers and planners in the Boston Transportation Department (BTD) confront the challenge of ensuring pedestrian safety on some of the nation's oldest and narrowest streets. They must do this even as the Central Artery Project, the nation's largest highway construction effort, affects motorist and pedestrian traffic throughout the city's historic downtown.

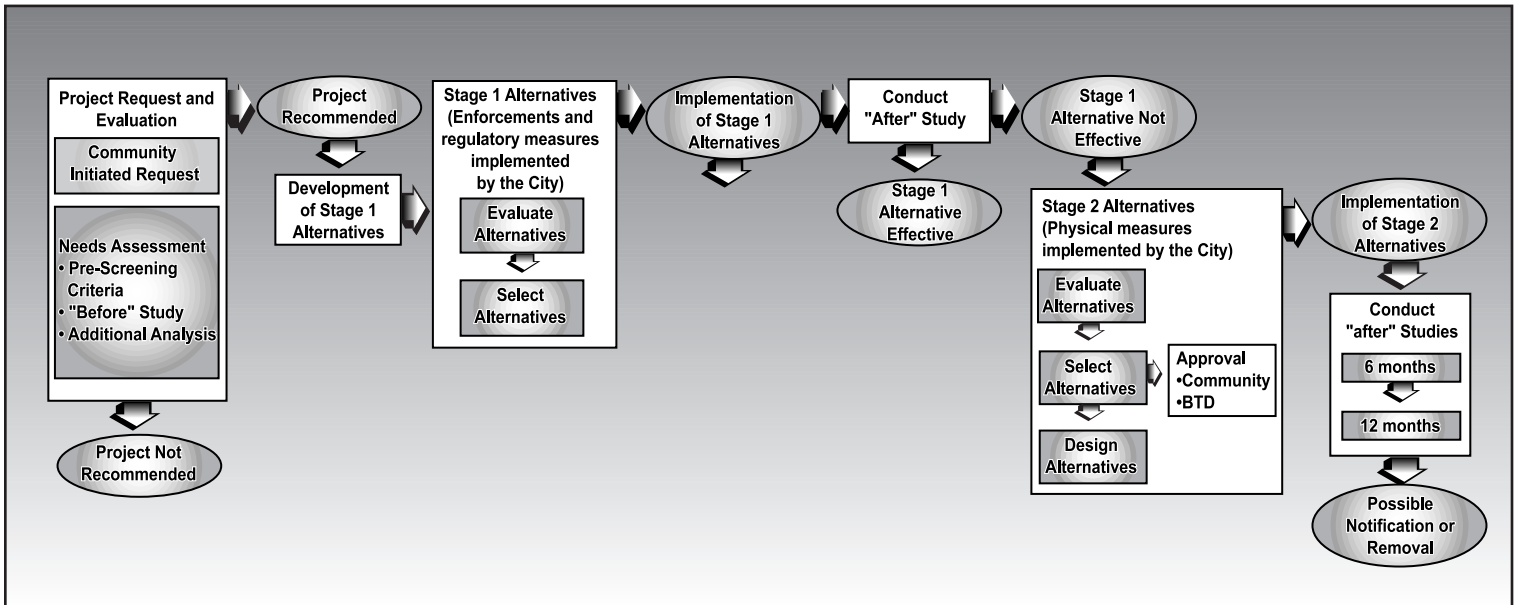
Efforts by the BTD and the city of Boston occur in the context of a Metropolitan District Commission (MDC), which includes dozens of Boston area cities and towns. The MDC holds responsibility for state projects, public works, parks and the roadways and pathways associated with parks. The city of Boston now has almost 800 signalized intersections. Of these, almost 300 are integrated for coordinated operation.

Alfredo Villar, senior traffic engineer, provided an outline of Boston's plan. The plan focuses on "hot spots," new development projects, the impact of new signals and signal relocations as well as the routine warrant analysis process.

BTD has published a report devoted to pedestrian issues known as Access Boston 2000-2010. This report includes several publications such as *Pedestrian Safety Guidelines for Residential Streets (PSG-RS)*, and *The Boston Bicycle Plan*, a public transportation plan and fact book. *The Pedestrian Safety Guidelines* discusses educational, enforcement, regulatory and physical modification efforts.

Also included in the report are technology efforts such as red light cameras, speed trailers, radar guns and flashers to designate school zones. Highest priority for project implementation goes to safety projects near:

- School zones
- Parks and playgrounds
- Community centers
- Senior citizen facilities
- Residentially located transit stations
- Hospitals



**Boston's Pedestrian Safety Guidelines for Residential Streets (PSG-RS)** delineates the course of action for implementing pedestrian safety projects.

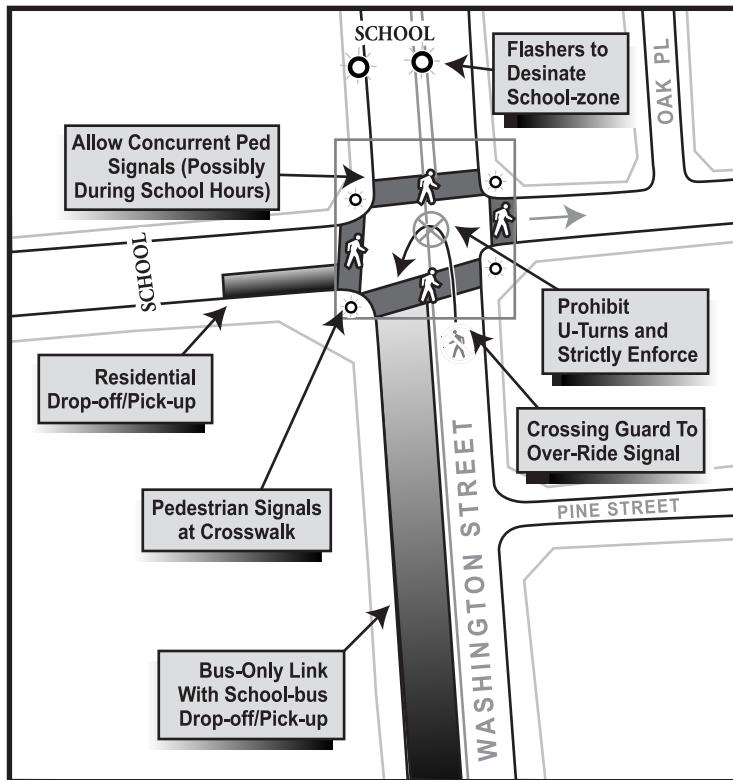
In 1998, Boston's EMS responded to 1,160 motor vehicle-struck pedestrian serious injury incidents. That high level of injuries prompted a "Walk This Way" campaign which reminded pedestrians of the need to wait for the walk signal at busy (and all) intersections. By November of 2000, an 11% decrease in injuries was reported.

## Chicago, Illinois

Asked about pedestrian safety in the Windy City, Chicago's deputy commissioner for traffic, Don Grabowski, focused immediately on safety at Chicago's schools. In a city of three million people, Chicago has roughly eleven hundred and fifty schools including roughly three hundred private schools. Grabowski described a "holistic" School Traffic Safety Program mixing education, technology and traffic calming. Funded by general obligation bonds, Grabowski hopes the program will cover a hundred schools, "fifty, for sure."

The problem at schools, according to Grabowski, is that "people (drivers) do not know when kids are present." Grabowski also knows that kids, being kids, do not always do the safe thing near streets and intersections. Thus, the holistic approach. The approach intends to:

- Isolate and set apart school zones visually and physically
- Make pedestrians feel safer
- Improve engineering and driver safety
- Improve quality of life, including making schools into activity center campuses.



Example of proposed regulatory measures for the Quincy School Area. Source: Chinatown Transportation Study, TAMS Consultants, Inc.

Grabowski produced a graphic showing a hypothetical school with a prototype treatment of signs, markings, speed humps, and speed boards designed to create a clear impression for drivers that they are in a special traffic zone.

Grabowski said that the department's approach stems from the view of Mayor Daley that "schools have become the core element of many communities." Grabowski also noted that elected officials, such as Marianne Smith of the 48th Ward, now stand for pedestrian issues and have their own ambitious pedestrian agenda.



The Boston Police Department uses speed trailers and radar guns to automatically detect and display vehicular travel speeds.

Robert Cyboran, project director, noted that many schools now function 12-14 hours a day due to school-based programs before and after the traditional 9-3 school day. Thus, pedestrian traffic near schools is no longer limited to "school hours." Consequently, speed boards, electronic displays that seek to increase safety by showing passing drivers their speed, could be programmed to be turned on, perhaps by the schools themselves, for special events after school and on weekends.

In addition to school safety, Cyboran emphasized other Chicago efforts to improve safety in residential neighborhoods. He noted that traffic-calming techniques reduce drive-by shootings. Specifically, he said, "by turning some residential streets into cul-de-sacs, high-speed drivers are forced to stay on arterials where they are more susceptible to surveillance and capture." Cyboran spoke of a "managed and engineered environment to mitigate abuses." Chicago's goal is clear—reduce the aggregate number of crashes and the aggregate speed on residential streets.

Chris Krueger, engineer of traffic planning, described Chicago's experience with countdown pedestrian traffic signals, a program that he described as "technically an experiment, though it has been underway for two years." Two Chicago intersections have the countdown signals. One is located at a busy intersection in a residential neighborhood at Ridge Avenue and Glenwood Avenue (45,000 vehicles per day) near a high school. The other, in Grant Park by the Buckingham Fountain, is at the confluence of a major park pedestrian route to a Lake Michigan access point and the heavily trafficked (150,000 vehicles per day) Lake Shore Drive.

Krueger described Chicago's experience with FHWA's experimentation process. He detailed the following steps: proposal, data collection, time period, reporting, field observations, and pedestrian interviews. Chicago aimed "to determine to what extent the countdown pedestrian signal could provide helpful information to pedestrians concerned about safely crossing a busy street."

In requesting authorization to experiment, Chicago's DOT committed to study "driver anticipation," survey pedestrian attitudes, and document before and after results. A pre-installation baseline survey, consisting of five major questions of fifty pedestrians, found that almost 60% of the respondents at the two locations "did not understand the flashing Don't Walk message."

After the installation, Chicago conducted a lengthier survey of more than a hundred respondents, finding out that nearly 80% of pedestrians "understood the countdown pedestrian signal." Roughly 90% of the respondents "felt that the pedestrian countdown signals were easier to understand than the flashing Don't Walk message."

"Driver anticipation" was also studied. The concern was the possibility that drivers would accelerate prematurely by using the countdown as an "early warning" signal. According to Chicago's Krueger, "there was no driver anticipation exhibited at either location."

Interestingly and importantly, senior citizens unanimously rated the countdowns as an improvement. Pedestrians under eighteen were also more likely to rate the new signals favorably than were non-senior citizen adults.

In March of 2002, after the eighteen month experiment, Chicago DOT noted no evidence of driver anticipation and no pedestrian accidents at either location. Since then, two additional intersections were being studied.

## **Los Angeles, California**

If there is a community where meeting the needs of pedestrians and motor vehicles constitutes an ongoing, delicate balancing act, it is the city of Los Angeles. In America's quintessential car town, John Fisher, assistant general manager at the Los Angeles Department of Transportation described his efforts to oversee and ensure pedestrian safety in his 3.7-million-person city set amidst a 16 million-person metropolitan area.

In Los Angeles, in recent years, pedestrian-related accidents were 6.7% of the roughly 40,000 traffic accidents. Meanwhile, pedestrian fatalities accounted for 42% of all fatal traffic-related accidents.

Progress has been made. The current accident rate is 30% lower than the comparable figure for 1990. L.A.'s pedestrian-accident rate is today significantly below the national average and the fatality rate is slightly below the national average.

Mr. Fisher spoke of his efforts to innovate technologically and maintain the city's existing infrastructure and technology in a city of 4,300 signalized intersections spread across 470 square miles. He presented the 23-point L.A. DOT Pedestrian Safety Program, a mix of physical modifications, technology introductions and enforcement efforts.

Among the technology initiatives proposed or being undertaken by LA DOT are:

- Pedestrian signal timing near schools/sports venues – adjustments for time of day and special school events



L.A.'s pedestrian-accident rate is today significantly below the national average and the fatality rate is slightly below the national average.

- Pedestrian signal timing near senior centers – adjustments for time of day and longer crossing times
- Sabbatical pedestrian timing near synagogues – adjustments for Jewish Holidays and automated button pushing
- Devices for the visually impaired – audible signals
- Mid-block pedestrian signals
- Flashing lights embedded in crosswalks – increased visibility at non-signalized intersections
- Smart pedestrian warning – automated triggering of flashing beacons
- Traffic accident record automation
- Video enforcement of hazardous driving near schools

The technology for pedestrian safety effort in Los Angeles has become a cause for both elected officials and the DOT administrators. L.A. city councilmember Jack Weiss announced in February 2002 a "comprehensive traffic and school safety program." His program, announced jointly with the L.A. Police Department and local school officials, promised video enforcement and technologies to minimize conflict at schools during drop-off and pick-up times. Weiss even donated a video camera for the effort.

Meanwhile, the city of L.A. has installed smart pedestrian warning devices at nineteen locations throughout the city. One such device is deployed at a school location at Temple Street and Rosemont Avenue. This location has fluorescent yellow-green signs, street pavement PED XING markings as well as a pedestrian tunnel under the roadway built specifically to minimize the amount of pedestrian/auto conflict during school hours. Of course, mothers with strollers or small children can not easily use the staircases found in such tunnels and many older kids just do not bother.

In that location, on a long sloping hill, the DOT installed a video system that detects "departing motion" in a six-celled grid superimposed over the area where the crosswalk meets both the near and the far curbs. The video is analyzed by computer to determine if the motion in question is that of a "pedestrian initiating a crossing versus that of one who is completing a crossing or one who is not in the crosswalk at all."

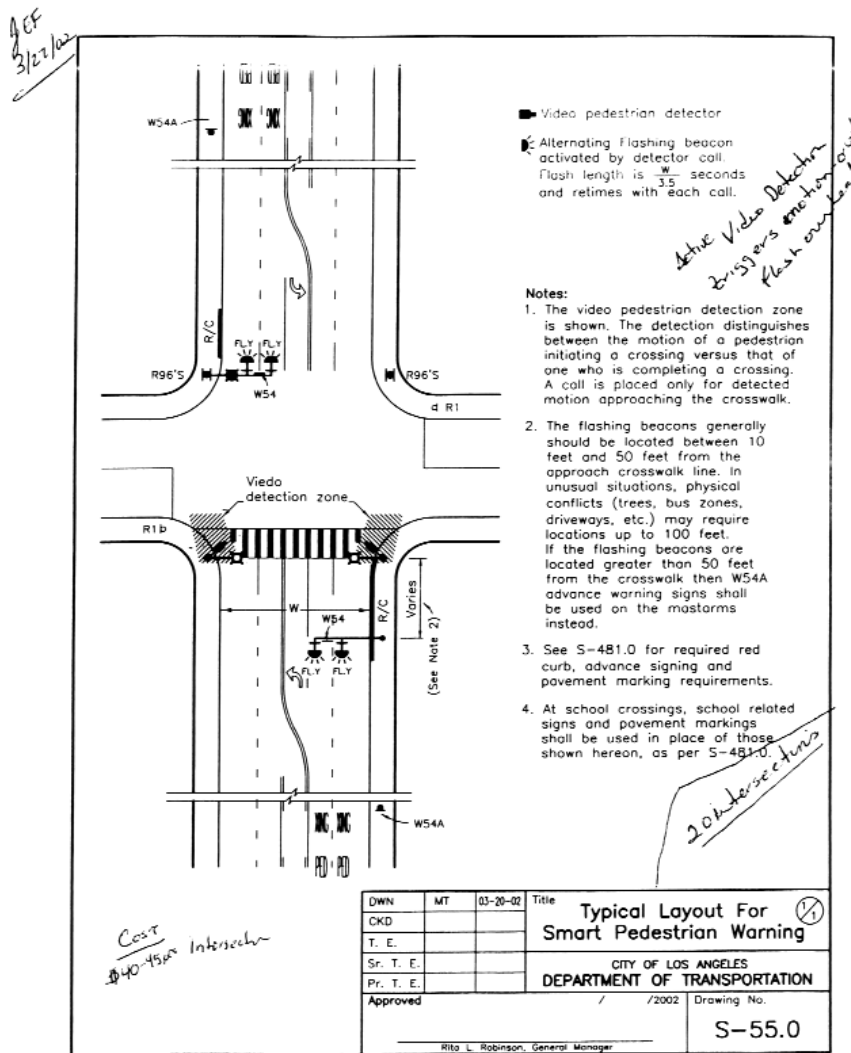
A "call is placed only for detected motion approaching the crosswalk." This "smart" system removes the need for the pedestrian to press the push button. Additionally, since the pedestrian does not see the flashing beacon, no false sense of security in the crosswalk is created.

The "call" triggers overhead flashing beacons generally located between ten and fifty feet from the approaching crosswalk line. In L.A., an experiment is ongoing to

determine the optimal flash. Fisher has developed the "pulse, pulse, pulse, pause" per-second flash, which he believes, is a powerful, noticeable and distinct signal. The intent is to make sure that school crossings occur safely. See diagram below.

The estimated cost of the new video-based detection and flashing signal system is \$40-45,000 per intersection. This is roughly half of the \$70,000 cost for a fully signalized intersection in LA. Fisher's team is continuing to refine the software program to filter out shadows and other visual static that would fool the programming and trigger unwanted flashing signals. A new 2070 traffic signal controller has been installed to manage the advanced signals, properly detect motion and importantly, ensure system performance. For Fisher, "Nothing is worse than a safety device that is not working."

Results from "before and after" studies show a 41% increase in the percentage of motorists that yield to pedestrians in the crosswalks.



City of Los Angeles  
 Typical Layout for Smart  
 Pedestrian Warning

## Los Angeles County, California

In a county comprised of eighty-eight cities and almost fifteen million people spread over 4,000 square miles, pedestrian safety has many facets.

On City Terrace Drive in East Los Angeles, a four-lane arterial street with less than 10,000 cars per day, the county became aware of pedestrian safety concerns near an elementary school and a few blocks away near Hicks Avenue, where pedestrian collisions had occurred. The school location has 1,500 children, of whom 90% walk to school. A street modification project was combined with a scheduled resurfacing project. The striping was replaced with one travel lane in each direction, a 2-way left-turn lane and bike lanes. Bulb outs—physical expansions of the sidewalk into the street—were built into the crosswalks at selected intersections near the school to shorten the "within street" crossing distance. The fluorescent school signs are ubiquitous.

At Hicks Avenue, three non-fatal collisions in a five-year period were followed by a pedestrian fatality which occurred in July 2001, about the same time that an In-Road Warning Light (IRWL) was approved. The completed installation included IRWL embedded in the crosswalk, audible and tactile pedestrian indications and an overhead flasher all activated by a push-button.

On a stretch of Cesar Chavez Avenue (a key local artery) where it crosses Marianna and Gifford there were a number of non-fatal pedestrian crashes. In the vicinity were a junior high school, an elementary school, a large neighborhood park and a senior center. After a request for a traffic signal at Gifford Avenue by a citizen's group was rejected, an appeal led to a crossing guard and the promise of further study. An area study (including both Gifford and Marianna) resulted in a signal at Marianna and the removal of the Gifford crosswalk and crossing guard. Citizen groups again objected. Under political pressure, a pedestrian-activated flashing beacon with Spanish and English audible and tactile pedestrian indications was installed in December 2000 in addition to the traffic signal at Marianna Avenue. There have been no crashes since.

The city of Pasadena has also implemented a smart pedestrian warning device at the intersection of Garfield Avenue and Orange Grove Boulevard. The location sits between a working class residential community and a school and park. Orange Grove Boulevard is a major east-west artery through Pasadena connecting to freeways to the west and south. This installation includes IRWLs and overhead flashers triggered by video detection of "departing motion" in the crosswalk. A new signal controller runs the device.

A most interesting signal installation is found in the Old Pasadena neighborhood of the city of Pasadena. Old Pasadena has in recent years become a shopping,



An intersection in which a Pedestrian Scramble is implemented, allowing pedestrians to cross in all directions including on the diagonal.

strolling, visiting, sitting downtown location similar to the historic downtowns found in eastern locations such as Boston, New York's Greenwich Village and Philadelphia. Pedestrian volumes are extremely high. Big chain retailers have proliferated along with boutique, small shops and cafes.

At the intersection of the heavily traveled commercial and shopping street Colorado Boulevard and the relatively minor cross street De Lacey Avenue, the city has installed a third phase to the traffic signal. During phase three, which is set for twenty-five seconds (comprising both the Walk and the flashing Don't Walk phases), pedestrians are permitted to cross in all directions, including on the diagonal. Motorists on both Colorado and De Lacey Avenue must wait. No "Right on Red" is permitted. This unique phase is commonly called the "pedestrian scramble."

### **Miami-Dade Metropolitan Planning Organization, Fla.**

David Henderson is the MPO Bike/Pedestrian coordinator. He detailed a number of technology approaches in use or under consideration in his fast-growing, dynamic community. Miami-Dade County has 1,600 pedestrian crashes annually, including eighty fatalities.

Through a FHWA grant, the Miami area Metropolitan Planning Organization is working with the University of Florida to "identify high-crash intersections and corridors appropriate for high and low tech engineering countermeasures."

Data for the project has come from a separate joint project by the MPO, the University of North Carolina Highway Safety Research Center and the University of Florida at Gainesville. That project will develop a GIS-based pedestrian crash analysis database. GIS-based crash mapping is viewed as a partial solution to the high rate of pedestrian crashes in eight Florida counties.

The goal of the joint effort is the establishment of a "statewide database of pedestrian and bicycle crash information linked to a state-of-the-art GIS system capable of graphically displaying detailed maps that can be used to analyze a myriad of elements, aiding local jurisdictions in the reduction of crashes."

One problem they encountered was the accuracy and completeness of police crash records, particularly in regard to precise location, if the crash site was not at an intersection. It should be noted that most pedestrian crashes occur outside of intersections. Another problem is the divergence of data collection methods from county to county and sometimes among jurisdictions within counties. A third problem stems from county disagreement over which base map to use. A fourth is the problem of address matching.

Suggested measures to overcome these challenges include the use of GPS devices by police and emergency responders. Also proposed is the use of laptop computers in patrol cars. Systematization and conformity of crash report forms throughout the state is also suggested. This would speed up the availability of crash data and allow the inclusion of digital photos and crash diagrams.

Advantages of a spatial based crash mapping system include the ability to portray high incident locations and corridors and also show proximity of crashes to schools, senior centers and hospitals.

### **Milwaukee, Wisconsin**

Sited on Lake Michigan, the industrial city of Milwaukee (population 650,000) has seen automobile accidents drop from 18,000 in 1995 to roughly 14,000 in 2001. Pedestrian injuries hover around 600 with ten pedestrian fatalities in 2000 and nine in 2001.

Though the absolute fatality numbers are low, Milwaukee's safety director, Pamela Roberts, the city engineer, Jeffrey Polenske and Chris Fornal, an ITS planner, are determined to better understand the causes of pedestrian crashes and equally determined to expand the city's responses.

Among the city's pedestrian safety efforts is a concerted effort to understand the police crash data. Milwaukee analyzes all accident data, not just injury/fatality incidents or accidents that caused \$1,000 or more in damage. When a trend is spotted, action, such as eliminating rush-hour left turns on busy Wisconsin Avenue is taken. Milwaukee has also instituted "leading pedestrian signals" of one or two seconds on Wisconsin Avenue cross streets to lessen pedestrian/vehicular conflict at intersections. These "leading" signals allow pedestrians to enter a crosswalk before turning vehicles enter the same crosswalk.

Milwaukee has also done a great deal of experimentation with audible signals for the visually impaired. Milwaukee has several intersections with audible-capable

signals that provide a beeping/chirping sound alerting visually impaired pedestrians to the change of signal. The devices, estimated to cost \$7-10,000 per intersection, are located in "places heavily used by the visually-impaired community."

According to Polenske, Milwaukee is committed to establishing "walkable communities." Using funding from a federal transportation program aimed at improving congestion and air quality in cities with air quality problems, Milwaukee is identifying specific locations, corridors and neighborhoods for streetscape and safety improvements.

Milwaukee makes electronic speed display boards available to its neighborhoods on request. Participation of neighborhood groups and businesses is sought. The speed boards are deployed for a week at a time and are sometimes backed up by enforcement.

## **New York, New York**

New York, New York is arguably the nation's capital of pedestrians. Ensuring that the millions of people using the city's streets each day do so safely is a feat of engineering, enforcement, education and creativity. Still, in a "good" year there are roughly 200 pedestrian/bicycle deaths in the five boroughs that comprise this city of eight million people.

Always on a grand scale, the city is currently replacing all 11,300 of its signalized intersections with the pedestrian symbol signals known in the trade as "man/hand." New York is also installing \$30 million in light emitting diodes (LEDs) in the traffic signals.

Faced with a high number of pedestrian crashes on Queens Boulevard, a high speed, heavily traveled, east-west artery, the city has taken a corridor-long, multi-dimensional approach. Red light cameras have been installed to reduce red-light running at selected intersections. Signal cycles have been lengthened to facilitate pedestrian crossing of the wide boulevard. Electronic speed boards have been deployed along long straight stretches to alert drivers to their excess speed. By converting a traffic lane to a parking lane, DOT engineers reduced the avenue width usable to the motorist, affording extra protection to pedestrians. This narrowing also serves to slow motorists. Finally, pedestrian fencing was added, reducing mid-block crossings by pedestrians.

In a city with almost constant conflict between the high levels of crossing pedestrians and the high level of cars, buses, and taxis, getting buses to successfully make left turns is a challenge. Steven Galgano, NYC DOT's executive director for engineering and the city's Transit Authority developed a unique turning system for a famously crowded intersection at 34th Street and Seventh Avenue (between Macy's and Madison Square Garden). The system enables a transponder device



Always on a grand scale, the city is currently replacing all 11,300 of its signalized intersections with the pedestrian symbol signals known in the trade as "man/hand."



In a “good” year there are roughly 200 pedestrian/bicycle deaths in the five boroughs that comprise New York City.

(EZPASS) that is located on all buses serving a given route to communicate with a traffic signal at the 34th and 7th intersection. When an antenna located 50-100 feet from the intersection’s traffic signal picks up the signal that an approved bus is nearing the intersection, a left-turn arrow is displayed allowing the bus to enter the intersection. Conflicting traffic and pedestrians are presented with a red light or DONT WALK indication. Signs state boldly "Only Buses May Turn Left."

To assist New York City’s many senior citizen pedestrians, Galgano uses signal cycle changes, adjusting the length of the Walk/flashing Don’t Walk phase to accommodate an estimated three feet per second walking pace rather than the standard four feet per second pace. Such adjustments are particularly important when seniors need to cross the city’s wide arteries including Eastern Parkway, the Grand Concourse and Queens Boulevard.

While Galgano has tested many pedestrian technologies, he is wary of high tech solutions to New York’s many user conflicts. For example, he believes that the countdown in the "Don’t Walk" phase of countdown signals will induce increased crossing. Fearing a false sense of safety, Galgano, a DOT veteran, is also cautious when it comes to in-road warning lights at mid-block locations near schools.

## **St. Petersburg, Florida**

Michael Frederick is the manager for neighborhood transportation in the Transportation Department of St. Petersburg, Fla. St. Petersburg belongs to a metropolitan area that includes parts of Pinellas, Hillsborough and Sarasota Counties. Pinellas is the most densely populated county in Florida. Hillsborough still has some highly rural farming areas. The cities of Tampa and Clearwater lie within the metropolitan area. Route 19, which bisects Pinellas County, has a history of high levels of pedestrian crashes.

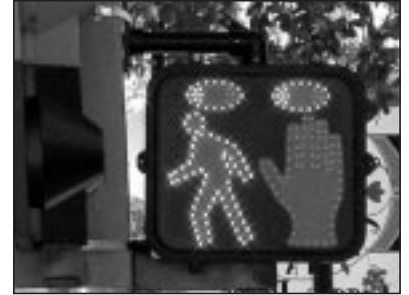
Frederick attributes that record to rural redevelopment. Pedestrians and bicyclists now live and travel alongside heavy-volume, high-speed roads, which for many years were traveled by high-speed vehicles that considered the area to be rural and largely unpopulated. Motorist/pedestrian conflicts have dramatically and fatally increased in these newly densified locales.

In Hillsborough County, many of the pedestrian deaths also occur in high-speed rural areas, often involving migrant workers. Drinking and lack of proper lighting or adequate sidewalks are all contributing factors in this area.

Frederick’s St. Petersburg is experimenting with a number of pedestrian safety technologies including:

1. Mid-block smart electronic devices at crosswalks.
2. Lead pedestrian intervals, three-second all-red phase for vehicles, allowing pedestrians to enter crosswalks unimpeded by turning cars.

3. Animated, blinking blue (scanning) eyes that move from left to right and back are used at 20 signalized intersections in the pedestrian signals. These devices are designed to make pedestrians more aware of movements by vehicles from either side.
4. A half signal (part signalized, part stop sign intersection) is installed between a shopping center and a senior center. This provides signalization as warranted and a control where a signal is not warranted.
5. A microwave sensor crosswalk warning system is deployed at a mid-block crossing on Central Avenue between 32nd and 33rd Streets. The sensor detects pedestrian presence in a crosswalk and triggers an overhead warning signal to motorists.
6. Implementing the PBCAT (Pedestrian Bicycle Crash Analysis Tool) to categorize pedestrian and bicycle crashes with vehicles by type, time of day and location with the purpose of reducing crashes in the future.



St. Petersburg, Florida, uses “animated eyes” at around 20 signalized intersections.

In St. Petersburg, 44% of pedestrians killed from 1994-1998 were 65 years old or older. Half of these elderly pedestrians were 80 or older.

## Seattle, Washington

Gerald Willhelm, a thirty-year veteran of the Seattle Transportation Department (STD) described a "half-signal" deployed near Seattle's northern boundary. This device is used to signalize the pedestrian crossing on an intersection's major street while the minor street is controlled by a stop sign. The safety benefits of this device to pedestrian and motorist are contended. FHWA "disallowed this signal installation decades ago," believing it to be "confusing to the motorist" and a generator of pedestrian-vehicular conflict. On the other hand, this device helps keep traffic levels low on minor streets which would become traffic alternatives without the control, a popular matter for many communities. Seattle's accident rate at these half-signal intersections is now one accident every three years. Unfortunately, statistics were not available for the prior period.

Seattle has made use of numerous traffic circles in lieu of traffic signals or four-way stops. These circles force motorists to slow down as they, in effect, traverse or turn in an intersection without causing the inefficiency to throughput caused by stop signs and traffic signals, i.e., making motorists stop and wait when no other vehicles are present.

## Tucson, Arizona

Tucson is a fast-growing city of 500,000 in a metropolitan area of 800,000 people. Though its pedestrian crash rate is low, Tucson has a goal of using education and engineering "to watch our pedestrians like a hawk." Tucson's pedestrian safety program won the Institute of Transportation Engineer's annual award in 2001.

Richard Nassi, transportation administrator for Tucson's Department of Transportation, described several of the technological applications now deployed in Tucson. He noted that so-called pelican, mini-pelican, puffican, toucan, half-signal and hawk-type signal configurations were all in use.

Nassi is particularly pleased with the results from the HAWK beacon device. The device is push-button activated at mid-block crossings. The overhead signal which flashes yellow, then solid yellow and then an alternating red, in the manner of a stopped school bus, is off unless activated by a pedestrian. After six months, motorist yielding reached 93%. Two years later, the yielding behavior exceeded 93% as measured by a University of North Carolina, Highway Safety Research Center Study. Nassi believes the "wigwagging" red lights are readily noticed and an important safety component.

FHWA has noted that the beacon device, as deployed by Tucson, was not in conformance with the MUTCD. FHWA has also noted that Tucson "failed to seek FHWA experimentation approval for its use."



## CHAPTER 6

# Advocacy Groups, Think Tanks, and Universities



Supplementing the pedestrian safety efforts that occur at the federal, state and local levels is the work of universities, think-tanks and advocacy groups. These independent organizations have made valuable contributions that:

1. Identify the nation's least safe intersections;
2. Explore the dynamics of hazardous pedestrian/vehicle conflict locations; and
3. Provide a clearinghouse for pedestrian safety information.

*Mean Streets*, an annual report from the pedestrian safety advocacy group, Surface Transportation Policy Project (STPP), has identified the ten most dangerous metropolitan areas in the country in terms of safety for pedestrians. Consistently, STPP has found that fast-growing sun-belt cities and counties are the worst offenders. Too often, these communities are planned, and roads are built, without adequate regard to the needs of the people who live there when they are not in their cars. Northern cities including Pittsburgh, Boston, Rochester, New York and Milwaukee are rated the least dangerous.

The report created its ratings by assessing the number of annual pedestrian fatalities in terms of the amount of walking in a given community. *Mean Streets* concludes, "Sprawling communities that fail to create safe places to walk are the most dangerous for pedestrians." Urban densities, transit options, public spaces, sidewalks, and to some degree, urban congestion, help to make the northern cities safer. It is a multi-faceted dynamic.

Patricia Turner at the University of South Florida's Center for Urban Transportation Research (CUTR) described a mid-block crossing research project. What's important, Patricia noted, is "how people cross roads." Xuehao Chu, a senior research associate at CUTR, led the mid-block crossing study. Chu's team chose and studied crossing habits and attitudes at 33 selected mid-block locations in Pinellas and Hillsborough Counties in Florida. For the study, volunteers were asked to rate the mid-block locations on perceived quality of service, usually a function of the supply of traffic gaps. Traffic counters measured volume at the chosen sites.

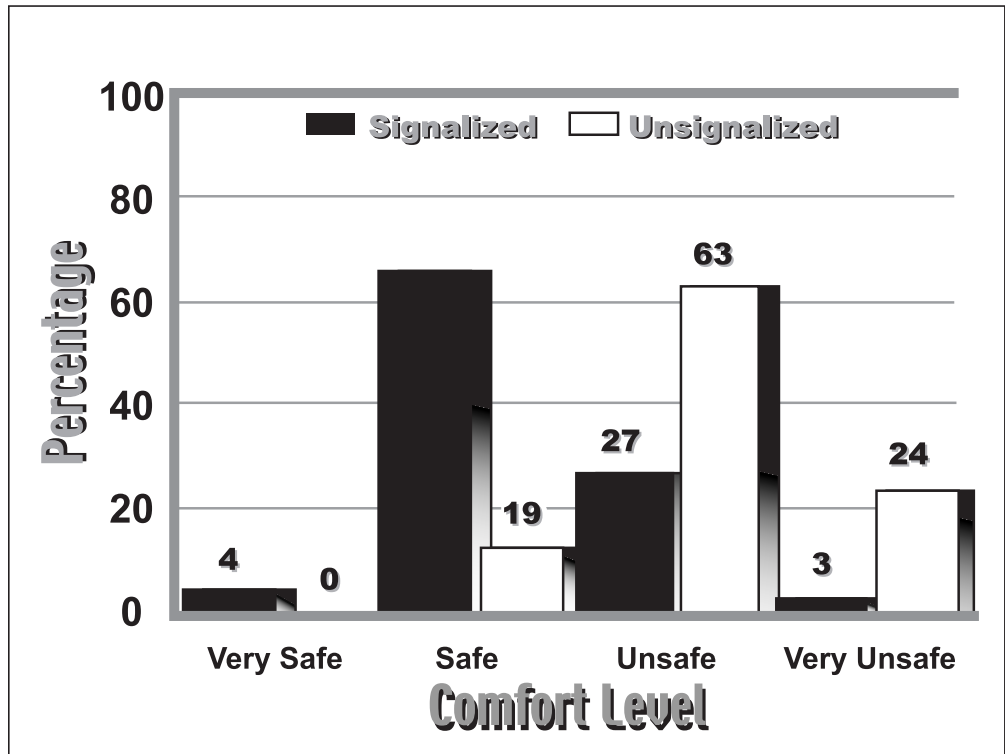
From the observations, Chu built a model that shows the significance of various factors in determining quality of service. Most important were cycle length and distance between signals.

Turner's report indicates that multiple interventions, signage or engineering actions increased yielding behavior and reduced conflicts compared to intersections with only one intervention. In a sixteen-month project, she observed that it is hard to isolate the effects of a single intervention. However, the report makes clear that the best results occurred at sites with "lead pedestrian intervals, prompting signs, half-signal and ITS warning systems."

Among the findings presented in CUTR's *Making Crosswalks Safer for Pedestrians* report is a chart showing pedestrian comfort levels at signalized and unsignalized intersections. This chart shows that at signalized intersections, 70% of pedestrians felt safe or very safe, while at unsignalized intersections, only 13% felt safe.

At the University of North Carolina's Highway Safety Research Center associate director Charles Zegeer noted that pedestrian safety was now one of the four highlighted safety areas in FHWA's overall safety program. Zegeer's research center houses the popular and effective [www.walkinginfo.org](http://www.walkinginfo.org) website. The center has become both a clearinghouse for information on pedestrians and bicycles and a generator of informative materials such as the *Safer Journey and Pedestrian Bicycle Resource Set* CD-ROMs.

**University of South Florida's Center for Urban Transportation Research**  
 Chart demonstrating pedestrian comfort levels at signalized and unsignalized intersections.



# CONCLUSIONS



The issue of pedestrian safety is timeless (before vehicle crashes, there were problems with horses) and ubiquitous. It is widely encountered and it is well known. That is not to say that pedestrian safety is a matter that is either well understood or commonly perceived. Even those who understand the issue well change their viewpoint as they get into or out of their cars.

This white paper has sought to present viewpoints and experiences with a varied group of techniques. Through these experiences with technologies in diverse locales, the report offers the good, the bad and the mundane in regard to approaches to pedestrian safety.

Where this road goes is yet unclear. From the experts, though, there are some signs and clues.

Zegeer notes that "continued suburban sprawl" poses an ongoing threat to pedestrian safety by increasing the areas that lack pedestrian safety amenities while taking away resources that might otherwise go toward the backlog of needed pedestrian improvements. Specifically, Zegeer mentions the ongoing siting of schools in locales that lack proper and safe pedestrian routes as a perpetuation and extension of the pedestrian safety problem.



The role of sprawl and road building was also noted by Richard Nassi who wrote in Chapter 13 (pedestrians) of the *ITE Traffic Control Device Handbook 2001*, "pedestrians should be considered as design users for all streets and highways." He called proper roadway design "a partnership between pedestrian, driver and highway design."

This integrative view is proposed as the model for the future. Hundreds of pedestrian and bicycle coordinators and planners throughout the country have begun to

**Urban Village** | In Otay Ranch, a planned community, developers are claiming to have created an urban village. But a six-lane road as wide as a freeway leads into the development, making it a challenge to cross on foot. - New York Times

influence the road designing and building industries. FHWA research has focused efforts and resources toward safety and better design. Advocates of "walkable communities" and of "traffic calming" have made inroads into the thinking of local elected officials, convincing many of them that the pedestrian vote and viewpoint is no less important than the motorist vote. Indeed, while every motorist is a pedestrian at some point, not all pedestrians are motorists.

In cities with vibrant and busy downtowns such as San Jose, Milwaukee or New York, pedestrian safety on city streets has become a staple of both the political scene and the workings of transportation departments. In suburbs and in the suburbanized stretches of places like Tucson, Ariz., Pasadena, Calif., and Montgomery County, Md., communities have begun to seek innovative signals and markings, smart pedestrian warnings, speed boards, traffic circles and other means to ensure safety.

In rural areas and in undeveloped areas within municipalities, citizens are asking about lighting, sidewalks, wider shoulders and enforcement of drunk driving laws.

Over time, pedestrian fatality and injury rates have decreased. Some say this is because fewer people are walking and the ones, who walk, walk less. Some say that pedestrian safety has increased because engineering, education, enforcement and targeted "packages" of technology applications have been systematically focused on more and more areas of bad road design. Others believe pedestrians are smarter and drivers are better informed. No one knows for sure. What is likely, however, is that improved roadway design will increase safety, and technology will continue to be adapted to make local hazards less hazardous.

New York Times article on Otay Ranch urban village. Here a mother strolls with her child on a walkway running through part of the development.



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## List of Resources

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