Improving the Pedestrian Environment

Through Innovative Transportation Design

Prepared by Parsons Brinckerhoff

Institute of Transportation Engineers
Improving the Pedestrian Environment Through Innovative Transportation Design

An Informational Report of the Institute of Transportation Engineers

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Institute of Transportation Engineers
1099 14th Street, NW, Suite 300 West
Washington, DC 20005-3438 USA
Telephone: +1 202-289-0222
Fax: +1 202-289-7722
ITE on the Web: www.ite.org

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Introduction

This ITE informational report illustrates the rich and varied state of the practice in planning, designing, and enhancing pedestrian infrastructure. We could have titled it, “Walking: Back from the Brink.”

The report contains a small sample of the ways transportation professionals and citizens have brought walking—one of our most fundamental human activities—back into focus, not only in the capital budgets of government agencies but also in the lives of citizens, in communities large and small, across North America. In this brief survey, the reader can look out across the landscape of our communities and recognize the richness of the state of the practice. It also provides a retrospect of the past decade to appreciate how our communities are harvesting the benefits of a change in national, state and local transportation investment policies.

The report has four sections:
- Pedestrian Safety Awareness Programs;
- Pedestrian and Bicycle Bridges and Tunnels;
- Pedestrian and Bicycle Corridors; and
- Policies, Plans, Guidelines and Design Standards.

In each category are a handful of examples that are notable simply for the richly nuanced state of the practice that they represent. Some are “mega projects,” like New York City’s West Side Highway; others are minute ones, like the enhancement of audible crosswalk devices in Portland, OR.

Some deal with fundamentals, like the city of Phoenix, AZ’s school safety program, which focuses on practical techniques to enhance children’s safety while walking to school. Others deal with fantasy, like Tacoma, WA’s elegant bridge of glass, which literally elevates the pedestrian experience into the realm of fine art.

From plans to construction and operation, these case studies make clear that pedestrian projects need not be “pedestrian.” Each one represents a unique solution to unique conditions. Each has at least one, if not many, distinctive features. Today, the state of the practice in walkability and accessibility is as varied as the natural and man-made environments in which these projects are placed.

For each case study included in this report, we could in time, find 10 additional, comparable examples. We have long wished that the revival in pedestrian projects would no longer be newsworthy because the species known as “pedestrians” were no longer endangered. Despite rumors to the contrary, we think this day has come.

The authors wish to thank ITE for the opportunity to assemble and feature this set of case studies. Much of the material has come from local sources; any errors or omissions are our own. We also wish to thank the excellent advisory committee with whom we have been pleased to work. We hope this report furthers both the development of additional projects, and the healthy, safe, sustainable physical activity that these projects are designed to support.
Pedestrian Safety Awareness Programs

Introduction

The U.S. Surgeon General recommends that we participate in 30 minutes of activity most days of the week. Walking might seem like a suitable approach to attaining this goal, but it can also be dangerous when practiced in the presence of automobiles. Motor vehicle collisions with pedestrians accounted for 4,808 deaths in 2002. The number of reported injuries involving pedestrians that year was much higher, at 71,000. ¹

Pedestrian fatalities represent just over 11 percent of all traffic fatalities, yet walking trips account for only about 6 percent of all trips in the United States. Despite these statistics, walking remains a healthful, inherently safe activity for tens of millions of people every year. Recent numbers from the Bureau of Transportation Statistics reveal that three-quarters of U.S. adults (152 million) walked, ran, or jogged for more than 10 minutes within the past 30 days.

Clearly there is a need for transportation facilities that can safely accommodate the needs of pedestrians and bicyclists of all ages and abilities. Communities have been responding to this need with driver and pedestrian education campaigns, safety programs for schoolchildren, traffic calming measures, safer crosswalks for all user groups including the handicapped, improved surfaces and lighting and advertising campaigns to raise awareness of pedestrian issues.

The following case studies highlight various education and safety programs and facility improvements that some communities have implemented:

- In Boulder, CO, city officials analyzed and tested ways to improve vehicular traffic control compliance at crosswalks. The results indicate that drivers are now paying more attention.
- In Phoenix, AZ, hundreds of schools are now safer places for schoolchildren to walk because of its crosswalk safety program.
- In Oregon, the city of Portland took safety one step further with its accessible pedestrian signal (APS) program.
- In Seattle, Councilmember Richard Conlin initiated a citywide pedestrian awareness program.
- “Slow down! Chill out! Drive well!” The San Francisco Department of Public Health campaigned for increased pedestrian awareness and reports improved driver behavior.

**Project Name:** City of Boulder Crosswalk Compliance Studies and Treatment Implementation

**Project Location:** Boulder, CO, USA

**Contact:** Short Elliot Hendrickson Inc.

**Project Team:** City of Boulder, Short Elliot Hendrickson Inc.

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**Notable Features**

The city of Boulder installed preferred treatment for multi-lane, high-volume crossings at 23 locations citywide. The treatments resulted in an improved motorist compliance rate, rising from an average of 34 percent before installation to 77 percent afterwards.

**Project Objectives**

Providing safe and effective pedestrian facilities is a long-established goal for city officials as they work to reduce dependency on the automobile in Boulder. While many traditional engineering techniques, such as grade-separated facilities and pedestrian signals, have been employed to provide safe crossings at high-volume locations, the city has recently engaged in an effort to reinforce existing at-grade facilities with alternative treatments designed to make motorists more aware of pedestrians crossing the roadway. This, in turn, has created a safer, more positive experience for pedestrians.

**Project Description**

Both city of Boulder and Colorado state laws require motorists to yield to pedestrians in a crosswalk. However, pedestrians in Boulder have cited poor compliance with these laws as a major factor contributing to unsafe crossing conditions. Pedestrians simply do not feel safe crossing high-volume roadways because they have little faith that drivers will yield the right-of-way. Furthermore, this condition is worse on multi-lane crossings where pedestrians have to step out from behind a stopped car into the path of moving vehicles. The decision to travel as a pedestrian is based in part on the perceived safety and ease of crossing roadways along the travel route.

The city of Boulder hired Short Elliott Hendrickson Inc. (SEH) in June 1997 to study compliance at crosswalks and test the effectiveness of alternative treatments. Each of the treatments test-
Pedestrian Safety Awareness Programs

ed are designed to bring motorists’ attention to the crosswalk or to educate and remind them of the state law. The treatments installed represented a varying degree of enforcement and applicability to different roadway types and volumes. By testing several devices, the city could then determine which devices worked best for different conditions. The before-and-after studies began in 1997 and continued through 2003. The city has implemented treatments at 23 crosswalk locations, and has 16 more locations scheduled for installation.

To compare effectiveness of treatments on varying roadway types, crosswalk compliance studies were performed on two-, three-, four- and five-lane roadways at both mid-block crossings and unsignalized intersection crossings. In addition, treatments on right-turn bypass (yield) lanes at several major signalized intersections were studied. Roadway volumes ranged from a few thousand vehicles per day (veh/day) to 35,000 veh/day. Pedestrian crossing volumes varied from zero per hour to 270 per hour. Documenting this range of conditions helped to define which treatments were most effective for different roadway configurations and traffic volumes.

Treatment Types Studied

Motorist compliance at crosswalks was studied for each of the following treatment types:
- **Rumble strips:** Advance rumble-strips with YIELD TO PED pavement markings and signage. Installed at a mid-block, multi-lane, pedestrian crossing locations.
- **In-pavement lights:** Pedestrian-activated flashing lights embedded in the pavement prior to and at the crosswalk. Installed at a mid-block, multi-lane location.
- **Pedestrian activated flashing lights:** Pedestrian-activated flashing lights mounted on roadside poles and in the median. Installed at mid-block, multi-lane crosswalks.
- **State law signing:** Alternative signing (STATE LAW—YIELD TO PEDS IN CROSSWALK) mounted curbside and in median. Installed at single- and multi-lane crosswalks at both unsignalized intersection and mid-block locations.
- **Raised pedestrian crossing:** Six-inch elevated, flat-topped “speed table” with a marked crosswalk. These treatments were installed on right-turn bypass lanes at signalized intersections (where right-turn traffic has a yield condition).

Project Results

For all locations and treatment types studied, motorist compliance increased from 34 percent to 77 percent on average for all locations with treatments installed. These figures represent the percentage of motorists who properly yielded to a pedestrian versus the total number of motorists observed that encountered a pedestrian at a crosswalk. The following bullets summarize the treatments and applications found most successful during this project:
- **Pedestrian-activated, sign-mounted flashing lights:** Highly effective in increasing motorist compliance; provides best visibility (of treatments tested) for pedestrians and warning to motorists at multi-lane, high-volume pedestrian crossings. In high-volume locations where pedestrian signals have been considered, it was concluded by the city that these devices operated more efficiently than a signal would by decreasing both delay to pedestrians and vehicles.
- **State law signing:** Effective tool to improve compliance and to help educate drivers of the state law; Boulder will continue installing these devices at unsignalized intersections and mid-block locations where sign-mounted lighting is not appropriate or a less aggressive/costly treatment is desired.
- **Raised pedestrian crossings:** Effective in increasing compliance as applied at right-turn bypass lanes at signalized intersections.
Notable Features

The city of Phoenix School Safety Program represents an outstanding example of a fully implemented comprehensive approach to increasing pedestrian safety. It is the most significant improvement to school safety in Arizona since the inception of the 15-mph school zone in 1950. The School Safety Program is building a stronger relationship between schools and community and has been extremely beneficial for approximately 400 Phoenix schools and thousands of schoolchildren. While elements of the program are found in other communities, the comprehensiveness of the program and its recommendations is innovative and original. Recommendations include considering the planning and location of new schools, using traffic calming and enforcement to control driver behavior, creating safer environments for pedestrians and fostering a continuing dialogue between school administrators, transportation planners and law enforcement officials.

Project Objectives

The main goals of the project were to:
- Improve traffic safety at all the approximately 400 schools in Phoenix and at the more than 1,700 school crossings citywide;
- Improve the training and monitoring of school crossing guards, and make them more visible to traffic;
- Strengthen traffic enforcement at schools and school crosswalks, and encourage slower driver speeds around schools;
- Encourage more students to walk to school and assure schools are built at locations where it is safe for students to walk; and
- Encourage more parent and community participation in school traffic safety.

Driver feedback signs help keep drivers aware of speeding. Source: City of Phoenix Street Transportation Department

“Z” style crosswalks were installed as part of the improvements. Source: City of Phoenix Street Transportation Department
Pedestrian Safety Awareness Programs

Project Description

The Phoenix School Safety Program was developed by a school safety task force, which was created at the request of the city council following a tragic collision in which a young student ran into a busy street against a traffic signal and past the outstretched arms of a crossing guard. The task force was charged with evaluating safety conditions in front of all schools citywide to see what could be done to improve safety at schools and school-related crosswalks.

The School Safety Task Force was made up of individuals from the Phoenix Police and the Street Transportation and Law Departments, an elementary school principal, an assistant superintendent from the Paradise Valley School District, the director of the governor’s Office of Highway Safety, a volunteer engineering consultant and a parent volunteer representing another elementary school.

The task force, with the help of traffic and school safety experts, studied school safety data at all crossings citywide over a 12-year period. After conducting several traffic safety studies, the task force developed a list of 26 recommendations that included a combination of engineering, enforcement and educational countermeasures, as well as experimentation with new traffic control technology. In February 2001, the Phoenix City Council adopted all 26 recommendations and provided funding for six new positions and several new programs to enhance school safety.

The Phoenix School Safety Task Force recommendations were to:
1. Use two adult crossing guards at wide street crossings;
2. Implement photo speed enforcement at schools;
3. Paint SCHOOL pavement stencils on each high-speed approach to a school crossing;
4. Create wider paved student queuing areas at major school crossings;
5. Paint stand-back lines on the sidewalk to show children where to stand while waiting to cross;
6. Develop “Safest Route to School” walking plans for parents and students, and conduct school crossing safety audits to evaluate major crossings;
7. Use automated technology to issue run-red citations at traffic signals near schools;
8. Implement zero tolerance speed enforcement at 15-mph school zones and no more than 5-mph tolerance elsewhere around schools;
9. Selectively use advisory speed signs 5-mph below the posted speed to lower the enforcement tolerance and increase visibility of school warning signs;
10. Provide school crossing guards brighter fluorescent yellow-green (FYG) vests with more reflective material, as well as bright orange hats;
11. Change pedestrian signals from the standard WALK / DON’T WALK words to the international symbols;
12. Conduct more in-school safety training for students;
13. Enforce mandatory training of school crossing guards and require guards to attend the Phoenix Crossing Guard Training (or equivalent training) each year;
14. Monitor and evaluate crossing guards;
15. Enhance the Phoenix School Crossing Guard Training program and provide more training materials for crossing guards and schools;
16. Prohibit new elementary schools from being built on major streets;
17. Use major streets as school attendance or bussing boundaries to increase walking;
18. Provide bussing for elementary students who must cross busy major streets;
19. Build buffers and/or wider sidewalks along new schools and build more sidewalks;
20. Consider raising fines or adding points for school zone citations;
21. Experiment with a reduced school speed limit and active driver feedback speed signs with the SLOW NOW message to speeders (Orangewood Elementary School);
22. Experiment with reduced speed limit and a special police enforcement program (Kyrene Monte Vista Elementary School);
23. Experiment with active driver feedback speed signs that flash to speeders (Arrowhead Elementary School);
24. Experiment with a red-light enforcement camera, reduced school speed limit and special enforcement program (Mountain Sky Junior High School);
25. Experiment with in-pavement flashing crosswalk (Paradise Valley High School); and
26. Experiment with FYG school warning signs and FYG reflective SCHOOL post covers at several school locations.
Project Results

Phoenix has implemented all 26 recommendations of the School Safety Task Force. Highlights include:

- Implementing the Photo Speed at School enforcement program with 6,872 speed citations issued at school crossings using two photo-safety vans deployed for 1,827 hours in 2002;
- Improving crossing guard training program and developing new training handbook (English and Spanish language editions);
- Producing and distributing copies of new crossing guard training videos to all school districts (in English and Spanish languages);
- Equipping all crossing guards on busy streets with Type II FYG safety vests and bright orange hats;
- Converting all 1,600 school warning signs to the brighter FYG school signs with reflective FYG post covers on arterial collector streets;
- Completing 11 Safest Route to School walking plans and 173 crossing safety audits at 71 schools, and installed 577 SCHOOL pavement stencils in 2002;
- Installing numerous new sidewalks near schools in 2002; and
- Implementing and evaluating two different driver-feedback, speed-monitoring signs; an in-pavement flashing crosswalk; audible pedestrian push buttons and countdown pedestrian signals at several high-use school crossings.
**Project Name:** Program to Retrofit Existing Traffic Signals with ADA-Accessible Signals  
**Project Location:** Portland, OR, USA  
**Contact:** City of Portland Office of Transportation  
**Project Team:** City of Portland Office of Transportation, Oregon Commission for the Blind, American Council of the Blind, Oregon Chapter of the National Federation of the Blind, TriMet, Oregon DOT  

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**Notable Features**

The city of Portland prioritized crosswalk safety for pedestrians with its accessible pedestrian signal (APS) program. Going beyond the requirements of the Americans with Disabilities Act (ADA), the city worked directly with manufacturers to test the latest equipment and develop new technologies for audible crosswalk systems. The APS program, which includes participation and consultation from advocacy groups representing the visually impaired, has installed APS at 42 existing signalized intersections since 1996 and now has 52 intersections with APS equipment.

**Project Objectives**

The city’s APS program strives to provide better service to all pedestrians—especially elderly and disabled persons—using the city’s transportation system. The city aims to continue working with manufacturers in developing improved products to provide an APS that is effective, easy to maintain and reasonably priced.

**Project Description**

In the late 1970s, city staff installed buzzer-like devices at three intersections at the request of residents. These buzzers were inexpensive devices purchased from a local electronics store. They were installed at actuated signals so that the buzzer was only activated with a normal pedestrian push button call. Staff received some calls regarding the annoying sound and usually responded by placing baffling material around the buzzer. During the late 1980s, the city began using an inexpensive chime as an audible device. The chime was more pleasing, and the city seldom received any complaints even though the chime was installed in some fixed-time intersec-
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In 1995, the city had 10 signalized intersections with these chime-style audible devices.

In 1996, the city received increased citizen pressure for a larger audible signal program. As a first step, city staff determined that a formal policy was needed to determine how and where audible signals would be installed. City staff assembled a stakeholder group, which included representation from the American Council of the Blind, the National Federation of the Blind (NFB), the Oregon Commission for the Blind, Independent Living Resources and other groups representing both the visually impaired community and mobility instructors. A proposed policy was developed over a series of three meetings. Under this policy, audible signals would still be installed only on a request basis, and intersections had to have some unique or unusual characteristic to warrant the addition of an audible signal. In deference to NFB members, the city opted to use a technology that requires the user to hold the button for at least one second to place a call for an audible signal. This action made the technology “refuseable” so that only those who wanted sound would get it. The push button on these signals has a raised arrow to indicate they are equipped with an audible device. The policy recommended that the city also refer the requestor to a mobility specialist, as crossing problems are sometimes related to a lack of user skills that might be better addressed by training.

Installing the speaker and electronics inside the pedestrian head housing afforded greater protection from vandalism and placed the speaker closer to the users’ ears. In addition, the city tested the standard cuckoo/peep-peep sounds and voice messages in a trial installation. The voice message typically said, “The walk light is now on to cross 41st Street.” Even though these devices had background noise level sensors to increase the output as background noise increased, the voice message was often difficult to hear. The tests indicated that the use of tones cut through background noise better in an urban street environment. After the initial voice test, the city decided to use just the cuckoo and peep-peep sounds.

From 1996 through early 1999, the city installed Novax audible signals at 15 more intersections, bringing the total number of intersections with audible signals to 25. The city decided not to retrofit the old audible signals with the new technology unless the old units were being replaced for maintenance purposes.

In mid-1999, a problem arose when requests for audible signals outstripped city resources for the program. The city activated a citizens’ advisory committee (CAC) to review, rank and prioritize the requests. To evaluate and adjust the ranking procedure, city staff applied the scoring criteria to 10 intersections on the request list and made some revisions based on the results.

An integral part of the scoring and evaluation process was the onsite visit. A city electrician responsible for these installations and a mobility instructor from the Oregon Commission for the Blind met the requester at the candidate intersection to better understand the user’s needs and concerns. During this visit, staff made sure that they understood the movements the user was trying to make at the intersection. Often the mobility instructor recommended better ways to approach and/or cross the candidate location. After understanding the user’s concerns and agreeing that an audible signal was a viable solution, the city staff and mobility instructor then completed the field aspects of the scoring form. The remaining information, such as vehicle and pedestrian volumes and accidents, was gathered by office staff from existing city records.

City staff have continued to work with manufacturers to develop improved products to provide an APS that is effective, easy to maintain and reasonably priced. In addition to the speaker modification noted above, staff worked with manufacturers on ways to incorporate speakers into the standard push button assembly. By 2003 the city had scheduled retrofits for a total of 57 intersections.

**Project Results**

The APS program’s accomplishments include:
- Establishing an accessible pedestrian signal (APS) policy in 1996 through meetings with stakeholders;
- Developing scoring methodology to rank requests for APS;
- Establishing a citizens’ advisory committee to score and rank requests;
- Installing APS at close to 60 intersections;
- Working with various manufacturers on improvements to APS equipment;
- Participating in two national research projects to evaluate APS equipment; and
- Spending approximately $500,000—half city funds and half grant funds—on the APS program.
Pedestrian Safety Awareness Programs

**Project Name:** Pedestrian Summer Safety Campaign  
**Project Location:** Seattle, WA, USA  
**Contact:** FeetFirst Puget Sound Pedestrian Advocacy  
**Project Team:** Seattle City Councilmember Richard Conlin’s Office, Harborview Injury Prevention and Research Center, Public Health—Seattle & King County, Seattle DOT, Seattle Parks & Recreation, Chronic Disease Prevention and Healthy Aging—Physical Activity, Injury & Violence Prevention—Traffic Safety Coalition, Pedestrian & Bicycle Program, Transportation Demand Management Program, Senior Programs—Sound Steps, Olmsted Parks Centennial Celebration, Seattle Pedestrian Advisory Board, Seattle Police Department, Seattle Department of Neighborhoods, King County Metro Transit, Bicycle Alliance of Washington, Cascade Orienteering Club, Evergreen State Volkssport Association, Thistle Press—Urban Walking Tours, Seattle Architectural Foundation, Livable Communities Coalition, Transportation Choices Coalition, Cascade Bicycle Club, Washington Community Mental Health Council, Children’s Hospital, Washington Insurance Council, American Automobile Association, Traffic Enforcement—“Crosswalk Emphasis” and efforts including several of Seattle’s 13 District Councils

Pedestrian Summer Brochure with tips for safe walking and driving. Source: Puget Sound Regional Council

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**Notable Features**

This project is a prime example of local elected leadership advocating for pedestrian safety. A Seattle councilmember advanced the interests of pedestrians by developing a broad partnership and educational campaign based on respect and responsibility. Leadership for the Pedestrian Summer program from the Seattle City Council sent a clear message to the community and other agencies that the pedestrian environment is a high priority for the city of Seattle.

**Project Objectives**

With the support of the council, mayor, city departments, community organizations and businesses, the campaign hoped to foster more respect and civility between pedestrians and motorists and to
improve driver behavior by increasing awareness of pedestrian safety issues. The long-term goal was to get people more excited about walking by creating a safer and more pedestrian-friendly city. Additional campaign goals were to achieve greater visibility of pedestrian issues and awareness of the benefits of pedestrian improvements. The campaign also sought to demonstrate the city’s commitment to walking as a vital mode of transportation, a healthy form of exercise and a fun way to build community.

**Project Description**

The city of Seattle launched the Pedestrian Summer safety campaign to increase pedestrian safety through education, engineering, enforcement and encouragement. “This is about mutual respect and responsibility to create a safe city,” said Councilmember Richard Conlin, who conceived the notion of bringing numerous city, community and business resources together to raise pedestrian awareness. “If motorists and pedestrians take responsibility for respecting each other, we will have fewer injuries. Walking is a great way to better health, and a safe environment means more pedestrians.”

The Pedestrian Summer campaign tied together various public and private programs to encourage pedestrian safety. The campaign included four components:

- Education, including pamphleting and presentations at public events and mailings from insurance companies;
- Enforcement, including targeted enforcement by the Seattle Police Department of motorists who disobey crosswalk laws;
- Engineering, including the unveiling of new pedestrian safety devices installed by the Seattle DOT at troublesome intersections and school crossings; and
- Encouragement, including guided walking tours and parade participation by pedestrian advocates and organizations.

The Pedestrian Summer campaign officially kicked-off on May 24, 2003 at the Rainier Valley Fun Run where Councilmember Conlin unveiled the Columbia City Walking Guide. Pedestrian Summer was scheduled to last through September 2003, but many of the programs included in the campaign continued throughout the year.

The schedule of programs coordinated through Pedestrian Summer included:

- May 19—Council briefing on campaign, press conference
- May 24—Rainier Valley Run Around
- Ongoing—Crosswalk emphasis at targeted Seattle intersections with Police Department (SPD) Media Event
- Ongoing—Sound Steps Walking Program
- June 5—Walk to School Day networking
- June 14—Olmstead Walks at Woodland Park
- June 18—Train pedestrian ambassadors
- June 21—Fremont Parade
- June 24—Pike/Pine Crosswalk Action
- June 26—Walking Sidewalk Debate: How Do We Fund and Build New Sidewalks in Seattle?
- July—Unveiling of Crosswalk Flop Over Sign
- July—Pedestrian IQ Quiz Show on Seattle DOT Web site
- July—PEMCO Insurance targeted mailing to customers
- July—Launch billboard campaign
- July—Pedestrian pocket flags released
- July—Westlake Trail walking tour
- July 6—Wallingford Kiddie Parade
- July 19—Seattle Night and Day Navigational Challenge
- July 19—Art Deco Tours
- July 25–27—Booth at Central District Fair
- July 31—Lincoln Park Volkssport Trek
- August 5—Seattle Night Out
- August—Traffic calming tour
- September—School crosswalk unveiling
- September—Legislative proposals media event
- September 13—Uptown stroll, release of walking uptown
- September 22–23—Footprints and Biketracks
- October 8—Elected officials forum on Walking in Seattle
- October 8—Walk-to-School Day

**Project Results**

The partnership has attracted participation of more than 20 companies, non-profit organizations, government agencies and perhaps most importantly engaged dozens of citizen volunteers, called Pedestrian Ambassadors, from neighborhoods around the city of Seattle. Material results from Pedestrian Summer include a safety brochure, walking maps with safety information and events that engaged hundreds of people to raise awareness and support for improvements to the engi-
neered environment, (for example, sidewalks, traffic calming, safe sidewalks). Richard Conlin’s office generated support for the campaign in the form of significant direct financial sponsorship and considerable in-kind donations. The Pedestrian Summer message was reported in major newspapers and attracted other media endorsements including billboards and radio campaigns.
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**Project Name:** Pedestrian and Traffic Safety Project  
**Project Location:** San Francisco, CA, USA  
**Contact:** San Francisco Department of Public Health  
**Project Team:** San Francisco Department of Public Health, Department of Parking and Traffic and Department of the Police, Chinatown Community Development Center, Coleman Advocates for Children and Youth, International Institute of San Francisco, Neighborhood Safety Partnership, Network for Elders, OM1 Neighbors in Action, Parent Teachers Association, Park Presidio Neighbors, Rose Resnick Lighthouse for the Blind, Self Help for the Elderly, Senior Action Network, Tenderloin Housing Clinic, UCSF/SF Injury Center, Walk San Francisco, West Portal Neighborhood Association and Wu Yee Children’s Services.

The campaign encouraged pedestrians to be more aware of automobiles. Source: San Francisco Department of Health

**Notable Features**

A report published by the National Highway Traffic Safety Administration listed San Francisco as the fourth most dangerous city for pedestrians in the United States. By involving community members in devising strategies and interventions in their own neighborhoods, the health department was able to bring the community's wealth of perspectives and energies to this pedestrian and traffic safety problem, crediting this concerted effort with a 7 percent reduction in pedestrian deaths and injuries in San Francisco.

**Project Objectives**

For the 10 years preceding this project, pedestrians made up nearly half of all traffic fatalities in San Francisco, compared to a national average of 13 percent. With the support of the California Office of Traffic Safety, the Department of Public Health set out to change this. The project’s measurable objective was to reduce pedestrian injuries and deaths by 10 percent by December 2003.

**Project Description**

San Francisco is famous for being a walking city—one that is best experienced at a human pace. The city prides itself on being a place where residents and tourists alike can reach the majority of destinations on foot or by short rides on public transportation. Yet San Francisco is home to some of the most
dangerous streets for individuals on foot. As measured by injuries and deaths per 100,000, San Francisco’s rate of 128.9 is the worst in California and is more than twice as bad as number two Los Angeles.

Educational efforts were aimed at reducing hazardous traffic behavior. Source: San Francisco Department of Health

Research confirms that effective prevention programs can be designed only after examining comprehensive data and empowering community residents to advocate for environmental changes in response. While seeking to address the traditional “Four Es” of education, engineering, encouragement and enforcement, the San Francisco Pedestrian and Traffic Safety Project is grounded in a broad partnership with community agencies that have undertaken specific pedestrian improvements, involving both education campaigns and advocacy for environmental changes in their own communities.

Pedestrian safety is a complex problem—one without any single solution. Health department staff used training sessions to support local neighborhood educational efforts. City and county agencies provided assistance, access to data, networking and mutual support opportunities. Additionally, a citywide media campaign—conducted jointly with the Department of Parking and Traffic and funded with fine money from red-light camera enforcement—was used to create a larger context. The media campaign helped to create a sense that San Franciscans were working together to reduce pedestrian injuries and deaths. The media campaign focused on aggressive and distracted driving, and on the need for drivers and pedestrians to be more courteous. In addition to billboards, radio public service announcements and media coverage, community groups used posters with the media messages as a part of their outreach efforts, tying the disparate projects together.

Project Results

The project’s measurable objective was to reduce pedestrian injuries and deaths by 10 percent by December 2003. By April 2003, the State of California officially credited the project with achieving a 7 percent decrease in fatal and injury collisions involving pedestrians.

Some specific achievements of the project’s community groups included:

- Providing bilingual education in Chinese and English, including bilingual brochures, handouts and posters, and advocacy for pedestrian and traffic safety in Chinatown;
- Developing warning letters for residents who park on the sidewalk and “thank you” cards to give support to those who stopped. (This effort substantially helped to reduce blocked sidewalks, which forced pedestrians into traffic.);
- Producing educational materials for parents of preschool children about pedestrian injuries, potential traffic hazards and safe behaviors to avoid pedestrian injuries to young children;
- Conducting a charrette study of the West Portal neighborhood with the assistance of Walkable Communities Inc.;
- Producing a video to document the dangers children and other pedestrians face when crossing the streets near William R. DeAvila Elementary School;
- Conducting workshops on Pedestrian Safety 101, Preventing Dangerous Accidents and Becoming an Advocate for the Bosnian, Russian and Vietnamese immigrant communities; and
- Developing and delivering an educational campaign to reduce speeding and encourage safe traffic behaviors along the 31st Street corridor in the Bayview neighborhood.
Pedestrian and Bicycle Bridges and Tunnels

Introduction

Bridges are often the critical links in pedestrian and bicycle networks, and they can be the most visible and expensive infrastructure elements in the path system. The bridges highlighted in this section go beyond merely overcoming obstacles and connecting two destinations. Some are uniquely designed to reflect local architectural themes and act as a seam that brings two neighborhoods or communities together. Other bridges have been designed to become interesting destinations. The common thread throughout these case studies is the specialized attention that has been given to the details that matter to pedestrians to attract new riders, create new pedestrian destinations and facilitate pedestrian/bicycle travel past topographic barriers. The details—from colorful art to viewing alcoves—help to transform walking or riding across the bridge into a uniquely pleasurable experience. The following case studies illustrate some of these themes:

- The Chihuly Bridge of Glass in Tacoma functions simultaneously as a significant new downtown pedestrian link to leverage new development and an extension of nearby art museums.
- A new replacement bridge crossing the Susquehanna River in Pennsylvania shifted the emphasis from vehicles to pedestrians by carefully relocating the bridge to redirect through-traffic away from a historic downtown. The project also incorporates historic, aesthetic treatments on the bridge and throughout project area.
- At Monmouth University in New Jersey, a new underpass for a busy access road has reduced student/vehicle collisions while enhancing the campus’ historic flavor with architectural elements reminiscent of elegant thoroughfares in New York City’s Central Park.
- At the other end of the spectrum, Tucson’s Diamondback Bridge, which improves pedestrian access to the downtown, has employed an eye-catching modern design that reflects the desert ecosystem.
- In Winnipeg, Canada, the Provencher Bridge will be the first in North America to include significant gathering and commercial space along its span, so that the bridge will become equal parts destination and travel route.
Improving the Pedestrian Environment Through Innovative Transportation Design

**Project Name:** Chihuly Bridge of Glass  
**Project Location:** Tacoma, WA, USA  
**Contact:**  
City of Tacoma Economic Development Department (Culture and Tourism Division)  
Andersson Wise Architects, Dale Chihuly Studio, Museum of Glass, Anderson Bjornstad Kane Jacobs (engineers)

### Notable Features

In June 2002, Tacoma completed the Chihuly Bridge of Glass at a cost of $6.4 million. This 475-foot pedestrian bridge spans the BNSF Railroad and the I-705 freeway and provides an important new pedestrian link between the downtown and the Thea Foss Waterway. The bridge is a spectacular example of how to combine public art and practical functionality to improve pedestrian mobility and leverage new pedestrian-oriented development.

### Project Objectives

Traditionally a blue-collar city on the Puget Sound, Tacoma is currently experiencing a major renaissance of its downtown and its urban waterfront along the Thea Foss Waterway. The Waterway, forming the shoreline for downtown Tacoma on Commencement Bay, has for the past several years been the focus of intensive economic development and revitalization efforts. The Waterway had long been cut off from downtown by a railroad and the construction of the I-705 freeway.

The project was conceived to “bridge” these barriers and leverage significant new urban development. The basic bridge elements are designed to meet specific transportation goals for safe, comfortable and inviting pedestrian access linking the Union Station neighborhood and Washington State History Museum to the Glass Museum. In addition, the bridge serves a public art function by providing a home for additional glass art exhibits.

### Project Description

The Chihuly Bridge of Glass serves as both a pedestrian bridge and a grand gateway for visitors to downtown Tacoma, featuring hundreds of pieces of glasswork. The project evolved as a partnership between Tacoma native and world-renowned glass artist Dale Chihuly, the city of Tacoma and the Museum of Glass. Arthur Andersson, architect for
the Washington State History Museum, designed the bridge in collaboration with the city, bridge consultant Anderson Bjornstad Kane Jacobs, and Chihuly, who directed the project’s artistic development during an 8-year period.

In 1981, the Environmental Protection Agency declared the waterway to be part of a Superfund site. Ten years later, the city purchased 27 acres on the western side of the waterway, and in 1992, began studying the development potential of the area. Soon after, the city adopted a plan to guide the redevelopment of the waterway.

Following adoption of the plan, a group of community leaders, known as the Executive Council for a Greater Tacoma, spearheaded a drive to build the Glass Museum and allow Dale Chihuly to lead the design of a pedestrian bridge that would connect to it. The city of Tacoma then established a collaborative project process that would include Chihuly, the two museums and the Union Station neighborhood, including the U.S. Courts and the Washington State DOT.

The resulting bridge is divided into three main sections: the Seaform Pavilion, the Crystal Towers and the Venetian Wall. Moving from west to east, as visitors stroll through the Seaform Pavilion, they find themselves beneath an illuminated canopy of vibrant color and dynamic shapes. This exhibit features 2,364 objects from Chihuly’s Seaform and Persian series. The glass objects were arranged on top of a 50-foot long by 20-foot wide plate glass ceiling, which is supported by the base bridge’s extended concrete columns and 12 slender steel posts. Sunlight shines through the exhibit during the day, while florescent lighting illuminates the canopy at night. The glass sidewalls of the Seaform Pavilion are tinted so that visitors can immerse themselves in the exhibit to experience the pavilion’s flowing forms and color.

Moving east, visitors encounter the Crystal Gate, passing between two blue, 40-foot tall towers located at the bridge’s mid-point. Each tower features 63 large Chihuly pieces made from Polyvitrro, a polyurethane material developed to withstand the elements. Six highly focused spotlights make the ice-blue crystals sparkle at night. The towers had to meet rigorous standards to gain the state of Washington’s approval for glass installations over I–705. Day or night, the Chihuly Bridge of Glass’ ice-blue towers welcome people to the city of Tacoma.

Lastly, The Venetian Wall, located on the bridge’s east end, offers visitors a buffet of endless design, colors, shapes and texture. The wall has 109 bays, each housing a separate sculpture from Chihuly’s Venetians, Ikebana and Putti series. The 15-foot tall by 65-foot long by 2.5-foot deep high-security glass cases display some of the largest blown-glass artworks ever executed. The wall was constructed to maintain a positive pressure atmosphere. The Venetian Wall bay casing is made of steel frames and translucent glass walls, allowing natural light to shine through during the day. Fiber-optic lighting illuminates the wall at night. Visitors rest on concrete benches that line the bridge deck. Strategically located near the glasswork exhibits, the benches feature recessed lighting.

The city raised $6.4 million in public funds for the bridge’s infrastructure, and $10.7 million in private donations came from the Museum of Glass and Chihuly, which provided the glass art installations on the bridge. The city funding leveraged several sources, including $2.63 million in other local funds, $1.67 million in funds made available through the Intermodal Surface Transportation Efficiency Act of 1991 (ISTEA) and $2.1 million from a state public works trust fund loan.

**Project Results**

The Bridge of Glass is an important new link in Tacoma’s transportation network and was a primary catalyst for the economic revitalization of and environmental restoration of Tacoma’s blighted waterfront within a federally designated Empowerment Zone. The bridge also has initiated a renewal of Tacoma’s downtown and complements the city’s goals for compact growth, transportation efficiency, easy access to jobs and multi-modal travel. Besides the two museums, the bridge directly serves Thea’s Landing housing development, the expanding University of Washington Tacoma Campus, Union Station Federal Courthouse, the Tacoma Art Museum, the future site of the Tacoma Convention Center and Link Rail. Additional developments are in progress. Hundreds of Tacoma residents and visitors use the bridge every day to reach destinations that were previously unreachable on foot.

The project has improved economic activity via the Foss Waterway development and has contributed to the creation of 450 jobs and increased tourism for the Washington State History Museum, the new Tacoma Art Museum and the Tacoma Regional Convention & Trade Center.
The project has spurred a new supply of diverse housing at Thea’s Landing, which includes 236 new housing units—50 Condominiums and 186 apartments—restaurants and shops. There is now a similar project and a 200-room hotel proposed nearby, which will result in more than 700 new waterway units whose residents will use the bridge on a daily basis.
Notable Features

This new bridge provides an important social and economic link between two communities on opposite sides of the Susquehanna River. In rebuilding and relocating a primarily vehicular bridge, the pedestrian environment in downtown Danville was significantly enhanced by removing regional traffic from the historic core of the city. In addition, careful design attention was paid to provide a safe and pleasing pedestrian experience on the bridge itself so that walking could become a major mode of local transportation. Attractive aesthetic treatments on the bridge and throughout the project area successfully link the bridge and the two historic communities.

Project Objectives

A new bridge was needed to replace the truss bridge built in 1904, which had become functionally obsolete and structurally deficient. In addition to improving local traffic circulation, major project objectives included enhancing pedestrian conditions on the bridge—potentially making it a destination in itself—and siting the bridge to improve pedestrian conditions in the communities it links.

Project Description

The new Danville-Riverside Bridge is a seven-span, continuous composite steel girder structure 1,440 feet in length. It is 42-feet wide, including two 12-foot travel lanes, two 9-foot shoulders, and an 8-foot sidewalk on the downstream side.

The new bridge was strategically located to touch down one block downstream (west) of its previous location in downtown Danville. In moving the bridge connection from Mill Street to Factory Street, significant auto traffic was removed from the historic core of the city, providing opportunities to enhance the pedestrian environment and historic ambiance.
A new vehicular underpass—cut and cover tunnel—was located on Factory Street immediately north of the new bridge. An essential component of the project’s Environmental Impact Statement approved design, the underpass achieves the following objectives:

- Trucks and other through-traffic have been removed entirely from Danville’s Mill Street shopping district, creating a much safer environment for pedestrians and a pleasant “main street” environment in downtown Danville.

- Through traffic has also been removed from parts of Factory Street, preserving and enhancing the historic appearance and character of this residential area. The underpass allows traffic to flow safely and unobtrusively through Danville while protecting residents and pedestrians.

- Antique-style streetlamps give a cozy feel to the underpass approaches, the West Market Street historic district (above the underpass) and downtown Mill Street. Ornamental pedestrian railings atop the underpass provide a functional and aesthetic touch.

- Brick pavers and slate-style stamped concrete sidewalks on West Market Street (above the underpass) add to the charm of the pedestrian promenades and general area.

During final design of the bridge, the team worked hand-in-hand with both communities via a community design group. Through close consultation, design field views and design work sessions, the following features were incorporated into the project:

- An 8-foot sidewalk, complete with alcoves at each of six piers on the downstream side. The downstream side was selected to accommodate the many fishermen in the area. The alcoves are ADA compliant, and are large enough to handle a wheelchair and a baby carriage.

- Decorative railings and antique-style safety parapets to protect pedestrians from traffic.

- Antique-style, dual-acorn streetlamps to provide a safe and well-lit walking path. Streetlamps adorn both sides of the bridge and are located throughout Danville and Riverside. The lighting complements other architectural elements of the new structure.

- ADA curb cuts at all intersections in the project impact area.

- A pedestrian-protected gate at an active railroad crossing in Riverside.

- Gateway pylons designed to enhance the bridge touchstone points, while tying into the historic fabric of both communities. The finished brick pylons match the architectural features of the 1869 Danville courthouse.

In late 1999, during construction of the bridge and the underpass, the project team met with Danville Borough officials and representatives from the Middle School Home and School Association to address concerns about pedestrian safety related to changes in traffic flows. Pedestrian crossings to and from the Danville Middle School were problematic, so the team reacted by implementing improvements at existing signalized intersections in Danville and to the underpass area. Improvements included additional sidewalks along the portals of the underpass, more visible crosswalk markings, right-turn-on-red restrictions when school students would be using the crosswalks and increased pedestrian crosswalk time at selected intersections.

**Project Results**

The new bridge is a functionally and visually impressive community landmark. It is the only crossing of the Susquehanna River for approximately 25 miles. Not only is it a key regional link in the highway system, the bridge is the only pedestrian access for the boroughs of Danville and Riverside. Many pedestrians use the bridge for their daily commute to work, and school-age children use the bridge to walk to and from school. Additionally, many Riverside residents walk across the bridge to access the downtown shopping area of Mill Street, which was made more walkable by placing a section of the bridge approach underground. The project has received numerous awards, including two national awards and three state awards for project design and community engagement.

Environmental studies began in 1983, and construction was completed in 2001. Total bridge costs were $11.6 million, of which $916,000 were for pedestrian enhancements. The underpass cost $8.6 million, with pedestrian elements costing $620,000.
Project Name: Route 71 Pedestrian Tunnel at Monmouth University
Project Location: West Long Branch, NJ, USA
Contact: The RBA Group Inc.
Project Team: New Jersey DOT

Notable Features
This project successfully addressed a pedestrian safety problem common to school campuses bisected by major access roads and constrained by nearby historic resources. The resulting pedestrian underpass provides a good functional solution and employs elegant aesthetics to enhance the university setting.

Project Objectives
The project objective was to separate vehicle and pedestrian traffic without affecting the site’s historic character or compromising student safety.

Project Description
Monmouth University is a private university in New Jersey with more than 5,000 students. The 150-acre campus has dormitories, health facilities and a library on the north side of Route 71, and dining facilities, classrooms and administrative offices on the south side. For 30 years, a mid-block crosswalk connecting the campus accommodated pedestrians as well as small, motorized vehicles used by university personnel. The crosswalk was equipped with a flashing beacon and manned by crossing guards. The frequent stopping of traffic at the crossing created capacity problems along the roadway, and it became the location of numerous rear-end vehicular accidents, pedestrian accidents—including one fatality—and accidents involving crossing guards. During a one-hour period, traffic counts recorded 600 pedestrian crossings conflicting with more than 1,200 vehicles traveling on Route 71.

The southern approach to the mid-block crossing is part of a National Register historic property known as Shadow Lawn. The historic nature of the campus, the large volume of pedestrians and the high number of vehicular/pedestrian conflicts along Route 71 were key considerations in seeking solutions to improve safety and traffic flow conditions.

Three concept design alternatives were initially considered, including an at-grade crossing with curb cuts and a pedestrian refuge island, pedes-
an bridge and pedestrian underpass. The at-grade alternative could be completed quickly and was economical but did not eliminate traffic stops or fully address the separation of vehicular and pedestrian traffic. A typical pedestrian bridge would degrade the historic character of the site and would not gain approval from New Jersey’s Historic Preservation Office (HPO). Although the underpass alternative was preferred, critical issues arose including student safety, drainage, impacts to the existing historic context and constructability.

The preferred underpass alternative was further developed to mitigate concerns as follows: Safety issues were addressed with a security system linked to campus police; drainage problems were solved with a pump and underground storage system; architectural treatments were enhanced to blend with the historic context, and constructability issues were solved by a structural design approach aimed at minimizing impacts.

The tunnel approach ramps were designed to meet ADA standards with specific grade, landing area and cross slope requirements. Ramp termini were enhanced with plazas that not only formalize the entranceways but also act as gathering places for students. As pedestrians walk through the tunnel, they sense they are approaching a familiar place, which enhances a sense of security. In addition to the ramps, staircases were incorporated into the northern plaza area to allow easy access to the tunnel from existing dormitories and to minimize impact on the existing lawn area popular for student activity.

The approach ramps and necessary retaining walls were designed to minimize visual impacts to the setting and to be aesthetically compatible with the historic context of the campus. The tunnel culvert was placed as close to the existing roadway surface as possible, thus minimizing the required walkway lengths. The tunnel width of 14 feet was established based upon the pedestrian usage and its height of 10 feet was to accommodate university maintenance vehicles. The tunnel length is 71.5 feet.

Standard construction materials such as concrete walkways and retaining walls could not be used due to the existing appearance of the historic property per the state’s HPO standards. Aesthetic treatments borrowed from historic structures on campus were implemented, including concrete paver walkways, cast stone elements, decorative balustrade walls, decorative fencing, ceramic tile and bronze hand railings.

**Project Results**

The Route 71 Pedestrian Tunnel opened in August 2002, and thousands of students who cross the heavily traveled Route 71 each day welcomed the new facility. Project costs were $695,000 for engineering and architecture services, $830,000 for bridge construction and $3.2 million for road construction. The project was initiated in March 1999. Conceptual design and feasibility analysis required four months, final design lasted 11 months and construction took one year.

The project’s original intent was to eliminate the at-grade pedestrian crossing, thus improving safety. The project design not only achieved this objective but also resulted in a socially significant connection between the historic and more contemporary sections of campus. With the tunnel open, vehicular/pedestrian conflicts were eliminated.
**Project Name:** Broadway Diamondback Pedestrian/Bicycle Bridge  
**Project Location:** Tucson, AZ, USA  
**Contact:** City of Tucson DOT  
**Project Team:** Arizona DOT, Simon Donovan (artist), Tucson Pima Arts Council, TransCore (general consultant), Barraza-Aviation Parkway Citizens Advisory Committee

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**Notable Features**

The city of Tucson has built a new pedestrian bridge that provides an important link in its citywide path system and has created a regional landmark by working with a local artist and citizens to reflect the local context. The project simultaneously promotes safe pedestrian travel, art and local culture. It also gives pedestrians and cyclists a panoramic view of downtown Tucson and the Catalina Mountains.

**Project Objectives**

The project was conceived to bridge a busy intersection at Broadway Boulevard—34,500 vehicles per day—with a structure that resembles a Diamondback Rattlesnake and provide a key link in a citywide pedestrian path system. The path system is a component of the 1993 Downtown Land Use and Circulation Study, the goal of which was to connect people and important places and thereby create a vibrant downtown. Specifically, the plan states, “Downtown Tucson, Arizona is envisioned as a place where residents, commuters and visitors enjoy walking through an exciting urban environment on shaded sidewalks punctuated with public art and cultural markers characteristic of the Sonoran environment.” The Diamondback Bridge is one of seven pedestrian bridges envisioned to provide continuous, safe pedestrian access throughout downtown Tucson.

**Project Description**

The Diamondback Bridge is an important link in a citywide system of pedestrian pathways and sidewalks that extends from the northwest side of Tucson, through downtown, and then continues on the southeast side of the city. The Diamondback Bridge links the downtown business district with adjacent neighborhoods, regional parks, schools, Pima Community College and the University of Arizona. The
bridge fills a significant regional transportation need, connects several important land uses and creates a safe, continuous pedestrian corridor within the metropolitan area.

Walking through the belly of a giant rattlesnake with fangs, eyes that light up and a tail that rattles offers an unforgettable experience to Tucsonans and visitors as they safely cross six lanes of traffic at Broadway Boulevard. Transforming the artistic concept of a sinuous snake into a functional bridge required engineering and construction ingenuity.

The Diamondback Bridge is a post-tensioned, box girder concrete structure with bridge fencing material painted with a diamond pattern to simulate snakeskin. The bridge is 11-feet tall, 14-feet across, 280-feet long and allows for a 17-foot clearance above Broadway Boulevard. Pedestrians can make their way through the bridge via the tail or between the fangs of the open-mouthed rattler. The 28-foot high snakehead includes lifelike, translucent eyes that light up, and the 20-foot high tail is equipped with a 300-pound fiberglass rattle. Motion sensors installed near the rattle detect users’ presence on the bridge and trigger a realistic rattling sound effect.

The bridge has a unique rounded underside concrete superstructure with striped rustication that resembles a diamondback’s belly. The concrete abutments and center pier are faced with natural rock veneer to blend into the southwest desert landscape. Pedestrian fencing completes the snake-like body using circular tube-steel framing and expanded metal fencing. The tube steel framing creates a diamond pattern much like the diamonds found on a snake’s back, while the grating suggests a scaly skin. The changing light and shadows on the open weave fencing creates the impression of movement.

The expanded bridge fence canopy presents the pedestrian with an unobstructed, panoramic view of Downtown Tucson and the Catalina Mountains and provides a cool cross breeze on a hot summer day. At night, the interior lighting accentuates the rattler’s diamond pattern outlined by the contrasting structural fence members.

Careful planning and design considered maintenance needs early in the project to reduce upkeep throughout the life of the bridge. The concrete belly and abutments made from natural rock veneer are virtually maintenance-free. The rough surface and anti-graffiti coating deters vandalism. The steel fencing was painted with a special paint and UV clear-coat, which is guaranteed to hold up under Tucson’s intense sun for at least 10 years.

During several months, artist Simon Donovan and city staff made more than 25 public presentations to build support for the bridge. Computer-animated graphics were created and used to simulate the experience of walking through a snake-shaped pedestrian bridge. Word spread throughout the community and the simulation was featured on several local TV news shows. After much hard work and extensive community outreach, the public accepted the idea and engineering plans were drawn up. Later in the project, several local students became “artist assistants” and created a series of stencils and templates to be used to paint the complex snake pattern design onto the bridge surface. The students also created grooved strips for the form liner of the snake’s belly.

Project Results

The city of Tucson combined vision and technical skill to create a landmark bridge that serves as a key link to the downtown area. Walking in downtown Tucson is no longer just a means of getting from one place to another but is also a fun and whimsical experience. The bridge now serves as a distinctive gateway into downtown Tucson and is fast becoming a landmark and tourist attraction. As the locals say, “It is rather impressssssssssssssssssive.”

Funds to construct the Diamondback Bridge came from various funding sources, including local funds, Federal Highway Surface Transportation Program Funds and matching Transportation Enhancement Funds that could only be used for pedestrian and bicycle facilities. The final project cost was $2.5 million.

The project has won awards from numerous organizations, including the Federal Highway Administration, American Public Works Association (National and Arizona Chapters), Associated General Contractors (National and Arizona Chapters) and the American Council of Engineering Companies.
Project Name: Provencher Bridge
Project Location: Winnipeg, MB, Canada
Contact: City of Winnipeg Public Works Department
Project Team: Wardrop Engineering Inc., Gaboury Prefontaine Perry

Notable Features
This new pedestrian bridge includes a large, multi-purpose gathering plaza and commercial kiosks along its span—a first for any North American bridge—designed to bring people together on a daily basis. This design approach exemplifies standard public involvement.

Project Objectives
The project’s goal was to create a pedestrian bridge that was more than just a crossing, but was also a significant place for gathering and community building. More specifically, the bridge was expected to address the goals of improved pedestrian access to adjacent neighborhoods and riverbank activities, economic development, safety, attractive aesthetics, preservation of local culture and heritage, and fiscal responsibility. In addition, the planning process was to be inclusive, transparent, creative and free of preconceived notions.

Project Description
Located in downtown Winnipeg, the Provencher Bridge, built in 1918, is currently being replaced by a “paired bridges” design incorporating one bridge primarily for vehicles and commuter cyclists and a second exclusively for pedestrian and recreational users. The project, which began in summer 2001, opened to the public in December 2004. The vehicular bridge was built on essentially the same location as the existing bridge. It includes a small sidewalk on its north side for people walking to the Exchange District, near the project area.

The highlight of the project is the pedestrian bridge, which links two of Winnipeg’s most historic and culturally significant areas—the St. Boniface community, Winnipeg’s vibrant French quarter, and The Forks, a National Historic Site located at the confluence of the Red and Assiniboine Rivers, which incorporates a park, music festival site and a major commercial development—all on reclaimed rail yards. From a historical perspective, the bridge restores the alignment of the old Broadway Bridge, a once grand boulevard destroyed by ice in 1896.
The “ped” bridge is cable-stayed from a shimmering, metal clad spire rising 40 meters from the river. The cable-stay design reflects the light nature of its pedestrian traffic, while the spire signifies a place of meeting in the middle of the Red River—a celebration of the many cultures that have always come together along the historic river banks.

The bridge is 5-meters wide and 200-meters long. The main span is 110-meters long, and the signature feature is the transversely inclined spire. A 370-square meter (4,000-square feet) semicircular center plaza surrounds the southern portion of the spire’s base, providing space for services, washroom facilities and a restaurant or other businesses. Both the east and west landings provide potential dock access and open areas suitable for programming and temporary services, such as vendors. A rigid deck design was installed on the span to maximize pedestrian comfort.

The project’s greatest strength has been the public consultation process—the most comprehensive public consultation ever undertaken for a public works project in Winnipeg’s history. Unique to the process and fundamental to establishing public trust was the involvement of several community stakeholder groups in evaluating and choosing the public consultation contractor.

A project advisory committee (PAC) for the Provencher project was established in the fall of 1998, made up of representatives of various sectors in the community affected by the bridge, including residences, businesses, historic uses and cultural and tourism interests. PAC members maintained communication with their constituencies to ensure that their views were brought forward and to disseminate project information more widely. Each PAC member represented the views of a wider constituency, not merely their own individual opinion. The process was then launched publicly with media releases and a newsletter distributed to 18,000 addresses in the St. Boniface and downtown areas and to project stakeholders.

In the fall of 1998, the collaborative planning process started, continuing until the spring of 1999 during a series of 10 PAC meetings. After PAC members completed the preliminary work and consulted their constituencies, they generated eight possible bridge alternatives for the project’s technical consultants to analyze. Three main themes were established: (1) restoring the old bridge; (2) restoring the old bridge and building a new span; and (3) replacing the old bridge with a new bridge(s).

Four bridge alternatives selected by PAC as the most viable were presented to the public for input. Broader public input was gained through a second project newsletter distributed throughout the study area, display advertisements with response coupons, a project hotline and three open houses where the public could gain in-depth information and register their views. Finally, a comprehensive formal public opinion survey collected and analyzed bridge alternative preferences and the reasons for these preferences among area residents, area businesses and a sample of citywide respondents.

PAC members considered the public’s feedback and synthesized it with their comprehensive background knowledge, reaching consensus on the new paired bridges alternative—the plan that best met their highest priority goals of economic development, aesthetics, culture and heritage and fiscal responsibility.

**Project Results**

The comprehensive and collaborative planning process enabled project stakeholders to succeed in reaching consensus on a plan that was ultimately approved by the city council.

The most important ingredients to achieve consensus were:

- **Credibility and trust:** Building trust and power sharing were significant issues that needed to be addressed for the Public Works Department to establish credibility with the community.
- **Inclusive public process:** In forming the PAC, a careful recruitment process was designed to ensure broad and balanced community representation that would be reflective of the diversity of community views.
- **Comprehensive and collaborative planning:** PAC went through a comprehensive, five-step planning process of (1) conducting background research, (2) establishing of goals, (3) identifying alternatives, (4) evaluating alternatives and (5) developing recommendations.
- **Democratic process:** Although no one individual’s opinion dominated the PAC process, each individual’s perspective was heard.
- **Broad public input:** Gathering broad public input was a critical component of the public consultation process. As a result, the Provencher Bridge holds high public interest citywide, is a well-used route crossing the Red River and the cost of the alternative will be shared by all taxpayers.
Factual and Consistent Communication: The project team identified communication objectives, target audiences and key messages and worked to ensure that all publications and information provided to the media were consistent with the key messages. The team held facilitated work sessions at key points in the process, before the site tour and the public open houses, to identify probable questions and develop appropriate responses. This helped to ensure that everyone was “working off the same page” and in a way that was consistent with the goals of the public consultation.
Pedestrian and Bicycle Corridors

Introduction

Communities and neighborhoods thrive on interaction and depend upon the movement of pedestrians to make urban lifestyles possible. As much as architecture and the natural environment, pedestrian connections determine the quality of life of a neighborhood, city, or region. Therefore, pedestrian connections must be considered as integral to the urban fabric.

For the past 50 years, most transportation routes have been focused on the geometries of road design for motor vehicles. Recently, many communities have realized that a balanced transportation system provides the higher quality of life that most urban areas desire. Pedestrian and bicycle corridors have evolved from recreational amenities to become critical links in urban transportation systems.

The projects featured help connect people to the places they need to go and contribute to the sense of place that many communities are trying to develop:
- The Eastbank Esplanade gives city dwellers an opportunity to get closer to urban wildlife on the Willamette River and provides a major new pedestrian and bicycle corridor in Portland, OR.
- In the Westbrae neighborhood of Berkeley, CA, a dedicated coalition of volunteers, artists and public agencies helped the Ohlone Greenway project put a little more “art” in BART.
- When a cement truck fell through the elevated section of New York’s Westside Highway in 1973, it marked the beginning of a more than 20-year process that resulted in an exemplary urban boulevard in New York City.
**Project Name:** Eastbank Esplanade  
**Project Location:** Portland, OR, USA  
**Contact:** Portland Development Commission  
**Project Team:** Portland Parks and Recreation, Portland Office of Transportation, Hargreaves Associates landscape architects, Mayer/Reed landscape architects, KPFF consulting engineers

### Notable Features

This project successfully incorporates educational public art and a variety of uses in an area constrained by significant fish and wildlife habitat, historic bridges and an adjacent freeway, while providing a major new pedestrian and bike corridor in downtown Portland. The scenic corridor is located along the east bank of the Willamette River and completes a downtown waterfront loop used heavily by lunchtime, evening and weekend recreationalists. Part of the corridor actually floats in the river.

### Project Objectives

The Eastbank Esplanade is an important part of the long-term vision for downtown Portland. Early city planners included the park/corridor in conceptual open space plans, and more recently, the corridor was described in the Central City Plan (1988) and Eastbank Esplanade Park Master Plan (1994).

At the heart of the project is a desire to improve connections between all corners of the city:

- The esplanade loop provides an easy connection between the east and west sides of the Central City around its central feature—the Willamette River.
- A new steel bridge walkway and grand staircase provide improved connections from the Eastbank up to the Rose Quarter and Lloyd District, two major employment and entertainment districts.
- The Willamette River (Steel), Burnside, Morrison and Hawthorne Bridges all connect to the esplanade and are ADA compliant.
- Improvements to adjacent collector streets provide easy access to the esplanade for neighbors as well as workers in the Central Eastside Industrial District.

*Source: Portland Parks and Recreation, Oregon*
Project Description

The Eastbank Esplanade provides residents and visitors with a unique and distinctively urban experience. Tucked between Interstate 5 and the Willamette River, the esplanade is 1.5-miles long, extending from the Hawthorne Bridge to the Steel Bridge with connections to eastside neighborhoods as well as downtown across the river. Primarily a pedestrian/bicycle corridor, it offers unparalleled views of downtown Portland and leaves users with a whole new perspective of the river and the eastside.

Thirteen urban markers run the length of the esplanade, marking the eastside street grid and providing information about the river and the rich history of the area. Seating walls, benches, overlooks and small plaza areas offer places to stop and relax.

One of the highlights of the corridor is the 1,200-foot long floating walkway, the longest floating walkway in the United States. Here, the sensation of walking on water adds another dimension to the experience. The white caps on the floating walkway pylons are designed to discourage birds from landing on them, reducing the problem of bird droppings on the walkway. A total of 65 pylons anchor the floating walkway in place and each is embedded 30 feet into the Willamette River bed. The floating walkway was conceived due to the lack of available shoreline needed for a continuous path. The floating walkway is carefully constructed so that it is always ADA compliant, even at varying river levels.

Four pieces of public art are featured between the Morrison Bridge and the floating walkway. Moving from south to north along the esplanade, The Echo Gate is located beneath the Morrison Bridge. The sculpture symbolizes long-removed pier buildings and the myths of Shanghai tunnels. The Ghost Ship is sited on the south end of the former city Pier #2 bulkhead and is a grand lantern, illuminated from within, that marks the river’s current edge. The Stackstalk at the north end of the bulkhead is a hybrid beacon—part masthead, wheat stem and smokestack. Finally, The Alluvial Wall alludes to the interwoven layers of the river’s pre-industrial geology and human artifacts. RIGGA, a group of local artists, created the art as part of the Regional Arts and Culture Council’s Percent for Art program.

At the north end of the project, the new Steel Bridge pedestrian and bicycle walkway has been built on the lower deck of the historic Steel Bridge. The fully ADA-accessible crossing allows pedestrians and cyclists to cross the bridge from downtown and arrive at-grade with the esplanade. From here, pedestrians and cyclists have the choice of continuing south along the esplanade or going up a staircase or ramp, across a railroad bridge and connecting with the overlook by the Oregon Convention Center and Rose Quarter. A public boat dock provides 600 linear feet of eastside tie-up access for both commercial and private vessels, including possible future use by river taxis.

Twenty-two interpretive panels are at key locations along the esplanade. The interpretive panels are educational and provide information on topics ranging from the building of Portland’s bridges to the development of the city’s eastside. In total 280 trees and 43,695 shrubs—mostly native plants of Oregon—have been planted along the esplanade. Some early tree plantings proved to be tasty meals for local beavers, and mesh wire had to be placed around the plantings to deter them. Wildlife species...
that make this area their home include beavers, ducks, geese, herons, steelhead and salmon.

The final project phase includes the installation of a 3-acre crescent at the south end of the project. This area, which is envisioned to accommodate open space, parking and public attractions including restaurants, could become a major feature of the corridor.

The esplanade is a demonstration project for riverbank restoration and improved habitat areas for fish and wildlife. The riverbank has been reshaped in places with grading to allow for shallow habitat. Bioengineering techniques use native vegetation and other areas to pre-treat I-5 runoff before it enters the river—a unique feat for a river that seasonally fluctuates 30 feet in water depth. The plantings also minimize the need for riprap rock for erosion control.

To provide project oversight, the city formed a citizen Eastbank Riverfront Project Advisory Committee. PAC members were appointed by the mayor and the parks commissioner. PAC, which is still advising the city on future project phases, includes members of adjacent neighborhoods, the Central Eastside Industrial Council, landowners, river and environmental enthusiasts and long-time parks activists.

The esplanade is a public right-of-way for non-motorized, non-commercial vehicles and pedestrians, and is open 24 hours a day, 7 days a week.

**Project Results**

Today, the Eastbank Esplanade is heavily used by walkers, runners, cyclists and in-line skaters. It has also become a destination for picnickers, readers and artists sketching and painting. The total cost for the project, not including the Crescent, was $30 million.
Project Name: **Ohlone Greenway**  
Project Location: Berkeley, CA, USA  
Contact: San Francisco Bay Area Rapid Transit (BART)  
Project Team: BART—Real Estate, Customer Access and Government and Community Relations; City of Berkeley, Civic Arts Commission, Departments of Parks, Recreation and Waterfront, Transportation, Planning and Public Works Departments; Peralta Northside and Karl Linn Community Gardens; San Francisco Estuary Institute; California Rails to Trails; American Society of Landscape Architects; White House Millennium Trails Project; Berkeley EcoHouse; BEA-FEW Foundation; Berkeley’s Partners for Park

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**Notable Features**

This project exemplifies the collaborative results of a successful partnership between BART, the city of Berkeley and the Ohlone Greenway Group. The Ohlone Greenway project revitalized a 1-mile stretch of an unassuming transit maintenance service road into a pedestrian and bicycle corridor with a strong sense of place. The corridor, with art installations and outdoor seating areas, is now a neighborhood focal point for community education, showcasing the work of local mural artists and sculptors and reinforcing safe pedestrian and bicycle mobility.

**Project Objectives**

The project’s main objective was to take advantage of underutilized open space and improve the right-of-way by making it a desirable pedestrian and bicycle facility that incorporates public art. The design concept for the corridor was to develop a pedestrian/bicycle greenway that commemorates the neighborhood’s cultural and natural history by providing exhibits, public art, a social gathering spot and a pleasant and safe public pathway.

**Project Description**

This project is located in the Westbrae neighborhood of Berkeley, CA. It encompasses a 1-mile stretch of land within the right-of-way of the Bay Area Rapid Transit District (BART), which is adjacent to BART tracks. This right-of-way has been used in the past as a service road and a minimally improved bikeway and dirt pedestrian path. In 1997,
Karl Linn, a retired professor of landscape architecture and leader of the Community Garden of North Berkeley, approached BART and the city of Berkeley with an idea to improve the right-of-way by making it a desirable pedestrian and bicycle facility and by incorporating public art. During the next four years, muralists, steel sculptors, ceramists, landscape architects, bicycle specialists, educators, historians and staff from BART and the city of Berkeley created a partnership that developed a project and funding program that was truly community-based.

The Ohlone Greenway features art installations, interpretive signs and landscape restoration with native plants to convey the many-layered stories of the area and its inhabitants. Its goal has been to reach out to a diverse community by telling the story of the greenway in a lively and engaging manner.

Project design and construction was carried out between 1998 and 2002 by an extraordinary and dedicated team of artists, architects, landscape architects, educators, historians and agency staff. The project was dedicated on September 24, 2002.

**Project Results**

The project achieved its objective and transformed the thoroughfare into a linear neighborhood commons by providing opportunities for neighbors and visitors to socialize around the art installations and outdoor seating areas.

Since its dedication, the project has resulted in new educational opportunities and community projects. More artwork is planned and the community has submitted funding applications to expand the project area. The local community has adopted this section of the greenway by providing care and monitoring of the artwork, re-vegetation of native Californian plants and informational displays.

This grass-roots project has also built a strong sense of community ownership in the corridor. This sense of pride in a neighborhood can help to maintain the corridor and sustain its ability to perform as a community hub. Landscape architect and psychologist Karl Linn, who coordinated the work, explained, “The participatory planning, design and construction was carried out over the last four years by an extraordinary dedicated volunteer team of artists, architects, landscape architects, educators and historians. The experience has been so rewarding because of the enthusiastic spirit of collaboration and friendly personal interaction with representatives of the funding organizations that went beyond mere fiscal sponsorship.”
Pedestrian and Bicycle Corridors

**Project Name:** Route 9A Reconstruction
**Project Location:** New York, NY, USA
**Contact:** Vollmer Associates
**Project Team:** New York State DOT (NYSDOT), Vollmer Associates; Bechtel Infrastructure; Signe Nielsen P.C.; Domingo Gonzalez Design; Infratech Associates; Maitra Associates P.C.; Munoz Engineers P.C.; Helen Newhause & Associates; and Mueser Rutledge Consulting Engineers

### Notable Features
The Route 9A Reconstruction project exemplifies the integration of dedicated pedestrian and bicycle facilities in a reconstructed urban transportation corridor. This project replaced Manhattan’s elevated West Side Highway (Route 9A) after a truck fell through an elevated section and the highway was demolished. The project features:

- A separate bikeway/walkway extending the full length of the project corridor’s 5.4 miles;
- Safe, convenient and barrier free at-grade crosswalks with landscape median refuge areas;
- Designated pedestrian crosswalks reinforcing the neighborhood scale of the local adjacent communities;
- A boulevard design that enhances the waterfront and creates a park-like environment; and
- Preservation of water views and pedestrian access for the future Hudson River Park.

### Project Objectives
NYSDOT’s objective was to create an urban boulevard, in other words, a vehicle and pedestrian transportation corridor, featuring:

- Separated pedestrian and bicycle routes;
- Increased pedestrian safety and access to the Hudson River Park Waterfront; and
- Pedestrian refuges away from moving traffic.

### Project Description
On December 16, 1973, a construction crew was making repairs to the West Side Highway. A cement truck on its way to the construction site fell through the northbound roadway, causing a 60-foot section of the highway to collapse. Although the bridge was considered unsafe after the incident and incapable
of serving traffic demand, early designs to replace it met with public resistance and were deemed too expensive. The demolition of the highway started in 1977 and was completed in 1989.

In 1986, NYSDOT began studying alternatives to replace the West Side Highway. The urban boulevard concept, one of the four alternatives considered, represented a visionary urban design achievement with the creation of a new vehicular and pedestrian transportation corridor for Manhattan’s west side. The new at-grade, landscaped roadway stretches 5.4 miles, from Battery Place to 5th Street, with a continuous bikeway/walkway running the entire length along the waterfront. The walkway, which runs along the 16-foot wide bikeway, provides pedestrians with continuous access along the West Side Waterfront. Decorative pavements, pedestrian-level lighting and landscaping create a park-like environment with outstanding views.

Because the six-lane boulevard separates the neighborhoods to its east from the Hudson River and the walkway to its west, pedestrian access and safety were significant design considerations. Barrier-free, signalized, at-grade crosswalks were designed for both pedestrian convenience and safety. The boulevard’s 19-foot wide raised center median provides a large refuge area for pedestrians and protection for trees and shrubs from vehicles and roadway salt. In addition, a 20-inch high, low-profile barrier was designed to discourage mid-block crossings and direct people to the designated crosswalks. A landscaped area between the boulevard’s southbound travel lanes and the bikeway/walkway provides a safe refuge area for pedestrians, preventing them from walking directly into the path of bicyclists and joggers.

**Project Results**

This design reinforces the pedestrian environment through traffic calming, enhanced visual quality and architectural streetscape treatments that help create a sense of place. For example, at each local street intersection view corridors to the river were planned to provide a connection with the community. In addition, the at-grade design integrates the new roadway into the pedestrian scale of the adjacent neighborhoods. The boulevard preserves view corridors to the Hudson River from intersecting cross streets and adjacent neighborhoods, encouraging pedestrians to enjoy this exceptional community asset. The design also establishes a park-like character in keeping with the future development of the Hudson River Park Waterfront.

The corridor’s overall feeling of continuity is conveyed not only by lush landscaping but also by urban design elements consistently used throughout the corridor. Decorative light poles, for example, convey the history of the area as well as the elegance of the urban boulevard. Their design is repeated in high and low street poles for uniformity. Similarly, paving material, chosen for its durability and aesthetic quality, is repeated in the bikeway, walkway and sidewalks along the corridor.
Introduction

Building facilities to improve pedestrian and bicycle mobility requires vision and planning at all levels of government. ISTEA gave a significant boost to a growing desire for more pedestrian and bicycle facilities in the United States. State governments, working with local communities, finally began to dedicate funding for facilities to help build more balanced transportation systems by providing choices for people to walk or bicycle. Since the early 1990s, cities and regions have similarly dedicated increasing resources to develop strategic policies and plans to guide investment decisions. They have also developed detailed engineering standards to ensure that built facilities function well.

Covering initiatives from broad policy goals to detailed sidewalk improvement plans, the following case studies highlight various aspects of planning for pedestrian and bicycle accessibility:

- Specific design standards in Montgomery County, MD, address how to provide walking and bike paths in green corridors where water quality and impervious surfaces are concerns.
- In its general transportation planning, Vancouver, BC, Canada gives primary emphasis to pedestrians and bicyclists and has created robust policies based on city goals, actual pedestrian travel behavior and opinion surveys. The city’s commitment to pedestrians and bicyclists is exemplified by the creation of pedestrian and bicycle arterial networks.
- In developing its first comprehensive pedestrian plan, Nashville, TN, utilized global positioning system (GPS) technology and customized software to focus first on providing ADA-required improvements in a quick timeframe to comply with a court mandate.
- The Puget Sound Regional Council wants to encourage cyclists to commute by transit. They believe “bikestations” make commuting more convenient and they have a plan to build more of them.
- In Oakland, CA, a pedestrian plan has been developed in conjunction with a high-quality, walking facilities map to educate local citizens about safe walking opportunities.
Improving the Pedestrian Environment Through Innovative Transportation Design

**Project Name:** Design Standards for Pedestrian- and Bicycle-Friendly, Environmentally Sensitive Roadways

**Project Location:** Montgomery County, MD, USA

**Contact:** Montgomery County Department of Public Works and Transportation, Traffic Operations Section

**Project Team:** Maryland-National Capital Park & Planning Commission, Montgomery County Department of Permitting Services, Maryland-National Capital Building Industry Association and the Montgomery County Road Code Committee

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**Notable Features**

Montgomery County, MD, has developed a comprehensive and practical set of design standards for open section roadways with sidewalks and off-road bikepaths. Open section roads do not have curbs and gutters and use shoulders and side ditches to redirect stormwater runoff. The standards were prepared for application in environmentally sensitive watersheds throughout the county and successfully balance the need for pedestrian and bike mobility with water quality concerns.

**Project Objectives**

To address residential and employment growth in rural areas, the county needed to develop standards to both promote pedestrian/bicycle travel and address water quality concerns. Specific objectives of the project included:

- Providing safe passage for pedestrians, motorists and bicyclists commensurate with the roadway’s classification and function;
- Decreasing stormwater runoff by minimizing paved surface area;
- Decreasing stormwater runoff temperatures;
- Maximizing grass surfaces to naturally filter stormwater runoff and encourage groundwater recharge;
- Ensuring manageable construction and operations costs;
- Preserving development yields;
- Providing an aesthetically pleasing neighborhood for future residents; and
- Maintaining access to underground utilities.
Project Description

In 1992, the Montgomery County Council adopted two pieces of legislation that would result in the construction of more sidewalks in new residential, commercial and industrial subdivisions. The legislation amended two sections of the Montgomery County Code: Chapter 49, the “Road Code,” and Chapter 50, “Subdivision of Land.”

The need to construct sidewalks on public open section roadways created a dilemma for both the public and the private sectors: the then-adopted county roadway design standards did not include sidewalks on open section roads. As a result, there was no consistency as to where private consulting engineers proposed to construct the required sidewalks. Some engineers proposed locating the sidewalk in the shoulder area while others proposed locating them behind the side ditch. With numerous subdivision plans being delayed in the review process, the county needed to develop consistent standards to both protect water quality and promote non-motorized mobility.

Three design standards were prepared for low-volume residential streets—tertiary, secondary, and residential primary classifications—and three standards were prepared for master planned collector roadways—master planned primary, two-lane arterial and four-lane divided arterial. The project also developed two landscaping design standards and a policy to allow waivers for closed section roads in environmentally sensitive watersheds.

The standards balance the competing goals and objectives of a diverse group of stakeholders, including motorists, pedestrians, bicyclists, public agencies, the development community, private utility companies and future residents. Noteworthy features of the standards include:

- Establishing uniform shoulder and ditch sections—with dimensions and slopes determined based on the hierarchy of roadway classifications;
- Preserving lot yields through the use of public improvements easements in lieu of requiring additional right-of-way; and
- Providing street trees to shade the pavement and grass surfaces in differing locations, commensurate with the roadway classifications, to reduce the temperature of stormwater runoff and improve aesthetics.

The standards are the result of a collaborative effort involving staff from the Maryland National Capital Park & Planning Commission, the Montgomery County Department of Permitting Services and the Department of Public Works. The local development community, through their representatives in the Maryland National Capital Building Industry Association and the Montgomery County Road Code Committee, constructed several pilot projects and offered valuable suggestions prior to approval of the final standards.

Project Results

The project’s major goals have been achieved. As a result of reduced runoff and improved water quality at the storm drain outfalls, the environmental impacts of open section roadways is significantly less than that of a comparable classification closed section roadway. Pedestrians, bicyclists and persons with disabilities are provided a pleasant and safe environment. The shoulder and ditch side slopes are such that maintenance by the abutting homeowners and public works crews can be performed with relative ease. Plan approval and permit acquisition have been facilitated since the adoption of the standards, and the standards have gained the acceptance and support of regulatory—planning, transportation and environmental—agencies as well as the private development industry.
Project Name: Vancouver’s Downtown Transportation Plan
Project Location: Vancouver, BC, Canada
Contact: City of Vancouver Engineering Services (Strategic Transportation Planning)

Notable Features

Vancouver’s Downtown Transportation Plan gives significant emphasis to walking that is not usually found in other cities. It reflects the city’s long-standing commitment to making pedestrians the highest priority and to the city’s goal of creating a livable and sustainable downtown community.

The plan is unique in that many details important to pedestrians are considered in this broad transport plan. These range from sidewalk conditions and traffic signal operations to detailed public area treatments. Of particular importance, the plan establishes pedestrian and bicycle arterial networks to help focus future development and improvements.

Project Objectives

The plan’s objective is to provide a comprehensive transportation strategy to accommodate the increase in people traveling to and from the downtown projected for the next 20 years without adding traffic lanes to bridges and roads. The plan also calls for improving the pedestrian environment so that walking becomes a more attractive, safe, efficient and comfortable transportation alternative.

Project Description

Walking and bicycle trips in Vancouver increased 55 percent between 1994 and 1999, and now surpass both auto and transit trips. To encourage walking, a series of public workshops and stakeholder meetings were held during the planning process. To better address existing transportation concerns—particularly pedestrian issues—several public “walkabouts” were held in various areas of the downtown. These enabled staff to meet with the public, observe conditions at specific locations first hand and discuss issues of concern—many of which otherwise would have gone unreported.
The consultation process identified the need for a network of enhanced pedestrian routes throughout the downtown. Like arterial streets for cars, a dense network of connector routes for pedestrians was developed downtown. These are considered the primary routes that pedestrians will choose when walking to their destinations. They were selected based on the connections they provided between various pedestrian destinations, such as waterfront areas, parks, retail and restaurant areas, employment centers, tourist attractions, hotels, the convention center, sport venues, community centers, performing art theatres, libraries, historic districts, transit nodes, landmarks and residential neighborhoods.

The fact that many pedestrians already use these routes was a strong indication of their value. Thus, the goal became to enhance pedestrian safety, comfort and ease of use along them. The plan also sought to make these streets fully accessible to all pedestrians, including those with mobility impairments, and to give pedestrians priority over other modes of transportation where possible.

In addition to the network of pedestrian connector routes, a network of greenways—multi-use recreational routes that provide greater priority to pedestrians and cyclists—was also created. Unlike pedestrian connector routes, greenways go beyond providing comfortable pedestrian routes. Their role is to expand opportunities for urban recreation and to enhance the experience of nature and city life. One of Vancouver’s most successful greenways is the Seaside Greenway, a waterfront promenade that provides a scenic path for cyclists, in-line skaters and pedestrians separated from vehicular traffic. Special attention to public-realm design and amenities, such as benches, public art, drinking fountains, abundant landscaping and special surface treatments, are common along these routes.

To help develop the plan and update previous studies, a comprehensive study on pedestrian travel habits on commercial streets was completed in 2002. The study, which documented mid-block pedestrian volumes and included a pedestrian opinion survey, was used to identify the busiest sidewalks, assess pedestrian levels-of-service, prioritize pedestrian and public-realm improvements, design pedestrian facilities, establish access provisions for new developments, determine pedestrian origins and destinations and obtain opinions about existing pedestrian facilities.

Some of the policies that were developed as a result of the survey include:

- Providing sidewalk curb ramps at every intersection;
- Removing restricted pedestrian crossings;
- Providing mid-block crossings and pedestrian bulges;
- Enhancing sidewalk crossings in rear alleys;
- Providing wayfinding signage;
- Minimizing parking and loading across sidewalks;
- Limiting above- and below-grade pedestrian crossings;
- Providing pedestrian weather protection;
- Removing pedestrian holds at signalized intersections;
- Providing audible pedestrian signals; and
- Providing pedestrian shortcuts, where possible, between privately owned buildings.

In developing the plan and monitoring its effects, the city used a variety of tools: a downtown sub-area pedestrian transportation model, review of collision statistics, street-level noise data to identify mitigation locations, a streetscape assessment model and downtown air-quality data.

**Project Results**

The Downtown Transportation Plan was unanimously adopted by city council in July 2002 after receiving support from all stakeholders. The plan is now policy and the implementation is underway. Key pedestrian results are summarized below:

- Daily downtown walk trips are expected to increase by about 50 percent by 2021, while automobile trips into downtown are expected to remain relatively unchanged.
- Downtown pedestrian volumes and opinions were well documented in the 2001–2002 pedestrian study. This study will be repeated every 5 years to track progress.
- A network of pedestrian connector (arterial) routes will be developed to provide easy, direct, safe and fully accessible routes across the downtown for all pedestrians, including those with mobility challenges.
- A network of greenways will be developed to provide greater priority to pedestrians and cyclists. Its role is to expand opportunities for urban recreation and to enhance the experience of nature and city life through public art, landscaping and other amenities.
- The adoption of numerous pedestrian policies and recommendations that will significantly
enhance pedestrian priority, convenience and safety.

- The identification of many potential improvements at specific downtown locations where pedestrian deficiencies exist.

- Assessment of traffic impacts, air quality, noise impacts, safety and streetscapes as part of the evaluation of the transportation system, particularly with respect to impacts to pedestrians.
**Project Name:** Nashville’s Strategic Plan for Sidewalks and Bikeways

**Project Location:** Nashville, TN, USA

**Contact:** RPM Transportation Consultants LLC

**Project Team:** Metro Nashville Public Works and Planning, Hawkins Partners, Fehr & Peers, Digi Design, Perdue Research

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**Notable Features**

Under a court mandate to comply with ADA regulations, this project utilized innovative technology to quickly identify deficient pedestrian facilities in a large geographic region. In addition, the project developed an efficient method for prioritizing improvements. As a result, Nashville is rapidly upgrading its pedestrian infrastructure in a systematic fashion.

**Project Objectives**

The purpose of the strategic plan is to enable Nashville to quickly and systematically plan and implement facilities that improve safety, enhance mobility, optimize accessibility and promote a better quality of life. More specifically, the plan’s goals included identifying all sidewalk-related ADA deficiencies, developing design standards for all sidewalk improvements, developing cost estimates for achieving ADA compliance, identifying strategies for funding needed improvements, establishing sidewalk construction priorities and developing design practices and policies.

**Project Description**

Between 2000 and 2002, Metro Nashville dedicated $55 million for sidewalk improvements. This unprecedented level of funding created tremendous challenges for Metro Public Works to effectively prioritize, program, design and construct the improvements in an efficient way.

Complicating matters, in July 2000, Metro was mandated by the U.S. Department of Justice to bring all existing sidewalks into compliance with ADA and to develop ADA-compatible design standards for future sidewalks. This mandate placed Metro under extreme pressure to identify the extent of sidewalk compliance problems, develop cost estimates and create a plan for achieving ADA compli-
Improving the Pedestrian Environment Through Innovative Transportation Design

A key component of the plan was an inventory and condition assessment of all existing sidewalks and curb ramps within Metro Nashville. All 750 miles of sidewalks and 16,000 ramp locations within Nashville’s 530-square-mile area were inventoried. The team developed an innovative procedure utilizing custom developed GPS software linked to Metro’s Geographic Information System (GIS) to perform this extensive inventory. The software was loaded onto handheld personal computers so that field data collectors quickly and efficiently could record a wide range of sidewalk conditions. All ADA compliance problems were identified by location and recorded. This procedure simplified the data collection process and made it possible for the team to analyze the data and develop a detailed strategy for correcting sidewalk and ramp problems in a short time frame.

The inventory and subsequent analysis were the basis for developing cost estimates and recommendations for improving the existing sidewalks and ramps. The team developed detailed cost estimates for bringing all of Metro’s existing sidewalks and ramps into ADA compliance, as well as estimates for constructing new sidewalks in high-priority locations.

The project team developed a creative and effective method for prioritizing future sidewalk projects. This method, called the Sidewalk Priority Index (SPI), rates the need for sidewalks based on land use and transportation factors such as development type, density, proximity to schools, proximity to other pedestrian generators and accessibility to transit routes. The SPI ensures that sidewalks are first constructed where the need and potential for pedestrian traffic is the greatest. The county-wide SPI ratings are mapped using a GIS-based format. This method allows rapid calculation of the SPI for any location, and the SPI can be easily updated to account for changes in land use or other factors. The SPI is now being used by Metro for establishing priorities for new sidewalks and improvements to existing sidewalks.

Finally, the strategic plan recommends new and modified ordinances, policies, practices and programs to aid in the development of Nashville’s sidewalk and bikeway projects. Recommended education and law enforcement programs were developed by RPM Transportation Consultants to promote the development and use of sidewalks and bikeways in Metro Nashville.

The Pedestrian Facilities Design Guidelines included in the plan were developed to ensure the integration of pedestrian accommodations into all projects that have the potential to affect pedestrian travel within Metro Nashville. The design guidelines are based on standard and emerging practices used throughout the country but reflect the specific needs and circumstances of Nashville.

The project team effectively used a comprehensive public input process that included 10 public meetings, a citizen’s advisory committee, extensive newsprint and television coverage and a project Web site. Four public meetings were held at the beginning of the project to introduce the project to the public and to get feedback on the general issues affecting walking in Nashville. The meetings were held in different areas of the city to ensure diversity of opinions. A second round of four meetings took place after the collected data had been analyzed and preliminary recommendations were developed. During these meetings, the project team presented the results of the analyses, introduced the initial recommendations and received comments. Two final meetings were held to present the final draft of the plan, including all recommendations.

Throughout the planning process, a Web site provided information to the public on the plan’s progress, draft recommendations, upcoming public meetings and other pertinent issues. It also served as a means for Nashville citizens to submit their comments and ideas to the project team.

Project Results

The plan is being implemented and $75 million was allocated for constructing and improving sidewalks between 2001 and 2003. Full implementation of the plan will result in more than 900 miles of new and improved sidewalks built to national standards.

Almost all of Nashville’s sidewalks had at least one ADA compliance problem, such as missing or damaged segments, cracks, excessive cross slope, or obstructions such as utility poles, signal cabinets and mailboxes. The inventory also identified nearly 16,000 locations where sidewalk ramps were required. Approximately two-thirds of these ramps were missing. In addition, less than 10 percent of existing ramps were ADA compliant.

The Strategic Plan for Sidewalks and Bikeways is a landmark plan for Nashville, and for the first time in its history, Nashville has made a clear commitment to pedestrian mobility. The plan describes the steps necessary for Nashville to construct and
maintain a network of sidewalks that meet or exceed ADA requirements. The plan also recommends practices, policies and educational programs that encourage the use of pedestrian facilities. These policies and programs reflect the best practices from around the country and are now being used by regional planners, designers and administrators to ensure that pedestrian facilities are integrated into all of Nashville’s transportation projects so that Nashville will emerge as a world-class walkable and bicycle-friendly city.
A bikestation is a facility designed to promote bicycle transit commuting to work, as well as to encourage biking as a form of local mobility. This project is the first in the nation to attempt to project demand for new bikestation facilities, based on the performance of other bikestations, local demographic and transit data and travel characteristics of local bicyclists. The methodology was tested against actual performance at other bikestation locations and was found to be an accurate predictor of potential facility use.

**Project Objectives**

Encouraging bicycle access to transit can help increase transit ridership and reduce automobile trips on the Puget Sound Region’s already overburdened roadways. One way to encourage bicycle access to transit is to create good facilities for bicycles at transit stations—including bus transit centers, park-and-ride lots, rail stations and ferry terminals.

The Regional Council’s Bikestations Project aims to give local transit agencies the tools and information they need to better accommodate bicycles at their bus and rail stations, ferry terminals and park-and-ride lots. The project study and its findings will help these agencies plan, design and build regionally coordinated bicycle-parking facilities, appropriately scaled for potential levels of use. The project also examines the feasibility of constructing commuter bikestations, similar to those in California, at key transit stations in King, Pierce and Snohomish counties.

**Project Description**

Achieving a more efficient transportation system and enhancing regional mobility by increasing the number of people who bicycle and take transit rather than drive alone is an important goal for the Central Puget Sound Region. Communities nationally and internationally have discovered that bicycles and transit are a natural match. The average per-
son is willing to walk one half mile to transit services. However, the transit catchment area grows to 3 miles or more if the person is on a bicycle.

What is a Bikestation?

Accommodation for bicycles at transit facilities can range anywhere from a simple bicycle rack to a staffed bicycle commuter station or bikestation. A bikestation is a facility designed to promote bicycle/transit commuting to work, as well as to encourage biking as a form of local mobility.

Bikestations built in Long Beach, Palo Alto and Berkeley, CA, offer many different services such as secure bicycle parking and storage, bicycle repair, retail sales of parts and clothing, bicycle rental, food and snack sales, information kiosks and shower and changing facilities. The California bikestation efforts have demonstrated the utility and benefits of addressing the needs of bicyclists at key transfer locations on high-capacity transit systems in the West, as European examples have demonstrated for several decades.

The Regional Bikestations Project

Due to these proven successes, the Puget Sound Regional Council, local transit agencies and other jurisdictions in the region are exploring the application of bikestations as one strategy to encourage alternative travel modes. The region has already established a positive relationship between bicycling and transit, largely with the Metro Bike and Ride program, which provides bicycle racks on all the region’s buses.

Methodology

The demand methodology is intended as a flexible tool for use by transit and planning practitioners to determine bicycle-parking demand at any given transit facility. The methodology not only determines how many individuals might use a facility, but helps to determine which parking facility type will be most effective and efficient in a given location. The methodology was tested against actual performance at other bikestation locations and was found to be an accurate predictor of potential facility use.

Feasibility Study

The study examined feasibility of constructing bikestations at six locations in the Central Puget Sound region. These sites are:

- King Street Station, Seattle;
- Montlake Flyer Stop, Seattle;
- Tacoma Dome Station, Tacoma;
- Everett Multi-Modal Station, Everett;
- Overlake Transit Center at NE 40th Street, Redmond; and
- Bellevue Transit Center, Bellevue.

The study developed conceptual facility plans for all but the latter two projects, which are being developed by Sound Transit. Key factors in the evaluation of the sites as potential bikestation locations included:

- Construction cost;
- Visibility;
- Access to bicyclists and pedestrians;
- Access to transit;
- Long-term viability;
- Access to commercial activity; and
- Access to employment.

These factors were combined to determine the best design and operational response to the needs and demand present and anticipated at each location.

Design Guidelines

Consistent design guidelines for three types of bicycle parking facilities are presented. In addition to a bikestation design, the guidelines also describe basic bicycle parking facilities and an intermediate level appropriate for higher demand at locations not yet ready to support full bikestation development. The guidelines are intended to mesh seamlessly with existing Sound Transit signing and design elements and can be adapted to other sites operated by local transit partners. The design guidelines were used in developing prospective plans for facilities at Montlake, Everett, Tacoma Dome and King Street.

Marketing

An integrated, regionally-consistent marketing strategy is a crucial element for success of the regional bicycle parking program. This study outlines the key components of a regionally coordinated program to promote and market regional bicycle/transit facilities and services. Project findings show that the best way to accomplish this is through a public/private partnership in which the day-to-day operations of bikestations are contract-
ed out to a private venture with sufficient public oversight to ensure project goals are being met.

**Project Results**

This project looked at the feasibility of constructing bikestations throughout the region. Findings for specific sites were determined by applying the methodology developed to estimate the demand for bicycle parking and, thus, the potential market for bicycle parking services. Next, the level-of-service matrix was used to assess the best fit of services to the sites. Among the findings was a recommendation to build a bikestation facility near King Street Station in downtown Seattle. The other sites reviewed may eventually develop demand for a full-fledged bikestation, but for reasons specific to the locations, do not yet support a staffed facility. Of these other sites, significant facility improvements are justified at Montlake in the immediate future, while stations in Everett and Tacoma require additional transit service and/or denser development in the vicinity to make full-scale bikestation facility development worthwhile.

The methodology and level-of-service matrix can be used by local transit providers and other agencies in the region as a means of estimating bicycle parking demand at transit stations to determine appropriate facility development in response to the needs of an expanding community of bicycle/transit commuters. In addition, the methodology can be used to assess potential scenarios given different projected land use or transit characteristics envisioned for a particular site in the future. The design guidelines, construction documents, marketing strategy and marketing and design tool kit were developed so that implementing agencies have all the tools at their fingertips to develop and promote high-quality, uniform bicycle parking facilities that are part of a coordinated regional program.

This study emphasizes the role of a coordinated regional effort to prioritize, develop, market and administer an integrated system of regional bicycle parking facilities. In this respect, the study is unique in the United States. By implementing the ideas presented here, the region can take a big step forward in realizing regional policy goals that call for the reduction of single occupant vehicle travel and an increase in the number of trips made by alternate travel modes, such as transit and bicycle.
**Project Name:** Oakland Pedestrian Safety Project/ Master Plan  
**Project Location:** City of Oakland, Community and Economic Development Agency (Oakland Pedestrian Safety Project)  
**Contact:** Puget Sound Regional Council  
**Project Team:** City of Oakland: Public Works, Unified School District, Police Department, City Manager’s Office; Citizens Pedestrian Advisory Committee; Mayor’s Commissions on Aging, and Persons with Disabilities; Alameda-Contra Costa Transit District, BART.

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**Notable Features**

This project created a high-quality, easy-to-read and widely distributed pedestrian and bicycling map as part of a comprehensive and state-of-the-practice pedestrian plan. Unlike traditional “toolkits” designed for pedestrian advocates, the map encourages residents not just to read about pedestrian issues, but to actively—and safely—walk and bicycle in their city.

**Project Objectives**

The impetus for the plan was collision data in the late 1990s that ranked Oakland among the most dangerous cities in California for pedestrian injuries and fatalities. To promote walking and bicycling and make these modes safer, city staff obtained a grant from the California State Office of Traffic Safety to complete a state-of-the-practice master plan for pedestrians. Based on a “Three Es” approach that involved engineering, education and
enforcement, the Oakland Pedestrian Safety Project (OPSP) completed the planning in-house and integrated the process with other city planning projects.

**Project Description**

In November 2002, the city of Oakland adopted a comprehensive pedestrian master plan as part of the land use and transportation element of the city’s general plan. The pedestrian plan is an outgrowth of a comprehensive planning process integrating quantitative analysis, community outreach, policy directives, street redesign and new funding sources.

The result of a two and one-half year planning process, the plan reflects the growing importance of pedestrian safety and access in Oakland. The plan establishes a pedestrian route network extending throughout the city, emphasizing safe routes to school and transit. It also includes policy recommendations, design elements and priority projects to promote walking as a form of transportation and recreation that is safe and accessible for all Oakland residents. The plan’s project list coincides with a countywide sales tax, which provides a guaranteed source of funding for pedestrian-oriented capital improvement projects during the next 20 years.

The 20-year plan is based on an analysis of collision data and an extensive community outreach process. Using five years of data, staff analyzed more than 1,800 pedestrian/motor vehicle collisions by several variables including location, pedestrian/driver age and collision factors. The plan identifies the top 10 collision intersections for all pedestrians—and specifically for children and senior citizens—and the 10 schools with the most child pedestrian/motor vehicle collisions within a quarter mile radius.

The outreach process consisted of 70 community presentations plus monthly meetings of the Citizens Pedestrian Advisory Committee (CPAC) throughout the planning process. Members of the CPAC and staff at OPSP brought citywide collision maps to community groups where citizens identified areas and issues of concern. For OPSP, this outreach process provided a structured opportunity to conduct community education while soliciting citizen concerns at the neighborhood level. It also cultivated public support for the plan while building a coalition for pedestrian safety.

**Project Results**

In addition to the pedestrian improvements that have resulted from the plan, the project’s most visible element is the Walk Oakland! Map & Guide. A 24-by-36-inch, full-color map, Walk Oakland! is the public face of the pedestrian master plan, and shows sidewalks, walkways (a historic network of paths and staircases), landmarks, civic destinations, neighborhood names used but rarely published, street grades and bicycle and transit routes. On the back of the map are bicycle and pedestrian safety tips, a primer on pedestrian design improvements, recommended walks and walking tour information.

Initially, 5,000 maps were distributed to neighborhood groups—many of which had participated in its creation. Another 6,000 maps were sent to local schools and recreation centers where teachers use it to teach about walking, bicycling and geography. The map is also available in many Oakland bookstores and bicycle shops, where it remains in high demand. Wherever it has been distributed, the map has encouraged residents to safely walk and bicycle throughout the city.

The project also included annual sponsorship of Walk to School Day and has coordinated targeted enforcement by the Oakland Police Department. Starting with pedestrian safety, the pedestrian master plan has become a resource in the city of Oakland for addressing a host of issues including accessibility, walkable neighborhoods, neighborhood commercial revitalization, safe routes to school, safe routes to transit and public health.

The planning process began in spring 2000 and ended in fall 2002. The California State Office of Traffic Safety sponsored the completion of Oakland’s Pedestrian Master Plan as part of a $600,000 grant for a comprehensive, coalition-based program to promote pedestrian safety in Oakland based on the “Three Es” approach. The total cost of the plan was $242,000. The entire plan can be viewed at www.oaklandnet.com/government/Pedestrian/index.html.
Numerous recent reports have documented the declining general health and fitness of adults and children in the United States due to inactivity and other causes. Fortunately, another growing body of literature is documenting ways that walking, bicycling and other activities can improve health and fitness. The 1996 Surgeon General’s report “Physical Activity and Health,” for instance, recommends “a minimum of 30 minutes of physical activity of moderate intensity on most, if not all, days of the week.”

Benefits attributable to increased walking include:

- A 20 percent reduction in the incidence of breast cancer;
- 50 percent risk reduction for certain types of diabetes;
- Heart disease reductions of 30 to 40 percent;
- Reduced risk of colon cancer;
- Reduced risk of stroke;
- Improved thinking skills for senior citizens; and
- Improved longevity.

Moreover, projects that increase walking and bicycling can help to improve local traffic conditions and air quality, which also contribute to the general health of cities and their residents.

The case studies profiled in this report represent projects that encourage walking and physical activity by creating additional walking destinations, more pedestrian-friendly or safer walking environments, and solutions to particular barriers or challenges that might hinder walking and biking activity. Collectively these projects and programs can contribute significantly toward building a more livable, sustainable society by building a more robust transportation system as a result of more pedestrian paths, bikeways and transit stops.

Hopefully, this compendium of projects and ideas from some of North America’s most progressive and health-conscious cities will inspire community leaders and transportation, planning and engineering professionals to develop additional noteworthy projects, which could be described in future updates of this report.