REBUILDING AMERICA'S INFRASTRUCTURE

Streets designed for all

Complete Streets offer user, community, and environmental benefits.

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Many of the most significant and difficult challenges facing towns and cities revolve around transportation. For many years now, planners and administrators have sought out creative solutions in the quest to solve these dilemmas.

One creative solution that has become popular in recent years is the movement known as Complete Streets. This is a concept that promotes the design and construction of safe and efficient transportation networks at the local level. These networks are designed for all users, regardless of ability, or whether they bike, walk, ride, use mass transit, or drive.

Complete Streets projects can bring a number of positive effects upon a community including improved traffic flow entering and leaving a community, heightened interest in local commerce, and enhanced efforts to become more sustainable and environmentally conscious.

One unique feature

There is no single design template for a Complete Streets project; each concept and plan is as unique as the town or city in which it is implemented. However, there is one feature found in most Complete Streets projects: the creation or enhancement of pedestrian and bicycle-related features. Their purpose is to urge individuals to leave behind their automobiles and use alternate modes of transportation.

For example, a multi-modal intersection can link pedestrian services with those for bicycling and mass transit. Once a transit user leaves the transit vehicle, he/she typically becomes a pedestrian. Therefore, it is vital that a Complete Streets project includes improved directional and information signage and pavement markings alerting pedestrians to the location of crosswalks, street furniture (benches, way-faring signs, etc.), bike racks, drinking fountains, and street merchant pads.

A Complete Streets project typically encourages individuals to walk more by incorporating features that ensure their safety. This includes reducing the pavement width of arterial streets, which results in slower vehicle speeds since wider streets typically encourage operators to drive faster.

Figure 1: A Complete Street approach provides provisions for bicycles (a bike lane in this case), pedestrians, and vehicles – all within the same right-of-way.

An example of a Complete Street is seen in Figure 1. The approach provides provisions for bicycles (a bike lane in this case), pedestrians, and vehicles – all within the same right-of-way.

Figure 2

Figure 3

Figure 2 shows the existing condition of the Anderson Memorial Bridge in the Boston/Cambridge, Mass., area. Note the expansive pavement width, four lanes of traffic, and how little or no provisions exist for pedestrians or bicyclists. **Figure 3** shows the project under design. Benefits include a reduction in the number and width of vehicle travel lanes, as well as better definition of these lanes, and the addition of bike lanes.

Various benefits

Figures 2 and 3 depict the before and after conditions of a Complete Streets project. Figure 2 shows the existing condition of the Anderson Memorial Bridge in the Boston/Cambridge, Mass., area. Note the expansive pavement width, the four lanes of traffic, and how little or no provisions exist for pedestrians or bicyclists.

Figure 3 shows the project under design. Benefits include a reduction in the number and width of vehicle travel lanes, as well as better definition of these lanes. Additional amenities include:

- Increased sidewalk length, reduced cross walk length, and extended curbs;
- bike lanes;
- median islands; and
- more accessible pedestrian signals.

More roadway for cyclists

Since bicycling has become more popular in recent years, communities are designating roadway space for cyclists. One of the most popular means is the bicycle lane, which is delineated from the adjacent motor vehicle travel lane by pavement markings or striping. Bicycle lanes are proving effective in encouraging residents and visitors to consider bicycling, which has the effect of lessening the amount of motor vehicles on a roadway and improving air quality.

Figure 4

Figure 5

Figure 4 shows the before conditions on Massachusetts Avenue in Arlington, Mass. During the 1950s, this 66-foot-wide roadway featured travel lanes and parking along both sides, as well as trolley tracks running down the middle. The trolley tracks were ultimately removed, but no provisions were included for other roadway users. **Figure 5** shows a dedicated bike lane (which reclaims some of the pavement), a reduction in travel lanes (particularly since vehicle demands have decreased), and improvements for pedestrian crossings.

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Bicycle lanes typically measure 4 to 6 feet in width and are located on the right edge of the roadway. However, they can be designated to the left of parking spaces or right-turn lanes. Bicyclists also can be accommodated by wide curb lanes (WCLs), which typically measure 13 to 15 feet or wider. WCLs allow the lane to be shared by motor vehicles and bicycles while at the same time

giving sufficient room for automobiles to pass.

Bicycle lanes and WCLs are each beneficial in their own way. Advocates of WCLs believe that wider lanes encourage bicycle riders to operate more like motor vehicles, which leads to more correct maneuvering at intersections.

Meanwhile, studies have shown that a bicycle lane's stripes or pavement markings can bring about many positive results, including more predictable bicyclist riding behavior, fewer erratic driver maneuvers, enhanced comfort levels for both bicyclists and automobile operators, and less "dooring" – when bicycles riding adjacent to parked vehicles are involved in accidents – since a cyclist is typically riding in the middle of the lane.

However, some bicycle lane opponents feel these facilities make it difficult for bicyclists to handle turning maneuvers at intersections, particularly right turns.

Green elements
Complete Streets policies can help a community become more environmentally conscious. For example, many projects are including the planting of trees and shrubs, which improve air quality. Leaves filter the air by removing dust and other particulates, as well as absorb carbon dioxide.

Trees and shrubs also help reduce thermal pollution and urban heat island effects such as harmful increases of water temperatures in rivers, streams, and lakes. Stormwater runoff can get hotter as it washes across impervious surfaces. When the heated runoff enters a natural water source, it can negatively affect fish and other wildlife that need cold water to live and breed.

Projects are also incorporating porous pavement, which allows stormwater runoff to filter through to the ground more efficiently. In addition, sidewalk gardens containing specially chosen plantings can lower nitrogen and phosphorus levels in the stormwater. These gardens can also include specially structured tree planting soils, grates and drains that irrigate the plantings, and engineered composite soils, which store and treat runoff.

Innovative technologies
Many Complete Street projects include innovative technologies designed to make roadways safer and more environmentally friendly. These technologies can include barcodes and radio-frequency identification tags, which provide smart phone users with access to information regarding nearby bike-sharing programs, scooter parking, and electronic vehicle charging stations.

On-street cameras and sensors can analyze real-time traffic and parking trends, ensuring smoother traffic flow and reduced traffic congestion. LED street lights offer longer life spans, lower energy demands, and reduced maintenance costs. Other technologies include better timed traffic signals and improved or additional crossing times for pedestrians, countdown pedestrian signals, and the use of GPS devices for more efficient travel.

A project in Salem, Mass., is incorporating many of these technologies. Thanks to the support of the mayor and other local officials, the city developed a bicycle circulation master plan. Along with implementing some of the aforementioned technologies, the plan created bicycle routes by implementing "sharrows" (a shared-lane marking on a street) on various shared roadways; it also identified those roads that are suitable for bike lanes and corridors for exclusive bike paths.

In addition, the plan called for creation of more than 33 miles of designated bicycle routes within Salem (4 miles of bikeways, more than 6 miles of bike lanes, and 22-plus miles of shared bike routes), a detailed evaluation of a high-priority 4.5-mile "pilot" route, and construction cost estimates and maintenance costs. Currently, the city is in the process of developing the pilot route.

Roadways that better serve a community
Streets are vital to a community's well-being, its economic development, and its cultural enrichment. Unfortunately, they often are designed with just motor vehicles in mind.

The concept of Complete Streets is allowing municipal planners to create roadways that better serve a community's residents and visitors – roads that serve drivers, cyclists, and walkers. And not only are these streets becoming friendlier to all who use them, they are becoming friendlier to the environment.

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*During his 38-year career, **Dean L. Groves, P.E.**, senior vice president, Fay, Spofford & Thorndike Inc., has focused on transportation planning and environmental documentation in connection with complex transportation projects, and municipal engineering. **Doug Prentiss, P.E., PTOE,** principal traffic engineer, Fay, Spofford & Thorndike Inc., is currently involved in a statewide Complete Streets initiative in Massachusetts.*