

Bikeshare: Coming to a city near you?

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In the past, if you asked most folks in our profession if they knew what a “bikeshare” was, at best they might have heard of a few experiments with free public bikes that were spray-painted yellow or green and eventually wound up in local creek beds. European and North American cities have toyed with various iterations of bikeshares since the 1970s. Today most of us are aware of the stout frames, bright colors and snappy logos of organized public bikeshare programs that have been growing substantially since the first metropolitan-scale system in Boston in 2007.

In this article, we set out to determine what makes these systems successful, and what the typical cost is to install and run a bikeshare, and make some observations from a user’s perspective. We reached out to a number of professionals who have operated, delivered or evaluated the feasibility of bikeshare systems. In addition, over the years we have conducted our own field research on new bikeshare systems in Minneapolis, Denver, Anaheim and Chicago.

What is Bikesharing?

Bikesharing is based on the notion that one of the highest barriers to leaving your car at home is figuring out how to travel that first or last mile from your starting to your ending point. Perhaps you can take the bus to work, but it is a mile to the nearest bus stop, and another two miles from

where the bus leaves off. Or, you’d love to bike from your downtown hotel to the APWA Congress sessions, but you don’t want to schlep your bike across the country. Bikesharing can fill those gaps.

Modern bikesharing involves a fleet of specially designed, heavy-duty, durable bikes that are locked into a network of docking stations located throughout a city. Bikes can be rented from and returned to any station in the system, creating an efficient network with many possible combinations of start and end points. Many of the stations are located near bus and train stops to fill in gaps and complement the existing transportation network.



Chicago’s Divvy Bike

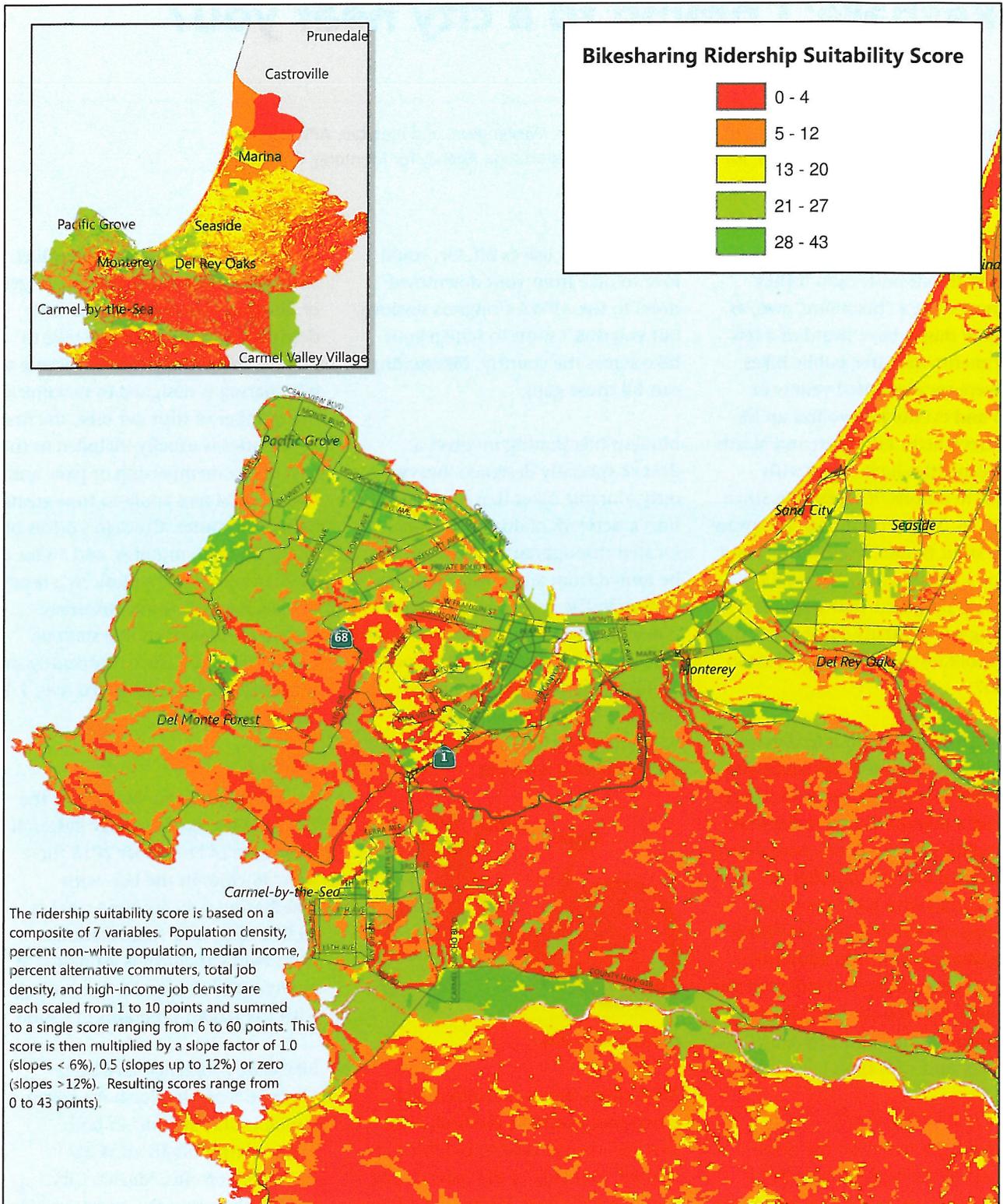
Most riders access the system via a two-part payment method. First, you use a credit card to purchase an annual, monthly or day pass online or at a bikesharing kiosk; then, you are charged a usage fee, usually for every 30 minutes of travel. In Chicago, riders can purchase an Annual Membership for \$75 or a 24-hour day pass for \$7. After checking

in at the kiosk, the rider can unlock an available bike with a member key or 24-Hour Pass code, ride to their destination, and return the bike to any other docking station. Because the bikesharing is designed to maximize the number of trips per bike, the first 30 minutes is usually included in the cost of the membership or pass, and incremental fees apply to trips greater than 30 minutes. Chicago’s prices of \$2 for 30 to 60 minutes, and \$6 for 60 to 90 minutes, are typical. As a result, while Chicago’s Divvy Bikeshare system currently has 300 stations and 3,000 bikes, since its opening in August 2013 it has provided over 1.1 million rides.

Background

According to Susan Shaheen at the UC Berkeley Sustainability Research Center, as of December 2013 there were 36 cities in the U.S. with bikesharing systems, for a total of 19,000 bikes and 1,900 stations. Worldwide, the fleet is estimated at nearly 520,000 bicycles for sharing, with the largest programs in China.

Bikeshare programs have been filling in a gap in North American public transit systems in both major metropolitan areas like Chicago, Toronto, Mexico City and Washington, D.C., and smaller cities like Chattanooga, Tenn., and Madison, Wis. With a population of 170,000, Chattanooga is smaller than at least 140 other urban areas in the U.S.—which means there is

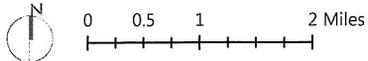


Bikes Sharing Ridership Suitability Score

- 0 - 4
- 5 - 12
- 13 - 20
- 21 - 27
- 28 - 43

The ridership suitability score is based on a composite of 7 variables. Population density, percent non-white population, median income, percent alternative commuters, total job density, and high-income job density are each scaled from 1 to 10 points and summed to a single score ranging from 6 to 60 points. This score is then multiplied by a slope factor of 1.0 (slopes < 6%), 0.5 (slopes up to 12%) or zero (slopes > 12%). Resulting scores range from 0 to 43 points).

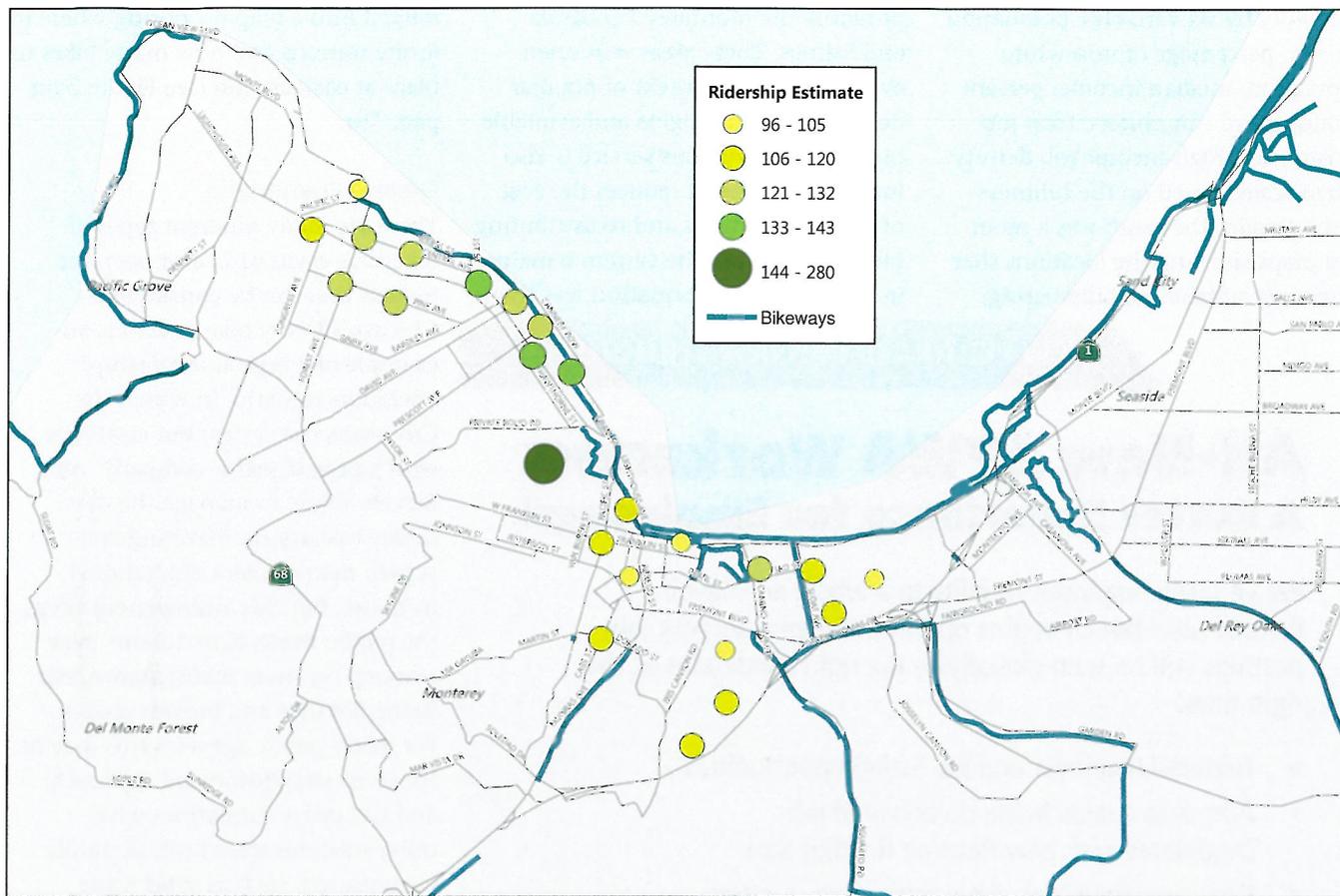
Source: 2009 TIGER/Line; 2006-2010 American Community Survey; 2010 Longitudinal Employer-Household Dynamics; AMBAG LiDAR Data



FEHR PEERS MONTEREY / PACIFIC GROVE BIKESHARING RIDERSHIP SUITABILITY SCORE

WC12-2934-TAMC_Bike_Share_Feasibility/Analysis/GIS

Figure 1: Monterey/Pacific Grove Bikes Sharing Ridership Suitability Score



FEHR & PEERS
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MONTEREY / PACIFIC GROVE - MONTHLY RIDERSHIP BY STATION

Figure 2: Monterey/Pacific Grove Monthly Ridership by Station

lot of potential for new bikeshare programs. The proliferation of these systems and their creative approach to delivery and operations is a sure sign that bikesharing has found a home in today's public right-of-way as an efficient and sought-after transportation option.

Bikeshare systems' benefits are broad: they promote health; are a cost-efficient use of the roadway network; improve congestion; lower emissions; and increase safety. They also support complete streets policies and increase urban mobility/social equity for all residents.

Feasibility

It takes some work to determine if bikesharing is right for your community. In Monterey County, Calif., pop. 425,000, Fehr & Peers in coordination with Economic and Planning Systems prepared a bikeshare feasibility study for the Transportation Agency for Monterey County. To narrow down where bikesharing would be most suitable, they screened the county based on the US EPA's Smart Location Database variables of housing, population, and employment density, land use diversity, and urban design. High population and intersection density (a measure of urban design) have been

correlated in the academic literature with bikesharing ridership, and housing density, employment density, and land use diversity reflect a built environment suitable for shorter trips that could be made by bicycle.

The map (see Figure 1 on page 58) shows the results of that analysis, which ranked the bikeability of locations on a scale from 0 (not very suitable) to 43 (very suitable).

A more detailed suitability analysis was applied to the cities of Pacific Grove, the Monterey, Seaside, and, separately, to the City of Salinas. These areas were scored for ridership

suitability by six variables: population density; percentage of non-white population; median income; percent of alternative commuters; total job density; and high-income job density. When scaled based on the hilliness of the terrain, the result was a set of area maps showing the locations that were most suitable for bikesharing,

primarily the Monterey Peninsula and Salinas. These areas were then evaluated in the context of popular destinations and origins and available bikeways. Contiguous service is also important in that it reduces the cost of servicing stations and redistributing bicycles to ensure the system remains in balance. The information was then

refined into a map proposing where to locate stations and how many bikes to place at each station (see Figure 2 on page 59).

System Ownership

There are many different types of bikeshare ownership and operator models that can be considered. Chicago's Divvy bike system is an example of a typical ownership/operation scenario, in which the City owns the system but contracts with a private sector company, Alta Bicycle Share, to manage the day-to-day operations. Planning and system management are handled in-house, but this arrangement keeps the public works departments busy working on street maintenance, not fixing flat tires and broken spokes. For many public agencies this may be the most straightforward approach and has many similarities with other subcontracted tasks in public government, such as solid waste management.

In other cases, a nonprofit both owns and operates the system. For example, Denver Bike Sharing, a nonprofit corporation, owns and operates the system, while B-cycle LLC, a privately-held company, provides the equipment and stations. A similar arrangement exists with Minneapolis, Minnesota's Nice Ride Minnesota program and PBSC.

Wholly-private ownership and operations agreements exist as well: New York City's Citi Bike, for example, incorporates bikes and equipment from PBSC with operations by NYC Bike Share, LLC and funding from Citibank and MasterCard.

Partnerships with local bicycle shops or existing rental facilities may make more sense in smaller jurisdictions. On the Monterey Peninsula, existing

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bicycle rental companies were very concerned that a bikesharing system would take away from their revenues. Instead, the Transportation Agency is considering a partnership with bicycle rental agencies.

Another option available to public agencies is putting operation and management roles in the hands of the nonprofit center, which is what occurs with Bike Share Austin. This approach allows for the system to be run by a focused organization, rather than being blended into the day-to-day operations of public works systems.

The choice among all of these operation and management options depends on the availability of revenues and the ability of the local agency sponsor to be involved in the management of the program.

Costs to Install, Operate and Maintain

In talking with various representatives from bikeshare programs, it became evident that they all required some measure of public funding to install, whether it be transportation-specific federal and state funds, or local general funds. While rider fees, private sponsorships and advertising have contributed to help cover some costs, none of the programs reviewed in the United States generate sufficient revenue from user fees alone to support both their full capital costs and ongoing operations and maintenance costs.

Programs such as Denver B-cycle and Minnesota's Nice Ride have capital costs of between \$45,000 and \$60,000 per docking station, including the cost of bikes, the payment kiosk, docking station, and installation, while smaller station costs can range from \$35,000 to \$40,000 each. The estimated total capital costs for the

Monterey area program was \$1.08 million, for a system of 24 stations, which would include 120 bicycles; 240 docking stations; membership "swiping" cards, software and kiosk/online technology; maintenance and rebalancing equipment; storage racks; and traffic barriers, as well as one-time set-up costs for development of system map and map racks, plus marketing, legal, and accounting services.

A bikesharing program also has ongoing operational expenses including: equipment maintenance replacement; bicycle rebalancing (to move bicycles from popular destinations back to popular origins); membership administration; marketing and promotions; and security and liability insurance. The Monterey County study assumed a cost of about \$1,500 per bicycle, or \$180,000, per year for the Monterey area system. Depending on the pricing structure and the usage of the bikes, rider fees could make up to 20% to 70% of the program cost. A few very popular systems appear to collect enough user fees to cover nearly all of the operating costs, most notably the Capital Bikeshare program. Other programs partner with corporate sponsors; but unlike New York, not every city has the ability to tap into Visa and MasterCard revenues.

The User Perspective: Navigating the Peaks and Valleys of Bike Sharing

As noted above, we have tested quite a few of bikesharing systems—at least all of those located at APWA conference sites—so we thought we would make some recommendations from the user perspective.

1. **Where are the bikes?** Most systems have excellent web pages, but you can't carry those on your bike. Phone apps, such as Divvy



CycleFinder Map of Divvy Bike locations and number of bikes

Bike's CycleFinder, make it easy to locate stations and list how many bikes are docked there. However, when we tested their brand-new system, the listings weren't always accurate and twice we found ourselves walking half a mile to the next station. Also, sometimes there is a need to close the docking station completely, due to nearby construction (or filming of a *Fast and Furious* movie scene). Accurate software will need to indicate that none of the bikes in that location are available for use while the station is out of service. For those who don't travel with a smart phone, an old-fashioned map of nearby station locations at each docking station is also helpful.

2. **Publicize often, but not too early.** An interesting situation occurred in Anaheim, where a round of publicity had touted the opening of the bikesharing system in July 2012. Yet, by the end of August, we could not find

any of the bike stations listed on the widely available bikesharing maps. We learned that apparently only the downtown station was operational, so you could only bike to and from that station. The publicity had gotten out ahead of the actual operations date. As of today our research shows that there are only 30 bikes and three docking stations in Anaheim—still too few to serve as a meaningful transportation system.

3. **You can be too popular!** The most popular locations may end up with too many bikes at them, without any room for docking any new bikes. In their first week of operation, we waited about 20 minutes in Chicago at the popular Navy Pier station along with several others who needed a space to dock their bikes. Undoubtedly they learned how to rebalance the

stations over time, and have made adjustments to increase or lower capacity at the docking stations after the first few weeks.

4. **Keep the Kiosk System Simple.**

Frequent travelers know that bus transit ticket machines are different in every city—so are the bikesharing kiosks. Some systems operate quickly and easily, and some require several different steps before you get your bike code. A system that is hard to read and understand, or assumes that every rider is a first-time rider, will add a great deal of unnecessary time to the check-out process, and result in long waiting lines. Test out the payment process for speed and simplicity when you are deciding which kiosk vendor to use.

5. **A safe bicycling network is still critical.** You can rent

a bicycle, but if there is not a good network of contiguous bike routes, or signs directing people to the safest routes, you probably won't try out bikesharing again. A memorable part of our ride in Denver involved carrying the rather heavy B-Cycle bikes down the stairs to reach the regional bicycle path. In Monterey County, after completing our study, we decided not to implement a bikesharing system precisely so we could focus our investments in improving our bicycle network instead. Once we have made better strides in that regard, we will take another look at setting up a bikesharing system.

The Future

Overall, the future looks very bright for bikeshare systems. There have been the lessons learned in deployment



This photo of a Divvy Bikes line captures the kiosk difficulty issue.

and financial challenges with raising capital and covering operations costs, but the systems are proving very attractive options for lowering vehicle counts, lowering emissions, increasing community health, and better utilizing the public right-of-way to meet the needs of multiple transportation modes. As core systems are developed in cities, adjacent metropolitan and suburban areas can request to have coverage and increase the customer base. New systems are coming online throughout the country. To learn more about setting up a bikesharing system in your town, attend the Tuesday session at the 2014 APWA Congress—and join us as we test out Bikeshare Toronto!

For more information, contact Freeman Anthony at fanthony@cob.org, or Debbie Hale at debbie@tamcmonterey.org. For more information on Bikeshare Toronto, visit their website at www.bikesharetoronto.com.

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Engineering a Successful Bikesharing System

From an engineering and technology perspective there are items during the planning, implementation, and operating phases of a bikeshare program that need attention.

During planning a major concern is seeing the program is successful overall. We want to prevent wasting funds and energy. Since bikeshare programs work best in bicycle-friendly communities we need to be sure we develop and configure other facilities such as bike lanes and ways, signing, and traffic signals so the community is bike-friendly. We also need to know what funding is available to carry out the project as well as to run and preserve the program once started. With this information we can first build all the components that make such programs successful and then keep it from deteriorating and driving potential customers away.

During implementation we need to specify equipment that contributes to the success of the program by providing convenient and reliable interfacing with user-customers. There are several equipment systems that make up a bikeshare facility; each provides a technical challenge. While bicycles themselves are not new, modern bikeshare equipment is different from equipment we grew up with in our front yard; it must be hardy and comfortable for different users. Also, we need equipment that can be kept up easily. On the other hand, the stations themselves are high-tech facilities that must be able to perform various tasks to ensure bicycles are available for users, while also guaranteeing that users can pay fees securely. Stations must have reliable communications with servers to guarantee that billing, and

management of the bicycles is reliable and secure. Several programs have gotten off to bumpy starts because of software glitches and communications problems. Since these items are often on the project critical path, problems can result in project delays and false starts.

How and where we locate stations, considering in particular where bicyclists enter and exit streets, is another critical factor in the station site design. Locations that allow safe and efficient pedestrian movement in, around, and through the site are critical for safety and customer satisfaction. Finally, there may be amenities for users such as benches, shelters, drinking fountains, security cameras, and lighting that all go to improving the customer experience and providing security. We must design and specify all of these items to ensure durability and heightened customer experience.

Once the program is underway we have continuing concerns not only with keeping all equipment in good shape, but in having the highest safety for users. User training and equipment familiarity should begin even before the program starts operating, focusing in on basics such as rules of the road for bicycles on streets, and helmet use. Signing, both standard and supplemental, to aid users, many of whom may be novices, is important. Similarly, pavement markings and traffic signals that make it clear how bicyclists can safely travel on often busy streets all contribute to program success.

Submitted by Dennis Randolph, P.E., PWLF, Director of Public Works, City of Grandview, Missouri, and Chair, APWA Engineering & Technology Committee 