

# PART 2

## IMPACTS OF AMENITIES

Amenities have a variety of impacts on customer behavior and perception and affect the adjacent communities as well -- impacts which may directly or indirectly affect ridership. Indeed, many transit agencies are committed to improving both passenger experience and the relationship of their facilities to the communities they serve because they feel that their long-term viability depends on it.

### 2.1 Impact on Ridership

A 1996 TCRP study, "Transit Ridership Initiative," describes ridership as "a fragile, somewhat ambiguous goal, and a moving target." The study found that many aspects of transit operations and investment decisions affect ridership. Most agencies that have increased transit ridership have undertaken a variety of programs concurrently. The report identified five main sources of increased ridership:

- Service adjustments;
- Fare and pricing adaptations;
- Market and information initiatives;
- Planning orientation (community- and customer-based approaches); and
- Service coordination, consolidation, and market segmentation.<sup>11</sup>

For example, Metro-Dade Transit Agency in Miami experienced a 9.6% increase in ridership between 1991 and 1993. This was attributed to increasing "customer service orientation" (walkways, shelters, safer pedestrian access, new benches, etc.) and use of mini-buses to provide more "cost effective and comfortable service," as well as limited stop services, special events to attract first-time riders, and improved bus-rail transfers and rail feeders.<sup>12</sup>

Another key transit ridership study, by Richard L. Oram and Stephen Stark, looked at the whole issue of exactly whom transit agencies should target to increase ridership: regular riders? non-riders? infrequent riders? In reviewing surveys conducted in cities across the U.S., the researchers discovered that most people who use transit ride infrequently. Their findings suggest that "a reasonable and easily achieved goal is to get many of the infrequent riders to ride at least a little more. A less reasonable goal is to fully convert these riders (or non-riders....) to regular or daily use."<sup>13</sup>

Using amenities is one strategy to increase ridership frequency, and the results of the Transit Design Game surveys show that amenities do, in fact, promote transit ridership. In addition to foregoing a fare reduction, a high percentage of riders surveyed indicated that they would increase their transit use if selected amenities were provided. Based on the research as provided in the *Transit Design Game Workbook*, which accompanies this Handbook, we estimate that spending at the 18 point level (one of the choices on the survey) for amenities would increase ridership in the case study cities by about 1.5 to 3 percent. 18 points is equivalent to spending about \$450,000 in annualized costs for a typical 300-bus transit system.

The research also clearly shows that passengers consider amenities to be important and a majority of riders in most cities are willing to forego a fare decrease in order to have them. However, there does appear to be a limit to what many riders are willing to "spend." For the 12-point survey, 53% of passengers (in Rochester) and 70% of passengers (in Aspen) stated that they wanted all of the features they had selected and were willing to forego a drop in the fare; only 14% (in Aspen) and 23% (in Rochester) wanted to reduce the fare 10 cents and forego all of the amenities selected. Increasing the budget to 18 points, however, actually reduced the percentage of riders wanting to keep the fare the same in most cities: many riders with an 18-point budget said they only wanted to spend 12 points, and reduce the fare 5 cents. This means, as expected, that the first 12 points spent on features are more valuable to riders than the next 6 points.

Interestingly, however, of those riders who said they would increase their ridership if the features they selected were provided, it was the more expensive and elaborate amenities (shelters with heat, deluxe benches, fully padded seats on the bus, etc.) that were most likely to induce additional transit trips. In other words, riders are willing to pay for modest amenities, but the more deluxe amenities that would induce trips are (from the rider's perspective) not generally worth the trade-off for a commensurate change in fare. This is like saying, "We would gladly take a Rolls Royce out for a Sunday spin, but a Volkswagen seems like a better investment."

## **2.2 Impact on Customer Experience**

While increasing ridership may not be the principal goal of some transit agencies due, for example, to the difficulties many encounter in adequately meeting existing passenger demand with diminishing available resources or aging fleets, they *may* be interested, nevertheless, in improving passenger experience and the amenities they provide. Many riders who requested amenities in Transit Design Game surveys were already using transit for all of their local trips. For these people, the benefit of amenities would be evidenced by their attitude toward the transit system and their willingness to pay for them -- not necessarily in terms of increased ridership.

Transit rider surveys and focus group research, detailed in the appendices, indicate that passengers expect transit to be efficient, safe, and comprehensible, as well as comfortable. An especially useful study by David A. Hensher looked at bus user preferences. Hensher asked respondents to state their preference among hypothetical sets of bus service

characteristics (for example, option 1 would have an old bus, a bus shelter, a \$1 fare, a 10-minute headway; option 2 would have a new bus, no shelter, a fare of \$.85, and a 15-minute headway). Respondents picked the one they preferred.

The result of this survey, completed in Australia, showed a variety of opportunities for enhancements to transit service. "Wait quality" was a top concern of passengers both in terms of the length of time, reliability of the bus relative to the schedule, and the availability of a place to sit down. Another important issue was "vehicle quality," which related to the interior cleanliness and age of the buses. Finally "trip quality" -- the opportunity to have a seat, efficient boarding, a smooth ride, and express service -- and "information quality" also contributed to satisfaction with transit service, with the availability of schedules at bus stops a very attractive feature. His conclusion was that the major areas to pursue enhancement are as follows:

- Providing shelters at stops, even if a seat is not provided;
- Improving punctuality of service;
- Memory timetables (e.g., buses run every 20 minutes) and posted schedules;
- Keeping vehicle interiors clean; and
- Increased express service.<sup>14</sup>

This study reinforces the notion that, while amenities are closely associated with passenger comfort, they impact a broad range of passenger experience issues. These amenity features are discussed below.

### ***Efficiency of Service***

Amenities can make transit more efficient and easier to use. For example, low floor buses can speed boarding, particularly among people with low or impaired mobility. According to *TCRP Report 2, "Applicability of Low Floor Light Rail Vehicles in North America,"* low floor vehicles reduce boarding times for "faster service and shorter trip times for all passengers," not just those passengers with disabilities for whom they are especially intended.<sup>15</sup> Another example is bus waiting areas which "bump out" sidewalks so that buses do not have to pull into the curb and waiting areas are increased in size. Portland, Oregon, has begun installing the "bump-outs" described in Case Study 3 in Section 4.3. Other examples of amenities that may improve transit efficiency are multiple doors to allow simultaneous boarding and alighting, the alignment of the waiting area with vehicle floor, fare purchase mechanisms, and the arrangement of amenities at the stop and the configuration of the waiting area to allow queuing and easy boarding.

### ***Safety and Image***

Amenities can improve security. A Canadian report, *Making Transit Stops Safer for Women,*<sup>16</sup> suggests a broad range of strategies including: adequate lighting at and around bus stops; telephones at or near stops; location of stops near active land uses; and a map of the surrounding area.

Amenities can also impact security indirectly. People often perceive a station as more dangerous than it really is because of a poor general appearance or lack of maintenance, or because it lacks the presence of official people, like ticket agents or retail vendors. These signs of deterioration are often equated with signs that a place is unsafe or "out of control." Studies of New York City subway station environmental improvements have shown that when stations are rehabilitated, people feel safer, regardless of actual crime patterns.<sup>17</sup> When amenities are provided and successfully maintained, there is also an implied security presence and a sense that someone is in control of the transit station. In addition, the use of fare or "smart" cards on buses and trolleys makes drivers feel safer because there is less cash on board. Security cameras on buses also may make passengers feel safer, even though their helpfulness in apprehending criminals may be limited.

### ***Information***

Amenities which provide people with knowledge about how to use the transit system improve their ability to use public transit and make it easier (and perhaps more likely) that they will do so. Examples of these are posted and available route schedules and information, both at the transit stop and on the vehicle, access to the driver to ask questions or directions, and recorded stop announcements.

### Case in Point 3: Passenger-Friendly Vehicles: The Enduring Legacy of the PCC Streetcar



In looking back over the history of transit, and especially transit vehicle design, it is clear that many early transit vehicles were designed specifically with passenger experience and comfort in mind. The open-air double-decker buses on New York's Fifth Avenue and the Cable Cars of San Francisco are two examples of vehicles that were (and are) fondly remembered. In London, the Underground System, for instance, was a model "single design" project, where stations, transit vehicles, graphics and signage all supported each other. The result was a cherished London experience, where people felt safe and well-cared for -- even delighted -- from the moment they caught sight of an underground station (from the omnipresent "roundel" logo) until long after they had arrived at their destination.

Arguably the best transit vehicle to roll off any American assembly line was the Presidents' Conference Committee (PCC) Car, a standardized, innovative streetcar design that was developed in the 1930s by the Electrical Railway Presidents' Conference Committee (ERPCC) to meet a wide range of needs and situations.<sup>18</sup> In 1930, the street railway industry was in deep financial trouble, already feeling the pressure of the automobile and the motor bus. Most trolley cars in service were obsolete and the industry believed that a more reliable, high-performance streetcar that incorporated the most modern technology available would help them realize a higher rate of return on their equity and revive the industry.

The original approach taken to the design process was novel -- and provides a useful lesson to agencies today. Rather than making piecemeal improvements to equipment and components, as had been done in the past, the team of designers confronted the task in a holistic manner. Their research, based on actual experience, was more scientific than what had been previously carried out. Through exacting study of the effects of movement on the human body and careful analysis of the performance of over 600 existing cars, the research team came up with a vehicle that was a composite of the best the industry had to offer.

**(Case in Point 3 continued)**

Previous attempts to improve streetcar design had consisted only of isolated efforts to meet local needs and problems rather than industry-wide goals. Instead of a standard streetcar design, ERPCC produced a group of components that could be assembled in several ways to meet an overall standard of performance and efficiency. Individual manufacturers sometimes varied the appearance of the car or the components, but the operating performance was always the same.

The PCC car introduced major advances in electric streetcar design, such as

- Easier and faster access: The two entrances and exits were wider than they had been previously, with three small steps rather than two high steps to facilitate boarding and alighting.
- New look: The appearance was sleek and uncluttered, suggestive of speed. The new cars had a streamlined look that was popular in automobile styling in the 1930s.
- Roomier: One of the models could hold as many as 135 passengers, including standees.
- Heating and ventilation: Forced-air ventilation used the structural elements in the car walls as air ducts. Heat from the dynamic brakes could be circulated inside the car body on cold days.
- Lighting: Interiors were brightly illuminated. One model used cove-mounted lighting reflected off the ceiling.
- Windows: The vehicle's windows rolled up and down as in automobiles. Later models had standee windows above the regular windows.

With the introduction of the PCC cars, ridership increased dramatically. In Brooklyn, where the first cars were operated, the Smith-Coney Island line posted a 33% increase in gross revenues from October 1936 to September 1937. Schedule speeds increased 14%, allowing (two) fewer cars to operate. Many passengers abandoned those routes without PCC cars. In Chicago, although the cars were operated by two-person crews, they were so efficient that labor costs were reduced by 10.8%.

PCC vehicles are still operating on a daily basis on regular trolley lines in San Francisco, Pittsburgh, New Orleans, and Newark, New Jersey and are much admired by their riders. In Newark, many passengers do not want new rail cars on their subway, but prefer the vintage vehicles, which serve to engender a sense of community among the riders.<sup>19</sup> Case Study 4.7 describes how the transit agency in San Francisco has restored vintage cars and put them into regular service on Market Street -- greatly increasing ridership compared with a bus line that used to run the same route.

The lesson from the PCC car is that, historically, innovations addressing real passenger needs and concerns on a holistic basis translate into quantifiable ridership increases. The challenge is to replicate such an approach today.

## **2.3 Impact on Communities**

### ***Urban Communities***

Amenities located within transit waiting environments can be viewed not only as serving transit, but as focal points for the communities around them. In fact, transit amenities -- such as newsstands, cafes, and even station buildings themselves -- can be catalysts for the physical, economic and social improvement of a community. The ridership benefits of amenities can thus be indirect, supporting revitalization of communities which in turn increases demand for transit.

Case studies documenting this approach are presented in *TCRP Report 22*, "The Role of Transit in Creating Livable Metropolitan Communities." There are detailed numerous case studies where transit amenities have had a strong positive impact on surrounding neighborhoods and entire downtowns and have sparked new community partnerships with transit. Successful transit amenity improvements from Boston to Los Angeles were implemented through such partnerships, formed between government and the private sector, which allowed local transit authorities to move beyond simpler amenities to develop entire environments integral to the revitalization of a downtown. These partnerships represent significant opportunities, given the fact that many transit agencies have limited operating budgets, do not always own the property at which their bus or light rail stops are located, and often have difficulty siting these stops. They also provide ways for local communities to take ownership of transit service and facilities.

### ***Suburban Communities***

In many suburban communities, providing transit service is difficult due to the design of streets; greater travel distances result from cul-de-sacs and winding roads. A lack of connections between subdivisions forces buses to use busy arterials, which are unappealing waiting environments for passengers. Many bus stops are not even located or reachable by sidewalks, forcing passengers to walk and sometimes wait in the street. Also, the design of the workplace, often an isolated building surrounded by parking lots, creates an environment accessible only by car.

This problem cannot be rectified overnight but, even in this situation, transit amenities can become a catalyst for improvements which are of broader benefit to a community. In Clark County, Washington, for example, zoning review includes criteria for improved transit access that must be addressed before a building permit is issued. This requires sidewalk access and transit stop enhancements to be included in the plan from the start and implemented on a step-by-step basis. In other communities, subdivision regulations have been revised (including those recommended by the Institute for Transportation Engineers) to stipulate adequate provision for transit including sidewalks and space for bus stops as part of the initial construction documents.

## **2.4 Impact on People With Disabilities**

Compliance with the requirements of the Americans with Disabilities Act (ADA) is pressing transit operators to make enormous changes in the way they design both their transit facilities and vehicles. Under ADA, a transit agency is obliged, when making design changes to a transit stop, to meet the new standards. These include adequate circulation space within a bus shelter; bus stops that are connected to streets and sidewalks by an accessible path (which means that sidewalks need to be provided); and, readable signage, including bus route and schedule information.

All of these changes serve to make transit easier for everyone to use.<sup>20</sup> In addition, improving access for everybody may be more cost-effective than just providing special services for people with disabilities. For example, in Madison and Milwaukee, Wisconsin, transit agencies introduced "community buses" designed for seniors. This is a specialized service designed to provide shuttles connecting destinations that seniors need to reach using small, low floor buses that they can board easily; now, however, non-seniors use these buses as well. In Ann Arbor, Michigan (Case Study 1, Section 4.3), low floor buses were purchased and introduced into service at no real extra cost and have drawn passengers with disabilities away from costlier van and taxi service to fixed-route bus service.

## **2.5 Conclusions**

Clearly, there are many reasons that a transit agency should address amenities as part of a total effort to increase ridership. As has been noted, the impacts are both direct and indirect and present a compelling argument for undertaking a combination of initiatives and providing a variety of features. The next section describes how to put an amenity program together in an effective way.



# PART 3

## KEY ELEMENTS OF AN EFFECTIVE AMENITY PROGRAM

To implement amenities, transit agencies must first understand what customers want, determine what amenities are available, and pay for the construction or purchasing and maintenance of amenities. Successful amenity programs are both *responsible* and *responsive* investments. A *responsible* investment in amenities and enhanced vehicle characteristics "makes sense" by contributing to ridership in a cost-effective manner both initially and after implementation -- when maintenance becomes an issue. The investment is *responsive* when the amenities function well for the transit user and result in improved comfort, convenience, and overall transit experience.

Many transit agencies believe that, due to rapidly shrinking state and federal subsidies, they are struggling just to provide the bare minimum of service and do not feel that they have the resources to adequately address or improve amenities. These agencies tend to ask, "What else can we cut to save money?," rather than "What can we do to boost our ridership to raise money?"

Still other agencies are split in their views. For example, some agencies spend more on rail than on buses, even though buses are the backbone of most transit systems and generally serve more passengers than rail. Rail, therefore, often has more appealing seating, stations, and better security, in part because many rail passengers are "transitchoice" rather than "transit-dependent" riders.

This section presents some common factors derived from the research that can help transit agencies implement amenities in a responsible and responsive manner.

### 3.1 Addressing Customer Concerns and Needs

The philosophy of a particular transit agency and the way it views its customers has a tremendous impact upon how it views passenger amenities. In the research, it was found that agencies which actively seek out and strive to address customer concerns are more likely to have implemented amenity improvement projects than agencies which do not

subscribe to such an approach or who see themselves as simply serving a fixed, transit-dependent clientele.

An increasing number of transit agencies have been able to "break out of the mold" and change the way they think about and define their purpose and the way they provide service to their customers. They have improved their public image in the process. The 1994 TCRP report<sup>21</sup> on ridership identified the agencies with the greatest increases in ridership as those aggressively changing many aspects of the way they do business. For example, some of these agencies view their competition as the private car and therefore provide amenities with that image in mind. Other transit agencies are taking time to assess customer concerns -- through focus groups, surveys, and other methods -- that are critical in ascertaining which amenities should be considered and where problems or potential may lie.

Transit agencies are more receptive to involving customers than they used to be and, according to Patrice Gauvin, Director of Marketing at Nova Bus in Canada, both agencies and manufacturers alike have begun paying much more attention to passengers' needs in the last five years. Customer satisfaction has become a more important consideration as well. Operators are conducting more surveys, marketing studies, and focus groups to better understand the needs of the "end-user" and are acting on their findings. Design used to be carried out mainly by engineers; now industrial designers, marketing professionals, planners, artists, and passengers themselves are becoming more involved.

In 1992, for example, the Canadian Urban Transit Association (CUTA) conducted extensive research into what bus passengers wanted on their vehicles. They found that in order to get a better grasp of customer needs, transit managers had to develop various "pulse-taking" methods. Ironically, CUTA found that "the occupational health, safety, and efficiency of drivers are already taken into account. The next step is the ergonomics of riders."<sup>22</sup>

"A transit agency cannot address amenities in a vacuum," concurs transportation consultant Howard Benn. Understanding customer reactions and human dynamics is an important part of the design decision-making process. For example, circulation in a vehicle must be considered at the same time as amenities, even though they are thought of as two separate issues, often studied by separate departments. For example, when designing a vehicle type to include standees, if you increase the number of seats from 40 to 44, four more people may sit, but the 16 people who remain standing are made considerably less comfortable because of the loss of standing room.<sup>23</sup>

In the market research section of this report (see appendices), examples are presented of how transit systems assess customer surveys, focus groups, and test vehicles to determine passenger preferences.

#### **Case in Point 4: New Jersey Transit Focus Groups**

Focus groups conducted by New Jersey Transit (NJT) in 1993 found "significant gaps between riders' wants and needs, and buses as they are currently designed." They also found that "the nature of the gaps are different -- qualitatively and quantitatively -- for both inner city or local riders and for suburban riders."<sup>24</sup>

Inner city riders who are less affluent described their transit trips as "shake, rattle, and roll." Their number one need was safety, with better lighting especially at the boarding area; their number two concern was more room for strollers and toddlers and lower steps at the boarding area.<sup>25</sup>

Suburban riders, on the other hand, found their general transit experience (riding different buses than inner city riders) to be pleasant, but their number one priority was "privacy...a cocoon" with comfortable seating, enough legroom, and a stop request button within easy reach. The number two concern was "control," including a continuing sense of estimated time of arrival, individual lighting, and easy access (including keeping a rear door, which NJT was considering eliminating). These changes were felt to be critical because NJT was losing ridership to privately operated vans which provided this level of comfort to suburban customers.

Perhaps most importantly, the report states that "customers respond very favorably to the proposed changes and to the idea that NJT cares... An important consideration which does not necessarily drive specific design features but is key to improving rider satisfaction with NJT is that they presently do not appear to find NJT as responsive to customer needs as they would like. There is a perceived lack of communication between NJT and its riders."<sup>26</sup>

### **3.2 Using the Transit Design Game to Involve Passengers**

The Transit Design Game, presented in detail in the accompanying publication, has been specially designed to elicit passenger concerns about amenities. Findings from the survey in five cities also suggest that involving customers in the planning process can provide useful information about people's concerns and needs.

For example, priorities for amenities vary according to the climate, lifestyle, and other characteristics associated with the different cities:

- Heated shelters were preferred in cold climates like Rochester and Ann Arbor, while in rainy/windy Portland, the preference was for shelters with walls.
- Bike racks were more popular in Aspen, Portland, and San Francisco -- where bicycling is more common -- but of little interest to riders in Rochester.
- Security cameras were not desired much in Aspen, where crime is low, but were much more likely to be selected in San Francisco, Portland, and Ann Arbor where concerns about safety are more prevalent.

Different types of passengers were interested in different features:

- More frequent riders were strongly interested in driver courtesy and on-board information--and were more interested than infrequent riders in keeping the amenities, rather than reducing the fare.

- Riders with longer trips were more interested in security cameras and information at the step (perhaps because longer trips have greater unreliability in the arrival times of buses). In Aspen, where long-distance commuters constituted most of the riders surveyed, there was a strong interest in more comfortable on-board seating.
- Transit-riders-by-choice tended to be more interested in bus stop information, low floor buses, storage, and security cameras, than did "captive" riders.
- Women are much more concerned about security and convenience, and are much more interested in bus stop lighting, security cameras, and driver courtesy. Low floor buses are much more important to women than to men.
- Higher income riders--somewhat surprisingly--are no more willing to forego a fare reduction than lower income riders.

Customers have extensive experience and knowledge about the functionality and appropriateness of transit amenities. Here are just a few examples excerpted from hundreds of comments made at focus groups using the Transit Design Game, comments that illustrate just how much customers do know -- when asked. The following comments demonstrate the variety of concerns that emerge when the Transit Design Game is used to conduct passenger focus groups. (Other research findings and additional passenger comments can be found in the accompanying publication, *The Transit Design Game Workbook*.)

*Luggage racks would be a good idea. People come in at the shopping center with their groceries and take up two seats. They have to stack stuff on top of themselves, and it takes a long time just to unload.*

*A lot of that [Quieter and Smoother Ride] could be fixed, and but I don't think it should cost six points. I don't know how much it would cost to have a maintenance guy just take a screwdriver and fix a few things. A lot of times it's just the windows clacking because they get loose. I don't think it would take a really skilled person to tighten up those panels or windows.*

*I was going to choose courtesy training but I didn't want to waste my points ... I couldn't afford it. There have been some bus drivers I've ridden with, and they didn't know all the routes, so I think the training should be a little bit more complete.*

*One thing about the head and arm rests. It's not too much of a problem in this [city] but it would be awkward for overweight people to have to sit jammed up against the arm rests in the last seat on the bus. So it would be a good idea to have arm rests on just some of the seats.*

*I spent all my points on security. At night on certain lines, or on the mall, there is no security and I think that some of the drivers are afraid to enforce the rules.*

*I chose the shelter with heat. I have a stop near my house but my wait is long and the service is unreliable. I froze, I got wet, the shelter is inadequate, faces the wrong way for the wind. No seating. Rain comes in. No matter what clothes you wear, you're still cold.*

### 3.3 Making a Commitment to Quality

Amenities that demonstrate a commitment to quality and are designed to create a positive image for transit extend the impact of that amenity. Maintenance, too, is essential to the long-term use and image of most features -- whether it is changing the information on schedules or keeping bus interiors clean.

#### *Design and Placement*

While many transit agencies have provided amenities for their riders, many do not live up to expectations simply because they are poorly located or designed. Mistakes made by transit agencies have ranged from vehicle seats that are too small to bus shelters that provide little weather protection. While people react positively to amenities which directly enhance their transit experience and rate them highly, people have the opposite reaction to features that do not serve their needs or are in some way dysfunctional. In fact, providing an amenity that does not meet customer concerns significantly reduces its positive impact and may produce negative reactions to it and the transit agency as well.

The placement, type and number of amenities provided affect both passenger perceptions of their effectiveness and their actual use. In Rochester, New York (Case Study 4), for example, the transit agency could not convince local traffic engineers to widen sidewalks to accommodate their new shelters. As a result, they had to develop an alternative shelter design, which functions very poorly and provides little comfort or weather protection for riders. Surveys conducted show that riders feel these amenities are really not worthwhile and a waste of money: many people simply wait outside of the shelter.

It is not always possible to anticipate how an amenity will actually function until one places it in operation. The research team for this study, in previous work, has found that what people say they do and what people actually do (consciously or unconsciously) may not always be the same thing. Furthermore, people are not always able to articulate needs and problems that they are clearly experiencing.

In the early 1980's, for example, we evaluated bus shelters in over a dozen cities. On the basis of this research, several design requirements for shelters that met passenger needs were identified:

- Visibility: People must be able to see a bus coming. Some shelters are designed with signs, solid walls, or other obstructions that block the view of oncoming buses or are set too far back from the curb. As a result, people will wait outside the shelter if they want to see which buses are coming.
- Accessibility: People must be able to board a bus conveniently. To many people, this is the most important aspect of a shelter's design; these people tend to wait (in a queue or a cluster) at the exact point where the bus doors will open.

- Information: People need to know when a bus will arrive and where it will go. This is not a problem for people who regularly take a certain route, but it may be for people unfamiliar with the service.
- Comfort: Comfort means different things to different people. To some, it means a place to sit, but this is not the only way that people can feel "comfortable." In fact, research regarding shelter use shows that seats are often empty, since many people choose to stand or lean. Leaning is a body posture characteristic of people waiting for a bus. People will lean against storefronts, trash receptacles, and the shelter itself. Whatever the reason, shelters should be designed to accommodate as much leaning as possible, with ledges and rails provided at appropriate leaning height. This is not to say that seating should not be provided, but because seating takes up a great deal of room and is more vulnerable to vandalism, it cannot be provided for all waiting passengers. Studies of commercial streets have shown that seating outside shelters can serve dual purposes and can be well used by both shoppers and bus patrons. As to "crowding," our studies have shown that in good weather (i.e., not cold or raining) the density of people does not usually exceed 10 square feet per person. Higher densities may be achieved in bad weather, but this has not been studied.<sup>27</sup>

Similar studies we have conducted in New Jersey at commuter rail stations, in New York City subway stations, and at other transit facilities revealed similar results, according to the particular design configuration of the transit facility. For example, we found that amenities on commuter train platforms (benches, lighting, trash receptacles, and information kiosks) worked more effectively when clustered together. Benches were more frequently used if they were located inside shelters or under canopies, next to a light fixture (important to safety at night), in the center of the platform within view of a ticket agent (again for security), and situated so that people did not have to lean over the seating to read a schedule or other information.

In addition to functional placement and design issues, commitment to quality also relates to the character of the transit vehicle or waiting environment. In Corpus Christi (See *Case in Point 5*), the transit agency visited bus transfer centers throughout California to get a sense of the "state of the art" in bus facility design and were disappointed in the lack of attention paid to the *quality* of the space. Rather than being inviting and comfortable, most seemed to be little better than concrete garages. The transit agency therefore decided to go beyond building just a bare bones bus transfer center in their city and instead create a mini-Mexican plaza, with an attractive shed structure, community art projects, and extensive trees, plantings, and seating.

Working holistically on a particular transit line -- treating the whole corridor, not just the transit vehicle or stop -- helps to build support for an amenity project and enhance ridership. The F Line Streetcar project in San Francisco (Case Study 5), where historic PCC streetcars have replaced electric trolley buses, shows how streetscape and vehicle design can work together to enhance transit visibility, increase ridership, and strengthen local business.

## *Maintenance*

Maintenance is a critical issue and many transit agencies lack the personnel and financial resources required to maintain amenities well. Amenities that fall into disrepair or are vandalized can give a worse impression to riders than if no amenities are provided in the first place. "The image of bus services," David Hensher writes, based on his study of riders in two Australian cities, "can be significantly enhanced if the vehicles are modern and clean."<sup>28</sup>

From the vehicle perspective, maintenance implications of design -- for example, longevity of and ability to clean and maintain certain materials, need for repair of specific types of seating and lighting, and structural soundness -- must be weighed against increased security measures and the threat of vandalism. In San Francisco, restored vintage streetcars, in regular transit service use, contain many elements theoretically prone to vandalism, including painted surfaces and well-padded seats.

Likewise, amenities and good design actually can decrease maintenance and operational costs in terms of vandalism. For example, it has been demonstrated that when a community decorates a constantly vandalized wall with a mural, the graffiti often stops. Seattle applied this philosophy to approximately 425 neighborhood bus shelters that have been outfitted with murals created by students and professional artists alike. "Researchers are now studying whether the murals have reduced graffiti, but bus riders say they sense a change... For the [transit] agency, the murals have sent a signal that Metro cares about the communities it serves, and neighborhoods are much more willing to listen now when Metro proposes a new shelter."<sup>29</sup>

The impact of amenities depends not only on their original design, but on how well they are maintained -- a theme that runs through all of the case studies in Part 4. In Rochester and Portland, efforts to meticulously maintain transit shelters in the downtown were planned from the very beginning of the project and were not afterthoughts. In San Francisco, drivers take such pride in the historic streetcars that they help keep them spotlessly clean, compared with other vehicles in the system.

## Case in Point 5: New Bus Transfer Centers, Corpus Christi, Texas



Since its inception in 1986, the Regional Transportation Authority (RTA) of Corpus Christi, Texas, has endeavored to create more comfortable and attractive transit centers in order to replace scattered bus stops throughout the city. Four have been built (Staples Street Station, Six Points, Port Ayers and Flour Bluff) and two more are planned in outlying areas. Staples Street Station, in particular, has become an important node of activity, because of its central downtown location, across from City Hall.

Tom Niskala, the former General Manager of the RTA, explained that the locations and designs of the transit centers were part of a conscious effort to create a positive image for public transit in Corpus Christi. Other goals included improving traffic safety and operating efficiency, as well as creating a sense of place and of civic pride in a neighborhood. "Transit systems often suffer from identity crises and agencies should design, not just to meet the customers' needs, but also to become a real presence in our communities," Mr. Niskala said. "Transit must serve a functional role, but it can also become a real asset in a neighborhood, encouraging more people to use it."

Until 1986, the bus stops were simply poles in the ground along heavily trafficked streets, without shelters, benches or other amenities. Major transfer points were simply street corners, without sufficient space for many people to wait. The system was particularly hazardous for transferring passengers because they often had to dash across busy streets and dangerous intersections to change buses.

At the beginning of the initiative, the RTA carried out phone surveys, trying to identify both their riders and their needs. The Texas Transportation Institute helped to identify the best locations for transit centers. A hierarchy of improvements was decided upon early on at each center, based on the experience of other transit agencies: shelters, benches, waste receptacles, information, clocks, planters and artwork.



**(Case in Point 5 continued)**

Today, all four transit centers have spacious sheltered areas and are equipped with benches, bus schedule information, drinking fountains, trees and planters, and artwork created with community involvement or by a local artist. They are all located where passengers can wait safely, out of the way of traffic. The Staples Street Station, which opened in 1995 as the central hub of the new system of transit centers, serves as many as 4,000 passengers a day. It offers a metal-roofed shelter somewhat evocative of a 19th century train shed with a clock tower, benches and seating around landscaped planters, historic lighting, and colorful, hand-painted tiles, made by members of the community. The most recent facility, Port Ayers Transit Center, with its bold geometric shapes and vivid colors, can be seen from a great distance. Its broad stucco and tiled columns support a roomy shelter containing benches, public phones, drinking fountains and bus information.

Particular attention was paid to design elements that would help give transit a better image, or make it "a good neighbor," without additional cost. For example, a conscious effort was made to use graphic design to create a new image, and the public was able to participate. Several simple, communicative logos were developed and taken to the local malls, where they were rated by the public. The RTA, through this effort, developed a colorful, curvy striped pattern that they applied to buses, schedules and banners at the stations. Community art projects were developed as mechanisms to ensure participation and build a sense of ownership among local residents. For the Staples Street Station, over 1,500 children and adults participated and created tiles for the building and planters.

Maintenance and security are more easily monitored as well, since the clean-up crews focus on fewer places and the police, rather than just cruising by, actually leave their cars and spend time at the centers. They are thus much more effective in preventing the homeless from settling in and harassing transit users. The RTA has also found that vandalism has decreased significantly, both because of the enhanced surveillance and the sense of ownership that has been fostered in the surrounding communities.

The RTA has worked to increase ridership in other ways, as well. Operations and scheduling are constantly evolving in an effort to enhance convenience and meet the needs of more users. The agency actively solicits customer input and suggestions. As a result, ridership has steadily increased every year since the RTA's founding ten years ago and has increased 31% in the last five years since most of the transit centers were built -- which indicates that they are a contributing factor. Moreover, Mr. Niskala maintains that "a safe, comfortable environment probably encourages people to continue taking the bus." In other words, the attractive transit centers may also play a role in maintaining ridership.

### 3.4 Minimizing Costs

In addition to the issue of a customer-friendly orientation is the issue of cost. This section provides examples of how agencies have dealt with cost to the benefit of the transit agency, customers, and communities alike.

*First, it is important to emphasize that amenities are not necessarily expensive; indeed, research shows that the cost of many are quite nominal.* We identified many projects that either cost no more to implement or maintain than the basic vehicle or transit stop. In addition, we identified methods to pay for amenities that go beyond just advertising. These are described in Chapter 4 of this Handbook and in the Workbook as well.

In fact, providing and maintaining amenities does not have to be an expensive proposition even for transit vehicles. An analysis of the prices of conventional and low floor buses, for instance, found them to be comparable. The Ann Arbor Transportation Authority (See Case Study 1) paid \$198,000 per bus for ten low floor vehicles delivered in January, 1993, compared to \$185,000 per conventional bus four years earlier. While the report cautions that price data must be viewed carefully, "the price data collected for this study... appears to confirm... that there is no measurable difference in the bid price resulting solely from low floor design."<sup>30</sup> (In addition, maintenance costs are reduced because of savings on the repair of wheelchair lifts.)

Sometimes, too *much* money is spent for amenities. There are many cases where amenities and vehicle enhancements do not work for patrons or, indeed, create other problems. For example, bus shelters may be placed at a site where they create congestion or circulation bottlenecks for passing pedestrians or for patrons trying to get on or off the bus or train. Ironically, there are many cases when *too many amenities* are provided -- more than people need -- because patron needs are not adequately understood. *TCRP Report 19*, "Guidelines for the Location and Design of Bus Stops," is an important step toward developing better design guidelines for bus waiting environments.

#### *Working with Manufacturers*

Since transit agencies purchase amenities for vehicles or waiting environments largely from manufacturers, working with these manufacturers is one of the key ways that amenities can be provided in a cost-effective manner -- and, more importantly, meet real passenger needs. For example, transit shelters typically are easily selected "off-the-shelf" through catalogues, but these standard elements may not address local passenger needs or complement the local architecture. This problem is compounded by the fact that most transit agencies have to buy from the lowest bidder. If the low bidder provides a design that is not what the agency (nor its passengers) wants, it often is obligated to accept it anyway.

One obstacle is the size of the market for transit amenities. As one historian described, "Throughout most of their history, transit bus manufacturers have faced two significant constraints on developing innovative technologies: little demand for such innovations,

and a persistently limited market size in terms of sales per year. The first constraint is largely due to the fact that transit... operators want sturdy vehicles with low operating costs, minimal maintenance requirements, and long service lives; they're not interested in expensive design changes that do not increase transit revenues."<sup>31</sup>

Despite these obstacles, there are many examples today of how transit agencies can modify a basic design to meet needs of commuters. Small improvements, which might seem minor can contribute significantly to a positive passenger experience. By working with manufacturers and fabricators, many amenities can be provided at little or no extra cost. In Aspen, Colorado (Case Study 2), the transit agency worked with the manufacturer of new commuter buses to provide reclining, padded seats; individual lighting; and baseboard heating -- which cost only 2-3% more than the standard \$250,000 bus or an extra \$7,000 to \$8,000. The transit agency strove to "try to approach" the comfort found in a private car and firmly believes that this approach has helped build ridership. The manufacturer was very responsive to making these changes, according to the agency.

In Seattle, the "basic" bus was designed "to increase rider comfort and safety and improve the bus system's identity -- without costing more to build or operate." Features include high back seats, colorful interiors, clear information, and better ventilation and lighting.<sup>32</sup> (See *Case in Point 6.*)

## Case in Point 6: New Bus Designs For Seattle/King County Metro



When King County Metro decided to order new buses in 1994, the Metro Arts Committee, a volunteer group of design and arts professionals who advise Metro on public art and design issues, saw this as an opportunity to create a new bus design and to replace the color scheme that had been in use since the 1970's. The idea won support from the transit agency, which had recently been formed by a merger of Seattle Metro Transit with the county government, and which wanted to update its image.

The Arts Committee's stated goal was "to increase rider comfort and safety, and create a new identity without costing more." The team hired to create the design decided that, rather than view this as a public art project and apply art to the bus, they "would make the bus itself an aesthetic experience that would give viewers and riders the feeling of being in the presence of good design, even if it were not explicitly labeled 'art work.'"

The Arts Committee hired a design team that included an industrial designer, interior designer, graphic designer, communications specialist and public artist. The team had six months to come up with a new bus that cost no more to build, operate or maintain than Metro's existing bus. At the same time, an Employees Task Force was appointed with representatives from every part of the agency -- drivers, maintenance workers, safety planners, and sales marketing and customer relations staff -- to provide oversight and guidance.

The design team first developed several exterior schemes that were displayed at shopping malls, libraries and community centers throughout the county to solicit public opinion. A survey asked the public to rate the exterior designs and to list the design and functional elements that they thought most important. Of the six new design elements listed, respondents marked three as most important: new seating material, anti-graffiti coatings and new seat designs. Of the six new functional elements listed, top-rated were improved ventilation, tinted windows, improved lighting and addition of route number

**(Case in Point 6 continued)**

sign on the street exterior side. Respondents were also asked whether they preferred buses with ads, without ads or if it mattered to them, keeping in mind that advertising helps pay for the bus system. The overwhelming majority said that they wanted ads.

Next, a prototype bus was outfitted with the new theme inside and out and a Marketing Research Strategy Group was organized to gauge public opinion through focus groups and additional opinion surveys. The exterior design turned out to be a little more controversial than expected, but many of the other proposed changes received high marks. Because there was not overwhelming public support for the exterior design a new scheme was developed which used color graphics. The new look is being incorporated into new uniforms, signage, bus shelters and on smaller vans, as well. Advertising is a strong element on the buses, but it was very much a part of the overall design, with the size and location of the ads determined by the designers.

New buses in Seattle now include

*Exterior*

- Two exterior color schemes of yellow/black/green and yellow/black/blue;
- Route signs on all sides;
- The largest possible reader board, with route number and destination.

*Interior*

- High-backed, vandal-resistant, vinyl-covered cushioned seats and cushioned backs, which replace old worn-out brown vinyl seats;
- Blue and green color scheme, replacing the old black and white colors;
- Vandal resistant walls and seat shells;
- Flooring material that is long-lasting and that prevents slippage when wet;
- Signs that communicate route, fare and safety information more clearly;
- Improved ventilation systems;
- A covering for the lighting up front to improve reading light but reduce windshield glare;
- "Next Stop" announcement system; and
- Materials throughout that are intended to be low-maintenance and vandal-resistant.

Before the end of the decade, 550 new buses will be in service. The new bus has been enthusiastically received by the public and Metro was pleased with the cost-effectiveness of the process: a new image for the agency was developed using percent-for-art money, while the new buses came in on budget. The process also helped to build a sense of "identity, ownership and pride" among the employees of the agency.

## *Community Partnerships*

Amenity projects completed within broader community objectives -- such as air quality goals or making a city more livable -- create stronger support for transit amenities. And, even when costs are significant (such as providing bus shelters) there are creative solutions to minimize acquisition and maintenance costs. Through public/private partnerships in Rochester (Case Study 4) and Portland (Case Study 3), for example, transit agencies greatly expanded what they were able to accomplish by themselves and became an integral part of community revitalization projects. In Aspen (Case Study 2), amenities on commuter buses are part of a much larger effort to reduce air pollution and vehicle usage, while eliminating the need to widen a scenic road to accommodate ever-increasing commuter traffic.

Today, transit agencies are exploring new ways to provide services (such as restrooms, refreshments and newspapers, shelter from the elements, and information) which can vastly improve the passenger experience. New Jersey Transit has begun to develop innovative community partnerships to accomplish this difficult objective without great cost to the transit agency itself. In some cases, this has involved partnering with a downtown business association to take over management of a station, involving local garden clubs in making landscaping improvements to a station, providing local artists and schoolchildren with paint and materials needed to create or repair a mural, and encouraging a city to pave or brick the pathways leading from the station to the downtown.

Developing a management system along with the amenities therefore becomes critical. For example, in Rochester, New York, new \$250,000 bus shelters (they are quite large and spacious) are meticulously maintained by property owners in the downtown through a special management district.

Adopt-a-shelter programs are also growing in popularity. Residents of Savannah, Georgia, have adopted 100 bus stops since 1992 and are committed to keeping the stops clean and litter- and graffiti-free. Many stops have been elaborately landscaped; one stop was even adopted and presented as a surprise gift to a family member. The Los Angeles Neighborhood Initiative is a community-based economic redevelopment effort centered on turning individual bus stops into places constructed and maintained by the community. At our focus group in Portland, Oregon, an elderly woman who personally cleans the bus information sign in front of her house says she and other volunteers would do more if they were asked!

## Case in Point 7: Community-Based Bus Shelters, Seattle, Washington

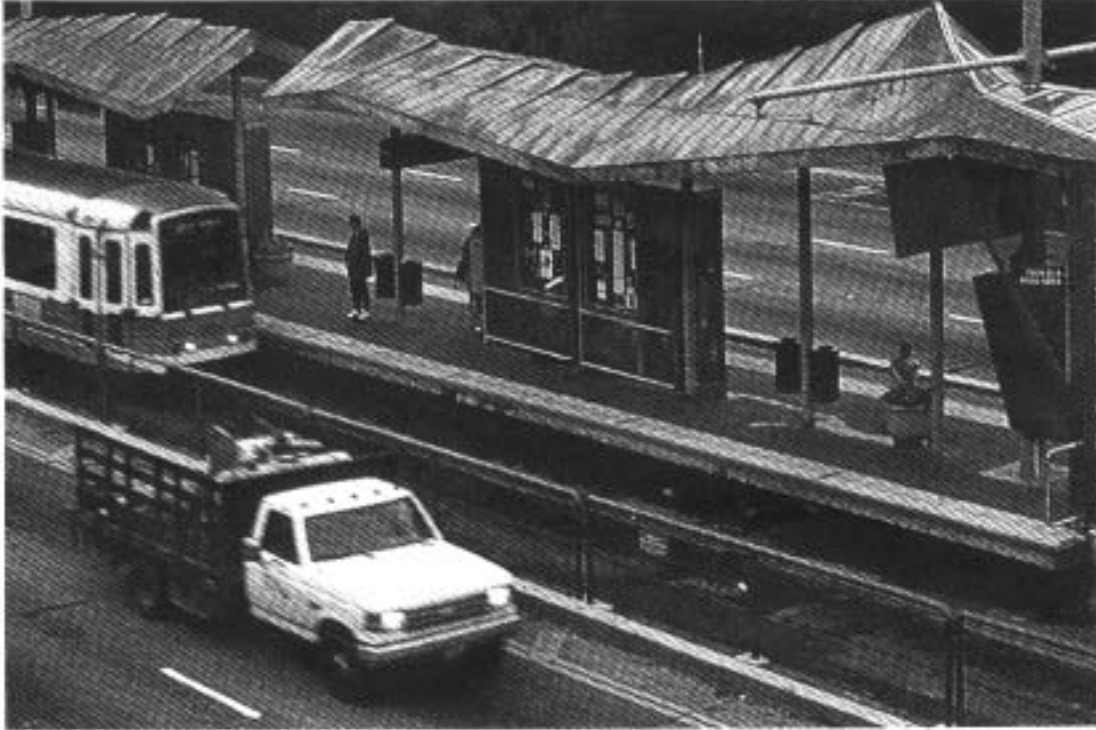


Hundreds of bus shelters in Seattle have become the canvases on which local residents, schoolchildren and artists display their creative skills and, in the process, inspire a sense of community ownership of transit. In 1989, when Metro employees were asked to come up with innovative ways to improve customer service, one team suggested asking local high school students to paint murals on some of the most heavily vandalized shelters. The idea was first tried out in an early pilot project that produced twelve murals with only \$1000. The success of this experiment led to what is now a \$65,000 a year program run by Metro's Bus Shelter Comfort and Safety Program.

Any group or individual that would like to transform a shelter into a work of art can submit a design for a specific shelter. After approval by Metro staff, the muralist is given pre-primed plywood panels and painting kits and upon completion, maintenance staff install the panels and coat them with graffiti-resistant paint. The total cost is only about \$600 per mural. Installation is usually done as part of routine maintenance.

Community groups and local arts councils often ask local artists to coordinate mural programs in the schools. Shelters now display Native American Indian designs, northwestern mountain scenes, city landscapes and local folk art. Some artists have gone beyond plywood and paint and have experimented with etched glass panels, photo-transparencies and other innovative techniques. The pride of ownership that has developed seems to have reduced vandalism and graffiti, especially in areas most frequently targeted.

### Case in Point 8: Artist-Designed Light Rail Transit Stations, San Francisco, California



Faced with significant community opposition to a light rail station rehabilitation project to be outfitted with standard agency station amenities, the San Francisco Municipal Railway (MUNI) -- with the help of the City's Art Commission -- found a solution by turning over the task of designing amenities, such as canopies, seating, and lighting, to two artists at the adjacent university, San Francisco State University (SFSU). The artists' proposals eventually won community support, and the stations, which opened in 1994, have become a distinctive feature of the City's transit landscape.

The two Lakeside district stations, known as San Francisco State and Stonestown Station, are among the busiest stops in the MUNI system. Before the project began, the station platforms consisted of narrow, crumbling concrete islands sandwiched between double light rail trackway and lanes of a heavily trafficked freeway. MUNI wanted to rebuild safer, wider platforms that would conform to ADA requirements. The agency also wanted the new platforms for high-level boarding, which offers improved wheelchair access and faster, easier, and safer boarding for all passengers.

With its image tarnished by a record of inadequate facilities maintenance, MUNI encountered bitter controversy when it first proposed the idea of improving the two Lakeside stations. This problem was exacerbated by the fact that the agency had not solicited community input before conducting the first phase of the project: track improvements and platform reconstruction. Residents near the stations did not want the burden of another round of long-lasting construction work and transit service interruption. They also felt that station amenities would have a negative visual impact on the neighborhood.

In need of a neutral intermediary, MUNI eventually turned to the San Francisco Art Commission, which manages the City's percent-for-art program. The agency left it up to the Commission to come up with a station design, as long as it was safe and easy to maintain. With very little time to gain community



**(Case in Point 8 continued)**

support, the Art Commission nominated two SF State University art professors for the design work. The artists began consulting with a group of university and neighborhood representatives immediately and, after a great deal of effort and negotiation won their support for two station proposals. When costs for the shelters and amenities far exceeded what MUNI had budgeted, the community rallied for more funding.

The artists' design included many enhancements to the basic station, including custom copper roofing, wire-mesh seating with arm rests, trash cans mounted on poles, enhanced lighting, leaning rails, and public telephones. For artistic displays and MUNI information, there are custom panels, which double as windscreens. Perforated metal screens provide additional wind protection, and ceramic tiles line the periphery of the platform. At the SF State Station, there are vines and plants, and planters that also serve as tile benches, as well as display cases for student artwork and university notices.

The cost of the canopies and other artist-designed amenities was approximately \$600,000 per station. Because of the unique design, however, MUNI was able to leverage \$400,000 in enhancement funding through ISTEA (International Surface Transportation Efficiency Act), which was matched by funds from the City's transportation sales tax. The Public Utilities Commission, which oversees MUNI, also contributed \$200,000 per station.

SFSU offered to maintain the SF State Station as an extension of its campus at a cost of \$50,000 a year, without the benefit of ad revenue. In exchange, the university asked that MUNI provide closed-circuit televisions linked by cable to the university and to MUNI, which it did.

According to MUNI, the project was "definitely a success" in the eyes of transit passengers and the surrounding community. Involving the community members in the design process also had a positive impact on MUNI's reputation.

## *Advertising*

Using advertising to support amenities is another strategy. However, many transit agencies tend to view amenities solely as a source of revenue (e.g., advertisements), sometimes losing sight of the fact that they are a service to customers. While clearly it is desirable to see how bus shelters and benches can collect revenue from advertisements, there is a chance that they begin to dominate the design rather than enhance rider experience. New York City's shelters, for example, provide little protection from wind-driven rain and are inappropriate for narrow sidewalks in midtown Manhattan. In Portland, Oregon, Tri-Met (the regional transit agency) is not planning to subcontract its shelter program to an advertising agency, but will manage the advertising program itself in order to increase revenues and give the agency more control over the final product.

### **Case in Point 9: An In-house Bus Shelter & Advertising Program in Portland, Oregon**



In 1992, Tri-Met, Portland's transit agency, set up a program to replace hundreds of its aging bus shelters with newly designed, more attractive, durable, and affordable structures using some of its discretionary federal funding. By the year 2000, the agency will have replaced all of its existing 550 shelters and installed hundreds more. Rather than contracting to advertising companies, the agency sees the shelters as a way of increasing income, as it plans to administer the advertising program itself. This necessitated that the agency purchase the shelters themselves, working closely with a manufacturer in their design.

**(Case in Point 9 continued)**

The steel and wood shelters that Tri-Met bought in 1976 began to deteriorate fairly quickly in the wet Pacific Northwest weather. Determined not to repeat mistakes of the past, the agency carefully researched the design of a new shelter. Working with a national shelter manufacturer, Tri-Met came up with the ideal design: a standard 3-post structure with all the exposed panel edges wrapped in mullion to reduce panel breakage.

After settling on the shelter's basic features, Tri-Met held a series of focus groups with passengers to experiment with alternate wall configurations that would provide better weather protection, accessibility, perception of safety, and appearance. For participants, weather protection was the priority: many preferred a design of two opposing "L"-shaped walls, which block wind from all directions without being completely enclosed. The modular construction of the shelters allows them to be reconfigured to suit passenger preferences. During the focus groups, participants were also asked to describe what they liked and disliked about existing shelters and to recommend improvements. Responses confirmed Tri-Met's assumption that adequate lighting, benches, and user-friendly signage are priorities for bus passengers.

Today, Tri-Met's new shelters have an aluminum frame, glass-paneled walls, and a translucent plastic roof which replace the polycarbonate-walled, steel frame structures that the agency installed in the 1970's. New materials were chosen for their resistance to weather. In addition, the panels reach almost to the ground, which is a major improvement over the 10" gap characteristic of the older shelters that allowed cold wind to blow into the shelter. The agency opted for clear roofing because it lets in more sunlight and street light. At night, this feature improves passenger perceptions of safety. Lastly, one of the shelter's sidewalls is removable so it can be replaced with an advertising display panel when the agency begins its advertising program.

Cooperation between Tri-Met and the manufacturer brought about a win-win situation: Tri-Met got its ideal shelter at a cost of \$2,400 each (about half the normal cost) and the manufacturer won a contract for over 800 shelters, the largest such contract with any agency in the U.S. at the time. By working together over a long period, the two organizations built a trustful working relationship and were able to save by eliminating contingency costs from the contract. This would have been difficult to accomplish in a normal open bid process. Buying the shelters in quantity also helped lower the unit cost of the shelters. Once the last structure is in place, Tri-Met will be able to administer its own bus shelter ad program, with an estimated annual revenue of \$1 million.

### ***Experiments and Demonstration Projects***

Experiments and demonstration projects that test amenities and assess customer reactions are becoming more common as part of the planning for amenity programs. These experiments allow an agency to determine how an amenity will function before a major investment is made, so it is a cost-saving measure as well. Portland's NW 23rd Avenue bus shelters/sidewalk extensions (Case Study 3) and Aspen's commuter bus amenities (Case Study 2) both started out as experiments by the transit agency.

The New York City Metropolitan Transportation Authority (MTA) conducted surveys and focus groups before developing its new test subway car and after the test car was in operation. (See *Case in Point 10*) The MTA also conducted focus groups for its new double-decker trains for the Long Island Railroad (LIRR). Based on the evaluation of an actual car, customers changed seating to 2x2 rather than 2x3, with wider seats with lumbar support; they also recommended eliminating tables and armrests, relocating coat hooks, and padding the lower luggage racks.<sup>33</sup> Unlike the subway cars, these double-deckers were not evaluated in actual operation, so passengers' reactions were hypothetical.

## **Case in Point 10: New Technology Test Trains, New York, New York**

In preparation for the purchase of hundreds of subway cars, Metropolitan Transportation Authority/New York City Transit (NYCT) has been testing two trains that feature a broad range of new technologies and design innovations. NYCT is striving to update its fleet with subway cars that cost less to maintain and operate and are more comfortable, reliable safe, quiet, and attractive for passengers -- while reducing crowding and facilitating boarding, wheelchair access, and overall circulation throughout the car to reduce dwell time. Components of the cars that prove successful during the test period will be incorporated into future car specifications. According to former NYCT President Alan F. Kiepper, before major procurements occur, the cars "will undergo a rigorous program of tests to prove that each innovation functions in the unique New York City subway environment."

For many years, NYCT has been hesitant to incorporate new technology because of costly mistakes made in major vehicle procurements of the past. In addition, today's cars have features that do not serve passengers adequately: seats on "A" Division cars, for example are too narrow. By soliciting passenger and operator input, and by testing the cars extensively, the agency hopes to avoid repeating previous mistakes. The improvements under consideration are critical, since the majority of the City's fleet is operating with 1960's technology. In fact, the majority of the features being tested have already proven successful in other systems worldwide.

During a lull in new car orders in the late 1980's, NYCT seized the opportunity to test state-of-the-art technology and develop a better approach for qualifying innovative features before incorporating them into cars ordered in quantity. During initial brainstorming workshops, the agency took into consideration a great deal of market research, such as passenger focus groups in which people were asked what they like and dislike about existing trains and how they would design the perfect train. With this research, the agency developed a set of features for testing, and awarded contracts for two test cars in 1989. MTA's Arts for Transit office was brought in to oversee design of the subway car interiors; usually the interiors of subway cars had not been considered for special treatment. However, because this was a test train, Arts for Transit organized a design "charrette," held at the Cooper Union, and invited environmental psychologists, designers, artists and planners to think about the train interiors in a different way. While the charrette itself did not lead to specific amenity recommendations, it expanded awareness within the agency regarding the need to consider the inside of the cars as well as the mechanics and engineering. Now, when large numbers of cars are purchased, design specifications include car interiors as well, and industrial designers participate in the decision making.

The new technology trains feature advancements in a number of areas, such as propulsion equipment, energy efficiency, and computerized self-diagnostic systems. The agency is also experimenting with many vehicle characteristics aimed at improving passenger experience, such as electronic strip maps, which show the location of the train along its route; more advanced public address systems, including automatic announcements of stops and exterior speakers so the train crew can communicate to passengers on the platform; an airbag suspension system; wider seats and seats without divisions; clocks; more interior lights, and quality design. The agency is also experimenting with wider, staggered doors, new seating arrangements, and relocated vertical handholds. In response to passenger concerns about safety, NYCT installed large windows at each end of the test cars to increase visibility into adjacent cars. The trains also incorporate the latest technology in door safety. Each train interior was designed by a separate design team according to higher design standards that emphasized attention to overall colors and details.

The two vehicles were first presented to the public in 1992; the agency brought customers on board to look at and try out new features and give feedback about them. At the same time, NYCT held focus groups with train conductors and engineers to evaluate and offer suggestions about the cars, cab area, and control panel. The trains were introduced into revenue service in 1993. Since that

**(Case in Point 10 continued)**

time, operations and maintenance teams have been evaluating the success of the many innovations aboard the two trains. Meanwhile, NYCT has continued soliciting input from consumers and performs "walk-throughs" of the test trains with representatives from the Permanent Citizen's Advisory Committee to the MTA (PCAC). Final modification will be made utilizing a final round of customer research in which subway riders "walk-through" a mock-up the near-final subway car.

The feedback from customers about the test trains has been very positive overall. In particular, passengers like the electronic strip maps, because they let riders know where they are along their route and are helpful in trip planning. Also, the windows on the ends of the cars are seen as an important improvement. In the past, people complained of feeling trapped because they could not see into the next car. The test trains feel safer and more pleasant in contrast. Alan Foster, Associate Director of the Permanent Citizen's Advisory Committee to the MTA, explains that in designing new subway cars, "everything is a trade-off. To improve one feature, you often have to sacrifice another." To improve upon the test cars, a compromise had to be reached between space near the doors and space for seating. The agency has relied a great deal on customer and operator input to come to decisions about new features and technology. As Foster explains, "this has been a great process, a real paradigm shift to have so much customer participation. The agency has been very receptive to all the input."