DESIGNING TRANSIT ACCESSIBLE COMMUNITIES study

DESIGNING TRANSIT ACCESSIBLE COMMUNITIES STUDY

Transit Committee
October 10, 2013

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For information, discussion and possible action for acceptance of the Designing Transit Accessible Communities Study.

Transit Accessibility

Transit Accessibility is…
the segment of an individual trip that occurs between an origin or destination point and the transit system.

~ Source: American Public Transit Association

Stakeholder Workshop

- Facilities Staff

- Transportation Planners

Stakeholder Workshop

- Human Services Coordinators

- Special Needs Coordinators

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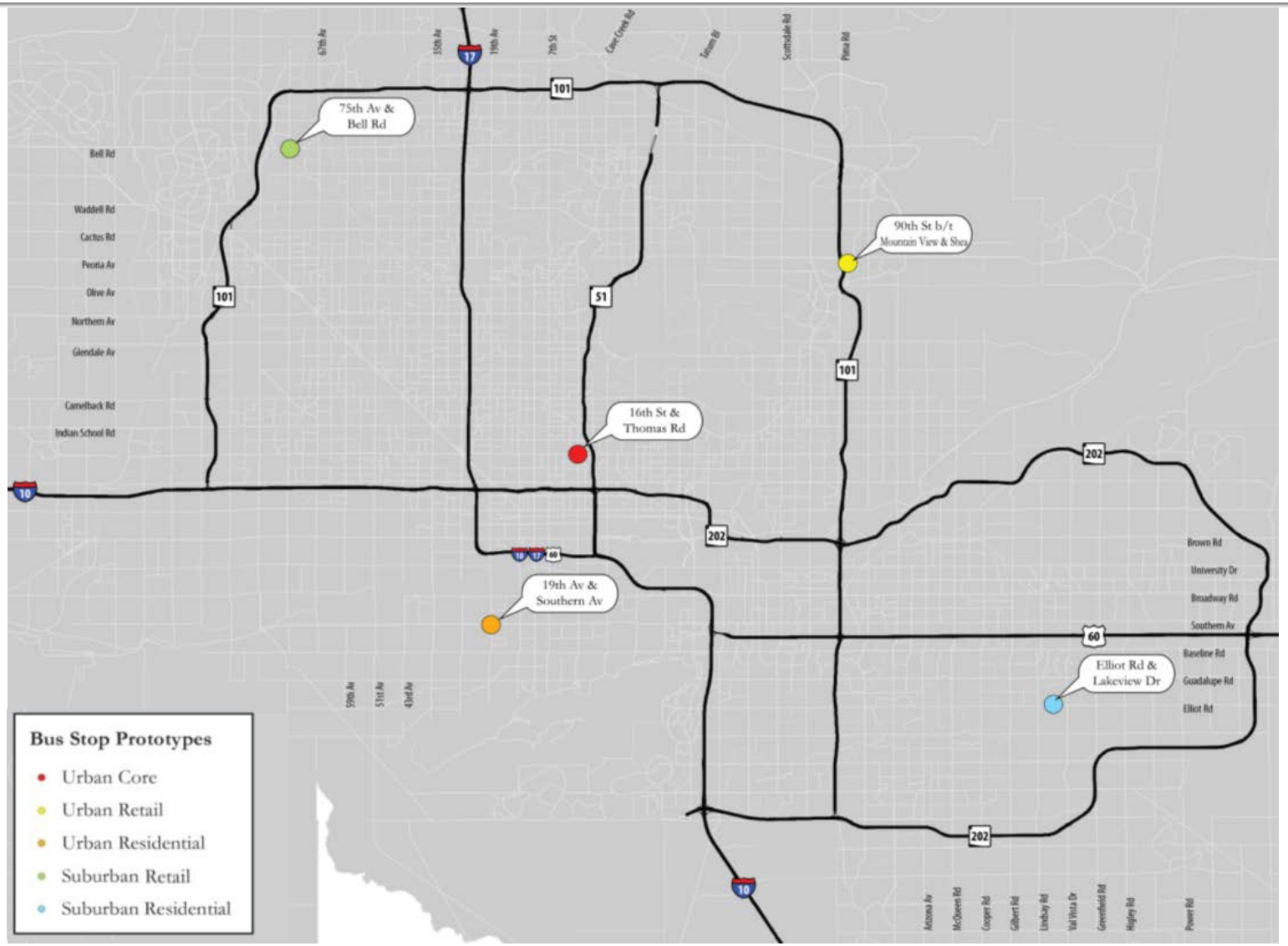
Case Study Locations



Bus Stop Categories

	Bus Stop Prototype	Urban Core	Urban Retail	Urban Residential	Suburban	Suburban Residential
Transit Supply Characteristics	**Level of Accessibility**	High	Medium	Medium	Low	Low
	High Frequency Transit Service	Predominantly high, but also includes low frequency service	Peak Hour Service	Only One All-Day High Frequency	None	Limited Stop / Express Service/ No Local Service
	Street Network Type	Traditional Street Network	Traditional Street Network	Traditional Street Network	Conventional Suburban Street Network	Conventional Suburban Street Network
	Percent of Total Bus Stops	15.4%	14.8%	7.8%	22.3%	39.5%
Transit Demand Characteristics	**Mean Daily Transit Boardings**	69 boardings	50 boardings	27 boardings	24 boardings	12 boardings
	Neighborhood Type	Core Metropolitan	Central Metropolitan	Central Metropolitan	Suburban	Suburban
	Presence of Retail	Both	Yes	No	Yes	No
	Employment Density	High	Medium	Medium	Low	Low
	Population Density	Mixed	Medium	Medium	Low	Low

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Surveys *(April 2012)*

Surveys Collected *(April 2012)*

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Case Study Location	Number of "Arriving To" Surveys	Number of "Departing From" Surveys	Total Surveys
16th Street & Thomas Road	101	8	109
19th Avenue & Southern Avenue	45	10	55
90th Street, between Mountain View Road and Shea Boulevard	9	6	15
75th Avenue & Bell Road	26	8	34
Elliot Road & Lakeview Drive *(alternative locations at 46th & Broadway and 67th & Baywood)*	7	1	8
TOTAL SURVEYS	188	33	221

Surveys Collected *(April 2012)*

1. Shade Trees (68%)
2. Bus Schedule Information (64%)
3. Streetlights (60%)
4. Landscaping (55%)
5. Bicycle Lanes (52%)
6. Bicycle Parking (51%)
7. Curb Extensions (50%)
8. Medians (43%)
9. Decorative Pavement (41%)
10. Art (40%)

Transit Accessibility Toolkit

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Issue

Importance

Improvement Considerations

Planning/Policy Guidance

Cost

Lighting

Information Signage

Wayfinding

Seating

Shelter

Shade

Adjacent Land Use

Bicycle Access

Bicycle Parking

Pedestrian Crossing

Sidewalk

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March, 2013

Prototype Concepts & Implementation Strategies

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Lighting

Issue

Street and pedestrian lighting is an important feature at bus stops and nearby crossing locations for the safety and comfort of pedestrians and transit users. Additionally, adequate lighting promotes safety and security in urban areas and increases the quality of life of a community by extending the hours in which activities can safely take place along a street.

Importance

A field survey was conducted of transit users at each case study location. Numerous questions were asked of transit riders including "How likely is it that you would walk or ride a bicycle to this bus stop more frequently if there were more street lights?" Of the respondents, 60% cited that improved lighting would increase their likelihood of walking or riding a bicycle.

At most case study locations, good pedestrian lighting was not provided. Instead lighting was provided by adjacent street lights which were often too far from the transit stop. Some stops provided a back lit advertisement which provides lighting within the shelter, however, many shelters of this design had advertisement lighting that was not in operation. Additionally, lighting in more urban areas might come from adjacent land use; however, in areas with larger setbacks this did not provide a good sense of security.

Improvement Considerations

Pedestrian-oriented street lighting can be implemented using a variety of designs and configurations. The types of lighting shown below are higher cost and would be most appropriate for more urban bus stops.

Freestanding pedestrian-oriented lighting at bus stops.

Pedestrian light mounted to street light pole.

Attached to street light pole in catchment area.

Attached to building face in catchment area.

Freestanding Pedestrian Light | Freestanding pedestrian lighting is typically provided in addition to street lighting. These pedestrian lights must be located within closer proximity to each other so to minimize pedestrian dark areas; typically every 50' as opposed to a typical street light spacing of 200'.

Pedestrian Light Mounted to Street Light | A pedestrian lighting arm may be attached an existing street light pole using a special SS band designed for this purpose. In addition to mounting to existing street lights additional pedestrian lighting may be necessary. Pedestrian lights must be located within closer proximity to each other so to minimize pedestrian dark areas; typically every 50' as opposed to a typical street light spacing of 200'. Depending on the integrity of the existing street light pole and the method used for construction/installation, this method may be more costly than providing a freestanding pedestrian light.

Pedestrian Light Mounted to Building | Mounting pedestrian-scale lighting to building facades is a cost efficient technique as often that cost is paid by the developer or property owner. However, this strategy requires that local design guidelines require such lighting be installed. This lighting technique would only work with buildings with small setbacks whose lit façade is directly adjacent to the pedestrian walkway; buildings with larger setbacks would not be able to provide lighting for the adjacent walkways.

Information Signage

Issue

To have an effective transit system, riders need to have easy, reliable, and up-to-date information regarding the transit service. Providing bus service information at bus stops is important to transit users and can be used effectively to increase ridership by retaining existing riders and encouraging the use of transit by new riders, infrequent riders, and disabled individuals.

Importance

During the field survey, transit riders were asked if an increase in schedule information would make them more likely to ride the bus more often; 64% of transit riders said they would ride the bus more often if adequate schedule information was provided.

At most case study locations bus stops had little to no information signage. The existing signage offered at all bus stops includes a bus route number sign only. Several locations also included a sign providing the bus stop number and a phone number that transit riders can call to get additional information about the bus stop location and routes offered at that stop. Few locations offered a full transit system map. One location (90th and Shea) provided park-and-ride location information. None of the case study locations provided a bus schedule, route destinations, or real-time travel information.

Related Elements	
Information Content	Station/stop, route, schedule, service alert, real-time location, destination, vehicle load factor.
Information Format	Map, table, website, trip planner, electronic message, phone text.
Information Delivery Media	Telephone, personal computer, mobile device, signage, kiosk.

Improvement Considerations

Information signage can be implemented in several formats and with various combinations of information. It is highly encouraged that transit stops include a full bundle of information for transit riders including: a bus stop number, route(s) number and destinations, transit system schedule, transit system map, transit system provider's contact information, and if applicable, the park-and-ride location. Furthermore, bus stops and routes with high ridership volumes can consider adding real-time travel information. The types of information signage shown below are but a few examples of the possible design and format to provide the information. Overall, transit system information signage should be as consistent as possible throughout the entire transit system.

Freestanding information kiosk with detailed route and schedule information.

Existing post-mounted bus stop sign with bus route number. Proposed post-mounted bus stop sign with bus route numbers and destinations.

Post-mounted information box with route map.

Bus Stop Sign with Route(s) Number and Destinations | As stated in the table above, the existing post-mounted bus stop sign includes the bus route number. These signs can be enhanced to include the route name and the primary destination along the route.

Information Kiosk | Each bus stop can include an information kiosk houses the transit system schedule and the system map. This may be another location to consider for the transit provider's contact information.

Contact Information Signage | Each bus stop can include the transit provider's contact information with the bus stop number. This sign provides another means for riders to get information regarding their bus route and bus stop. Many bus stops in the greater Phoenix area already include this sign. In addition to providing a phone number, these signs can be enhanced to include a QR code which would direct smart phone users to a website providing updated information on the bus route and bus stop.

Wayfinding

Issue

Wayfinding is an important component in guiding bicyclists, pedestrians and transit riders to nearby destinations. Wayfinding includes physical and visual elements that orient and aid people in reaching their destination including paths, landmarks, nodes, edges and districts. These physical and visual elements are further described in the FTA report titled *Traveler Information Systems and Wayfinding Technologies in Transit Systems* listed in *Appendix A: Reference Material*.

Importance

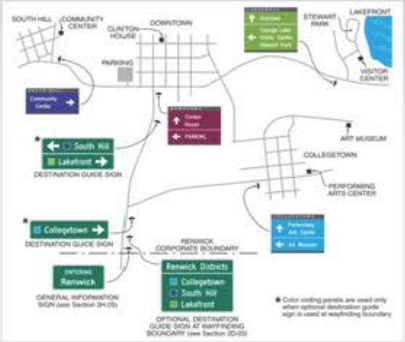
The field survey did not ask specific questions related to wayfinding. However, when asked if there were interesting things to see on their trip to the bus, only 19% indicated that there was something interesting to see along their route. None of the case study locations provided transit, bicycle or pedestrian wayfinding.

"...Wayfinding signage plays an important role in the overall success of a rail authority. Not only does effective signage help create an environment where passengers feel informed and secure, it also provides an unrestricted opportunity for the authority to create and/or maintain a defining image with its riders and the surrounding community. Essentially, wayfinding signage is the most prominent and, therefore, the most vital communication tool of any public transit system..."

Source: "Design & Placement: The Defining Elements of Successful Wayfinding Signage" (Owens, Ron)

Improvement Considerations

Bicycle and pedestrian wayfinding signage near bus stops and along other pedestrian/bicycle friendly routes would not only direct the pedestrian or bicyclist towards nearby destinations but would indicate where nearby pedestrian/bicycle friendly routes are located, and would be used to direct potential riders to nearby bus stop locations. Where it is not possible to provide a bike path or lane, bicycle improvements can focus on wayfinding which would connect transit stops with off-street routes and nearby local or collector streets where traffic volumes and speeds are more conducive to bicycle travel.



Transit stop wayfinding can be provided as part of a larger community wayfinding signage program.

Source: MUTCD 2009, Ch. 2D

The MUTCD provides general information signs that may be used to identify transit stops/stations.

Source: MUTCD 2009, Ch. 2H

Bicycle wayfinding signs may also indicate the direction of transit station.

Source: City of Long Beach

Transit Stop Wayfinding | Transit, pedestrian and bicycle wayfinding can be created or can be added to an existing community wayfinding program.

Transit Stop Directional Signage | These general information signs can used to throughout a community to direct users to nearby transit stop locations.

Bicycle Wayfinding | Bicycle wayfinding can be used to direct bicyclist to nearby bicycle friendly routes, to destinations, and to transit stop locations.

Example of Destination Classifications	
Primary	Downtown and adjoining jurisdictions (signed at a distance up to five miles).
Secondary	Transit stations and districts (signed at a distance up to two miles).
Tertiary	Parks, landmarks, colleges, hospitals, and high schools (signed at a distance up to one mile).

Seating

Issue

Seating is typically included in shelter design, but where installation of a shelter is not justified a bench with a shade tree provides comfort and convenience at bus stops. Factors used in determining installation and locations of bus stop seating include:

- Available space
- Stops with long headways
- Landowner/developer was denied permission to install a shelter
- Stops frequently used by elderly and the disabled
- Evidence of riders sitting on nearby land or structures

Importance

The field survey did not ask specific questions related to seating. In "Evaluating Transit Stops and Stations from the Perspective of Transit Users" 749 transit users were surveyed at 12 transit stops and stations around metropolitan Los Angeles; in terms of provided amenities, respondents selected "enough places to sit" as fourth out of five in rank of importance (Isekis, H., Taylor, B. D., 2010).

Most case study locations provided seating via a bus shelter. One location provided additional benches outside of the shelter. And one location provided no seating at the bus stop.

Improvement Considerations

Bus stop seating may be provided independent of bus shelters, offering comfort and convenience at bus stops. Seating at bus stops is often provided based on existing or projected ridership.

Bench | Seating provided independent of bus shelters would typically be provided where ridership is below those justifying a bus shelter. The quality, financing and siting of benches may vary according to the needs and resources of the responsible agency and local community. Locate benches near shade trees whenever possible to maximize shade or plant shade trees near the bench location. Coordinate bench locations with street lighting to increase visibility and enhance security. Do not locate benches in undeveloped areas of the right-of-way or near driveways to improve pedestrian safety and comfort. Locate benches on a non-slip, properly drained, concrete pad.

Seat Wall | Street walls can be designed at lower heights to serve as additional seating from transit patrons (aka Seat Walls). Seat walls can be integrated into pedestrian refuges. Shade trees should be planted near seat walls to provide the maximum amount of shade. Install skate stops or skate blocks along seat walls to avoid damage that may occur to wall.

Public Art/Gateway Monument | Seating can be incorporated as public art or as part of a gateway monument.

Bench with no advertising (shade from tree and building)

Seating provided on adjacent street wall, also known as a seat wall.

Seating provided on adjacent street wall, also known as a seat wall.

Shelter

Issue

Bus shelters provide protection shade, seating, protection from the elements, and serve as a visual guide for transit stops. The Transportation Research Board published a report titled *Guidelines for the Location and Design of Bus Stops* which demonstrated the importance of shelter location, design, and pavement materials used. The report states that both asphalt and concrete increase air temperature by several degrees because of the material's ability to retain and reflect heat. Temperatures at bus stops can often exceed actual air temperature by several degrees. The report also states where shelters should be located based on accessibility factors such as bus stop transfer distances.

Within the MAG region, local jurisdictions determine bus shelter designs. There are a variety of designs that can accommodate different passenger volumes and various site demands. In the MAG region, sun protection is a key function of shelters. Depending on the orientation of the bus shelter (south facing, north facing, etc.), time of day and transit service time, a typical bus shelter may or may not provide relief from direct sunlight. In these circumstances other shading strategies such as locating the shelter near an existing tree can also be considered.

Importance

The field survey did not ask specific questions related to shelter. In *Evaluating Transit Stops and Stations from the Perspective of Transit Users* 749 transit users were surveyed at 12 transit stops and stations around metropolitan Los Angeles; 69% of respondents reported shelter to protect them from the sun or rain as being important, also, it was the highest ranking in terms of importance of all five amenities surveyed (Isekis, H., Taylor, B. D., 2010).

Most case study locations provided bus shelters and bus stops. Some locations had bus shelters installed but bus service was not provided. At these locations bus transfer distances were long which resulted in riders missing transfers or cutting through developments to reach the next bus stop. One location had no shelter, only a bus sign and a shade tree. None of the case study locations included shelters designed for southern climates.

Improvement Considerations

Like bus benches, bus shelters may be supported by advertising or constructed using entirely public funds. Transparent screening is an important element of both of the examples below, as visibility is an important security feature and it also allows passengers to see approaching buses from behind the screen.

Furthermore, shelters can be coordinated with landscaping to provide maximum protection from the elements and to enhance the visual quality of the bus stop. Shade trees reduce heat at a site and provide additional shade for patrons waiting outside the shelter. To increase rider comfort consider using low heat gain materials and finishes.

Bus shelters can provide sufficient shade at all times of day to encourage their use. Shelters that do not provide sufficient shade may have a negative impact on transit ridership.
Source: MAG

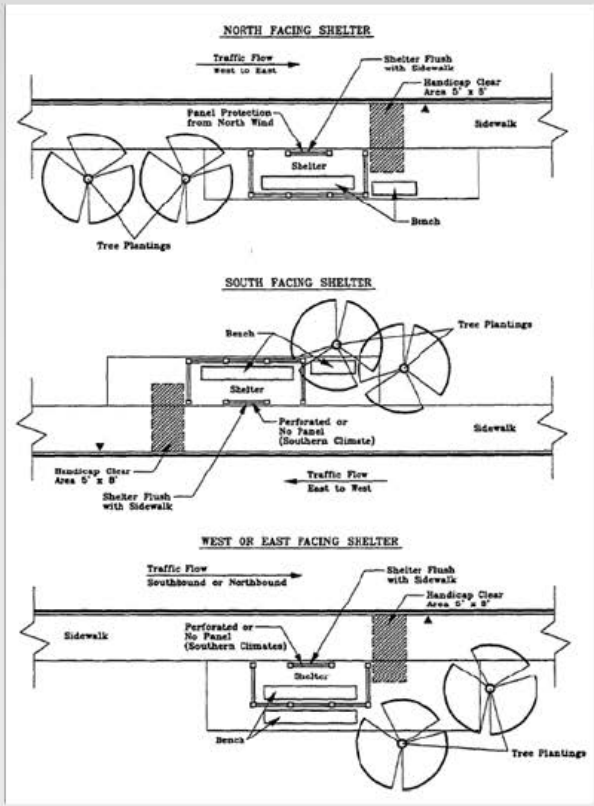
Public or development-funded bus shelters may be designed to satisfy more rigorous aesthetic or functional requirements. ***However, the provision of shade, during all times of day, always takes precedence over purely aesthetic design considerations.***
Source: South Mountain Studios

Valley Metro LINK bus stops are located in Mesa, Chandler and Gilbert.
Source: www.valleymetro.org/vm/link_intro

Standard Bus Shelter | A standard bus shelter must meet transit agency requirements including:

- Shelter location,
- Pedestrian access (i.e., direct sidewalk to the shelter),
- Visibility for vehicles and waiting passengers,
- ADA accessibility, and
- Signage.

The City of Scottsdale conducted a sun exposure study as part of the conceptual design for standard bus shelters in the city. The resulting design is similar to concept designs included in TCRP Report 19c (referenced above).



Conceptual Shelter Design for Southern Climates
Source: TCRP Report 19c - Guidelines for the Location and Design of Bus Stops

Landscape Shading

Issue

Adequate shading can improve uncomfortable environmental conditions like heat and sun. In the MAG region, sun protection is a key function of shelters. Depending on the orientation of the bus shelter (south facing, north facing, etc.), time of day, and transit service time, a typical bus shelter may or may not provide relief from direct sunlight. In these circumstances other shading strategies such as locating the bus stop near an existing tree can be considered. *TCRP Report 19c* provides detailed guidance on the shade of bus stop areas.

It is important to recognize that the movement of the sun will impact the effectiveness of the shade improvement. Before selecting a treatment visit the site during the period(s) of peak activity. Stop level transit ridership data and pedestrian counts will be useful in determining the periods of peak activity.

Importance

During the field survey, transit riders were asked if an increase in shade trees would make them more likely to ride the bus more often; 68% of transit riders said they would ride the bus more often if additional shade was provided. Only 21% of riders thought there were a lot of trees and plants.

At all case study locations only partial shade was provided during certain periods of the day but not during all hours of daylight. At most case study locations at least partial shade was provided from the bus shelter; at bus stops where a shelter was not provided a nearby shade tree provided partial shade. None of the case studies had adequate shade pedestrian or bicycle routes in the catchment area.

Improvement Considerations

Various strategies for providing shade at transit stops have been discussed in previous sections including the siting of benches to take advantage of existing shade and the design and orientation of shelters. In addition to shade at the bus stop location, consideration should be given to providing adequate shade on bicycle and pedestrian routes that connect to bus stops.

Street Trees with Grates | Shade trees planted in tree wells are common in urban areas where on-street parking may be directly adjacent to the planting area. Shade trees with grates can be installed which maintain a larger sidewalk space for pedestrian, strollers and handicapped individuals.

Tree wells are typically used in urban areas or areas with high turnover of street

A landscaped strip between the curb and

Landscape Strip | Streets with a landscape strip can be enhanced by planting street trees in the space between the sidewalk and curb. This location can provide shade both to the sidewalk and to on-street bicycle lanes (if applicable). When sidewalks are detached, shade trees can be planted on both sides of the sidewalk to provide shade throughout the day.
Landscape strips that will be planted with shade trees need to be at least 3' wide to allow for a minimum 2'6" clearance radius around the base of the tree. Evaluate tree litter, fruit characteristics, smell, growth rate, proximity to building structures and utilities, root spread, and seasonal growth when determining tree species. Certain species can have major impacts on building foundations, sidewalks, cars, pedestrians, and utilities.

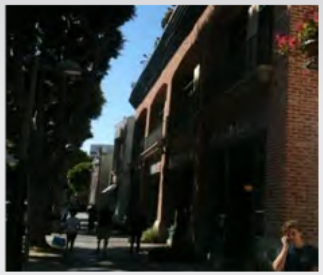
Shade Trees | Whenever possible, landscape transit, pedestrian and bicycle areas with shade trees rather than palm trees. Palm trees provide little to no shade.

Sidewalk-oriented Buildings | The design and orientation of buildings, particularly with regard to setback and height, can have a significant impact on the level of shade provided at transit stop and along sidewalks in the transit stop catchment area. Structures may also be built over sidewalks for short stretches to provide pockets of relief from direct sun exposure. Depending upon the orientation of the building (i.e. north, south, east, west) and the location of the sun, buildings with a zero setback line or small setback line can provide shade for the sidewalk. A two-story building has a comparable height to a mature shade tree.

Canopies | Canopies are typically used on private property. They may be erected to provide shade between the building entrance and the public sidewalk. Canopies have also been used on roadways in some urban settings.

Planning/Policy Guidance

- Install trees to maximize shade opportunities while considering the natural and built environmental impacts.
- Some cost effective strategies for planting street trees include:
  - Locating bus stops in locations where they will benefit from existing shade trees.
  - Prioritizing the planting of street trees that will serve existing bus shelters and sidewalks.
- Wide and/or detached sidewalks allow for a buffer zone that can include tree wells in urban areas or a continuous landscaped strip in more suburban settings.
- Shade can be a consideration during private development design and review and the implementation of public improvements within the public right-of-way. Identifying the appropriate strategy requires consideration of capital cost, maintenance and contextual factors such as aesthetics and the number of pedestrians and transit users who will actually benefit from the investment.
- Provide appropriate landscaping that does not interfere with pedestrian and bicycle accessibility.



The combination of tree wells and sidewalk-oriented buildings provides consistent shade throughout most of the day.

Sidewalk oriented development provides shaded connection between bus stops and building entrances.
Source: City of Chandler, Green Building Program

Canopies provide shade from the public sidewalk to the building entrance.

Cost

The table below lists the estimated unit construction costs for shade that may be included at transit stops. The potential application of each feature by prototype is highlighted.

Table 24: Cost of Shade & Potential Prototype Application

Feature	Description	Unit	Unit Cost	Application for Prototypes				
				Urban Core	Urban Retail	Urban Res.	Sub. Retail	Sub. Res.
Shading	Standard shelter w/ seating, lighting, bicycle rack, concrete pad, trash receptacle	Each	$16,000					
	Enhanced shelter w/ seating, side screens, lighting, bicycle rack, concrete pad, trash receptacle	Each	$25,000					
	Custom shelter w/ seating, side screens, interior lighting, stop area lighting, bicycle rack, concrete pad, trash receptacle	Each	$35,000					
	Shade tree (irrigated)	Each	$750					
	Landscape buffer w/ shade tree (irrigated)	Sq. Ft.	$3.00					
	Tree well with cover	Each	$250					
	Custom shade structure	Each	$5,000					

Adjacent Land Use

Issue

Adjacent land use is an important element to consider when creating or improving a pedestrian environment. Developments with large setbacks, retaining walls, or gated communities all act as barriers separating pedestrians and bicyclists from the development.

Importance

During the field survey, transit riders were asked if the bus stop was close to home, work, or shopping; 34% of riders thought the bus stop was close to their origin or destination point.

Of the case study locations, only the Urban Core stop provided direct access to adjacent land uses. The Urban Residential stop provided direct access to some adjacent uses but no direct access to the surrounding residential areas. All other case study locations had no direct access to adjacent land uses, the worst of which was the Suburban Residential stop which had walled subdivisions with access only at subdivision roads that were far from the bus stops.

Recent research has concluded that land use and development patterns have a significant impact on transit systems and stops:

"The results of this research suggest there are three primary means available to planners to enhance transit ridership through land use planning: increase residential density in the areas near transit corridors, concentrate mixed-use development within an eighth mile of the transit corridors, and channel a greater proportion of the retail development within a quarter mile of transit lines. In fact, this analysis suggests that transit planners would increase ridership to a greater degree through catalyzing retail, mixed-use and multifamily development than increasing transit service."

- Bus Transit and Land Use: Illuminating the Interaction

Improvement Considerations

Urban planners and transit planners should consider locating bus stops adjacent to land uses that generate the most activity or "eyes on the street" to enhance personal safety of transit users. Transit-stop-adjacent land uses can be compatible with high levels of pedestrian activity and provide services that may be useful to transit users, which also provide an economic development return on the transit investment.

Sidewalk-oriented Development | The design and orientation of buildings, particularly with regard to setback and height, can have a significant impact on the comfort of the pedestrian environment. Buildings with minimal or zero-setback lines create an ideal pedestrian environment and shorten the connecting distance for pedestrians from the street to the development. Many developments in the MAG region include a setback with surface parking between the building and the street; these developments can be improved by designing the site so that parking is provided on the side or rear of the building.

Where parking is located along the side or rear of a building, locate at least one building entrance at or near the street side of the building to allow for ease of pedestrian access.

Sidewalk-oriented development provides shade and direct access to building entrances.

Sidewalk/Pedestrian Paths | Should buildings have a setback, sidewalks or pedestrian paths can be installed which direct pedestrians to the easiest route to the building or development.

Street Walls | Street walls are a common urban design tool used to improve a development with a setback; however, these street walls can also disconnect street activity from the development. It is important that these street walls be designed with openings at key locations that provide easy access for pedestrians and bicyclists to access the development. Many subdivisions in the MAG region are walled, these walls can be designed with openings at strategic locations that provide easy access for pedestrians and bicyclists to both enter and exit the subdivision.

In Metro core locations, a minimal setback is encouraged, such as this example in Tempe.

The City of Tempe has several means by which to encourage pedestrian- and transit- friendly development. The *City of Tempe Transportation Master Plan* includes design criteria for new development (excerpt at right). Additionally, the City's Public Works Department enforces the City's *Engineering Design Criteria* which includes right-of-way dedication/improvement requirements (excerpt below).

Pedestrian-friendly Design Criteria for New Development

The City of Tempe Transportation Master Plan (pp. 2-2 & 2-3) includes design criteria for new development promoting pedestrian-friendly design:

- Encourage pedestrian and transit-user access to buildings by locating buildings at the minimum setback for arterial and arterial to collector intersections. The distance between bus stops and building entrances shall be minimized by using minimum setback requirements for locations of buildings on the site.
- Encourage pedestrian and bicycle access to the main building entrances from all sides of the site by providing more links to street frontages.
- Encourage buildings to locate closer to street intersections by minimizing the amount of parking allowed at street frontages, or by locating all parking behind or to the side of buildings.
- Encourage mixed-use development, allowing people to work where they live.
- New and existing cul-de-sacs and dead-end streets can be enhanced by providing connecting pedestrian and bicycle paths to the major streets.

Table 25: Cost of Wayfinding Signage & Potential Prototype Application

Right-Of-Way (ROW) Dedication/Improvement		Manufacturing/Industrial			Commercial/Retail			Residential		
		Large 70,000+ SF	Medium 18,000-70,000 SF	Small 0-18,000 SF	Large 45,000+ SF	Medium 8,000-45,000 SF	Small 0-8,000 SF	Large 75+ Units	Medium 25-75 Units	Small 0-25 Units
1. Public Health and Safety Requirements or Requests	1a. ROW/Install turning lane	R	R	R	R	R	N	R	R	N
	1b. Install looped water system where pressure/supply problems would otherwise exist.	R	R	R	R	R	R	R	R	R
2. Trip Generation Rate Requirements or Requests	2a. ROW for arterial street.	R	R	N	R	R	N	R	R	N
	2b. Full arterial half-street improvements (see 1b & 1e)	R	R	N	R	R	N	R	R	N
3. Individualized Determination or Requests	3a. Bus pad dedications for bench	R	R	N	R	R	N	R	R	N
	3b. Bus pad installation for bench	R	N	N	R	N	N	R	N	N
	3c. Bus shelter dedication	R	R	N	R	R	N	R	R	N
	3d. Bus shelter installation	R	N	N	R	N	N	R	N	N
	3e. Bus bay dedication (Arterial/Aterial, Arterial/Collector)	R	R	R	R	R	R	R	R	R
	3f. Bus bay installation (Arterial/Aterial, Arterial/Collector)	R	N	N	R	N	N	R	N	N
	3g. Multi-use path easement	R	N	N	R	N	N	R	N	N
	3h. Multi-use path construction (including lighting)	N	N	N	R	N	N	R	N	N
	3i. Construction of looped water main where existing pressure/supply is inadequate to service subject property.	N	N	N	N	N	N	N	N	N

Bicycle Access

Issue

Bicycle access is important in any city and within the MAG region. Access is an important extension of any transit system as it improves mobility, extends and enhances transit service quality, and reduces reliance on automobiles. Some of the common challenges to providing good bicycle access include street crossings, lack of bicycle lanes or paths, perceived dangerous roadways, constrained right-of-way, station characteristics, network connectivity, transit agency policies, and surrounding land uses.

Importance

During the field survey, transit riders were asked how they arrived to the bus stop; 22% of riders said they arrived by bicycle which is considerably higher than the national figure of less than 2%. When asked if certain improvements would increase their use of transit, 52% of riders indicated adding a bicycle lane would increase their use of the transit system.

Of the case study locations only the Urban Residential and Suburban Residential stops provided direct access for bicyclists to the bus stops via on-street bicycle lanes. The Suburban Retail stop had an off-street bicycle trail but no means of connecting from the trail to the bus stop. In addition to on-street and off-street facilities, bicyclists can often safely ride along local and collector streets that have lower traffic volumes and lower traffic speeds; however, none of the case study bus locations provided bicycle access from collector and local streets to the bus stop.

Improvement Considerations

Bicycle access improvements may include on-street or off-street bicycle facilities and can be focused on gaps or weak links in the bikeway network, particularly those situated between a transit stop and a major activity center. Existing or proposed bicycle paths can provide wayfinding signage to nearby transit stops and include marked and/or signalized crossings of major roadways to facilitate the use of bicycle paths to access transit.

Bicycle lanes on Southern Avenue in addition to vehicular travel lanes. Bicycle lanes can be installed by reducing the number of vehicular lanes from four to three or reducing vehicle travel lane widths.

Interim FHWA approved green paint denotes the "conflict zone" where buses and motorists will cross the bicycle lanes in order to pick up passengers or make right turns.

Buffered or protected bicycle lanes create greater separation between bicyclists and adjacent vehicular traffic and have been shown to attract new riders.

Bicycle Lanes | Bicycle lanes may be provided along major arterials and other roadways if there is sufficient roadway width. Because bicyclists in bicycle lanes often cross paths with buses and turning motorists near intersections, treatments such as interim FHWA approved green paint are being used increasingly at these locations to highlight the conflict zone. Designated bicycle routes or shared roadways may include a variety of treatments including signage, pavement markings, and traffic calming treatments.

Bike Lanes and On-Street Parking | A major component of bicycle access is on-street parking. On-street parking creates many hazards to cyclists when bike lanes are located behind parked cars. Where ROW permits, buffer space should be considered between parking and bike lanes.

Bicycle Paths | Bicycle paths are off-street routes that provide additional comfort and safety for the bicyclist. These facilities should be well lit with landscaping whenever possible.

Crossings | Street crossing locations are one of the major safety issues for bicyclists. Well lit and signalized bicycle crossings can improve safety. Crossings that occur at street intersections can be coordinated with pedestrian crossing signals. Local regulations determine allowable bicycle travel and crossing treatments, increased signage and standards can improve cyclist's awareness. Where bicycles cross at mid-block locations, HAWK signals, Rapid rectangular flashing beacons, and in-road flashing beacons can

Bicycle Parking

Issue

Bicycle access can also address the need for bicycle parking and on-board accommodations (exterior and interior. Allowing bicycles on buses and providing bicycle accommodations at bus stops can great expand the service area of a transit system. Currently, buses in the MAG region provide exterior bicycle racks on most of their bus fleet. However, additional consideration should be given to routes and stops with high bicycle activity and when the exterior bicycle racks are at capacity.

Importance

During the field survey, transit riders were asked how they arrived to the bus stop; 22% of riders said they arrived by bicycle which is considerably higher than the national figure of less than 2%. When asked if certain improvements would increase their use of transit, 51% of riders indicated that adding bicycle parking would increase their use of the transit system.

Of the case study locations, few bus stops provided bicycle racks or other bicycle parking facilities. Occasionally adjacent private developments would provide a bicycle rack. Exterior bicycle racks on buses were often at or near capacity and the transit agency does not accommodate interior bicycle storage. Additional bicycle racks may be needed, particularly at locations with low frequency transit service.

Improvement Considerations

Information signage can be implemented in several formats and with various combinations of information. It is highly encouraged that transit stops include a full bundle of information for transit riders including: a bus stop number, route(s) number and destinations, transit system schedule, transit system map, transit system provider's contact information, and if applicable, the park-and-ride location. Furthermore, bus stops and routes with high ridership volumes can consider adding real-time travel information. The types of information signage shown below are but a few examples of the possible design and format to provide the information. Overall, transit system information signage should be as consistent as possible throughout the entire transit system.

Bicycle Racks | Bicycle racks that fit universal bicycle design standards can be installed in the landscape or furniture zone of the sidewalk so that they do not obstruct the path of pedestrians.

Bicycle Corrals | Bicycle corrals are typically installed in an on-street parking space. This option is attractive to some business owners who see the conversion of a single car parking space into 8-12 bicycle parking spaces as an opportunity.

Bicycle Cellar/Transportation Station | Bicycle stations are major investments that are typically incorporated into larger transportation facilities. They can include a variety of bicycle parking options such as racks, lockers, and bike sharing facilities as well as personal lockers, showers, bicycle repair, rentals, and accessories, as well as other pedestrian amenities. The Bicycle Cellar at Tempe Transportation Station is an example of this type of facility.

Bicycle Lids and Lockers | A bicycle lid or locker is a secured box that stores a single bicycle which can be locked to prevent theft and vandalism and protect the bicycle from environmental conditions. This improvement is commonly considered one of the highest standards of bicycle safety and can be placed at locations where numerous cyclists are parking and storing their bicycles for extended periods of time.

Sidewalk bicycle racks.

Bicycle corrals.

Tempe Transportation Station

Pedestrian Crossing

Issue

Pedestrian and cyclists are most vulnerable at pedestrian crossings. Typical crossings include crossing at street intersections or at mid-block locations. Particular attention should be paid to locations with high vehicle-pedestrian conflicts and accidents.

Importance

During the field survey, transit riders were asked how they arrived to the bus stop; 61% of riders said they arrived by foot which is slightly higher than the national figure of less than 59%. When asked if curb extensions would increase their use of transit, 50% of riders indicated adding these improvements would increase their use of the transit system. And when asked if installation of medians would increase their use of transit, 43% of riders indicated adding these improvements would increase their use of the transit system.

None of the case study locations included curb extensions and just one location (the Suburban Retail case study) had pedestrian refuges although they were too narrow to accommodate a waiting pedestrian with stroller or a wheelchair. None of the case study locations included formal mid-block crossings; however, several locations experience a high amount of illegal mid-block crossings.

Improvement Considerations

When planning for access to transit stops, desired crossing locations can be identified and enhanced to support safe and comfortable crossing of roadways by transit users. Such improvements can include marked crosswalks, traffic signals, pedestrian refuges, and curb extensions. Pedestrian crossings should be as short as possible, reducing the time exposure of pedestrians to cross traffic.

Reduced Curb Radii | Shortened crossing distances through reduced curb radii or curb extensions are encouraged where such improvements would meet minimum design standards.

Curb Extensions | Curb extensions shorten crossing distances and can be installed on streets where on-street parking is allowed. Curb extensions also create additional space at street corners that can facilitate the installation of dual curb ramps. This provides the mobility impaired and pedestrians with strollers and other wheeled devices a shorter crossing distance. Neither curb extensions nor the adjacent gutter pan can extend into the bicycle lane at intersections. Drainage must be considered when designing curb extensions.

Curb extensions shorten crossing distances for pedestrians and can create additional space at street corners that can facilitate the installation of dual curb ramps.

Mid-block Crossings | Mid-block crossings are discouraged, but when necessary can be enhanced to improve pedestrian safety. Whenever possible, locate bus stops near intersections where crossings already exist and not at mid-block locations. When bus stops are located mid-block, a pedestrian crossing can be added to facilitate safe and legal crossings. Unsignalized mid-block crossings can use high visibility crosswalk markings and include median refuge islands wherever possible. The path through the median refuge should be angled to turn pedestrian to the right to face traffic before making the second stage of the crossing. The desired minimum width for a median refuge is six feet as that

This mid-block crossing includes a raised median refuge, high contrast crosswalk, and in-pavement flashers.
Source: pedbikeimages.org

Raised crosswalks may be appropriate at some locations where reducing traffic speed is desirable. The impact on drainage must be considered.
Source: pedbikeimages.org

Sidewalk

Issue

Sidewalks are the means by which pedestrians access transit stops. Creating a comfortable pedestrian environment is important to a transit system's success. Unsafe and unfriendly pedestrian environments such as narrow or damaged sidewalks, poor landscaping, and poor lighting deter walking activity.

Design sidewalk ramps to continue in a straight or direct line across intersections. Currently, many sidewalks force pedestrians (and bicyclists) to walk out of their way to cross the street. This reduces visibility of the pedestrian for drivers and makes the pedestrian circulation less efficient by putting more distance between destinations.

Importance

During the field survey, transit riders were asked how they arrived to the bus stop; 61% of riders said they arrived by foot which is slightly higher than the national figure of less than 59%. When asked if there were good or bad sidewalks and walkways; just 38% of riders classified the sidewalks and walkways as good.

All of the case study locations included 4-to-5-foot wide sidewalks along arterial roads which provide a network for pedestrian connectivity. The Urban Retail case study location included enhanced sidewalks along several segments of roadway including near the arterial street intersection and adjacent to bus stops. These enhanced sidewalks were 10 feet wide and detached from the street curb providing a landscape strip for shade trees.

Improvement Considerations

Widening and detaching the sidewalk accommodates a heavier flow of traffic and provides a buffer which improves real and perceived pedestrian safety. Additionally, wide sidewalks with "buffer zones" make additional pedestrian improvements possible. The buffer zone may take very different forms in urban and suburban contexts.

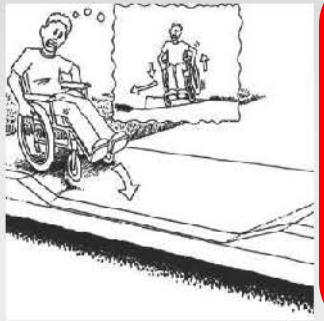
Urban Sidewalk | In urban areas, sidewalk buffer zones are used for the placement of trees, bicycle parking, street furniture, signage, lighting and other elements while maintaining a clear path for pedestrians. Trees planted in tree wells with grates provide shade while increasing surface area for pedestrians, wheelchairs, and strollers. On-street parking increases pedestrian comfort by creating an additional buffer between pedestrians and traffic. The clear zone for pedestrians can be a minimum of ten feet in urban areas.

Suburban Sidewalk | In suburban areas the buffer zone typically takes the form of a landscape strip between the street and sidewalk, providing space for trees and other landscaping, fire hydrants, mailboxes, and utility poles. The clear zone for pedestrians can be a minimum of five feet in suburban areas.

Driveway Ramps | Driveway ramps on narrow attached sidewalks are of particular concern because the resulting cross slope can be steep and turns wheelchair users toward the roadway and moving traffic. The issue of cross slope can **be addressed in all new developments either through the installation of detached sidewalks with buffer zone or by designing a route around the driveway ramp providing wheelchair users with a flat surface when crossing driveways.**

Urban area with sidewalk buffer zone.

Suburban area with landscape strip buffer zone.

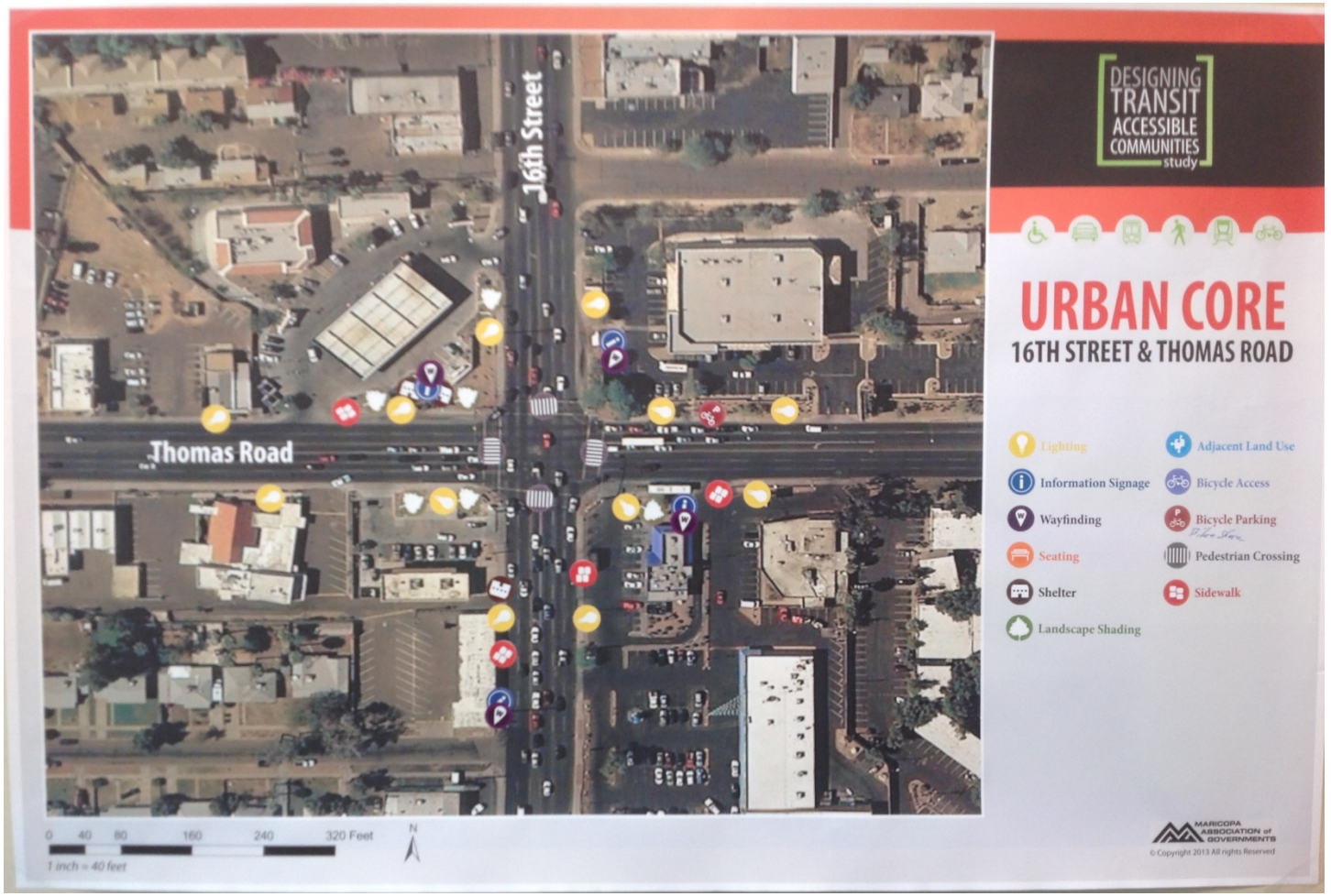


When cross-slopes change rapidly over a short distance, wheelchair use becomes extremely unstable.

Workshop #2

MARICOPA ASSOCIATION of GOVERNMENTS

DESIGNING TRANSIT ACCESSIBLE COMMUNITIES study


16th Street
Thomas Road
DESIGNING TRANSIT ACCESSIBLE COMMUNITIES study
URBAN CORE
16TH STREET & THOMAS ROAD
Lighting
Adjacent Land Use
Information Signage
Bicycle Access
Wayfinding
Bicycle Parking
Seating
Pedestrian Crossing
Shelter
Sidewalk
Landscape Shading
0 40 80 160 240 320 Feet
1 inch = 40 feet
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19th Avenue
Southern Avenue
0 40 80 160 240 320 Feet
1 inch = 40 feet
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DESIGNING TRANSIT ACCESSIBLE COMMUNITIES study
URBAN RESIDENTIAL
19TH AVENUE & SOUTHERN AVENUE
Lighting
Information Signage
Wayfinding
Seating
Shelter
Landscape Shading
Adjacent Land Use
Bicycle Access
Bicycle Parking
Pedestrian Crossing
Sidewalk
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DESIGNING TRANSIT ACCESSIBLE COMMUNITIES study
SUBURBAN RESIDENTIAL
ELLIOT ROAD & LAKEVIEW DRIVE
Elliot Road
Lakeview Drive
Lighting
Information Signage
Wayfinding
Seating
Shelter
Landscape Shading
Adjacent Land Use
Bicycle Access
Bicycle Parking
Pedestrian Crossing
Sidewalk
0 40 80 160 240 320 Feet
1 inch = 40 feet
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75th Avenue
Bell Road
DESIGNING TRANSIT ACCESSIBLE COMMUNITIES study
SUBURBAN RETAIL
75TH AVENUE & BELL ROAD
Lighting
Information Signage
Wayfinding
Seating
Shelter
Landscape Shading
Adjacent Land Use
Bicycle Access
Bicycle Parking
Pedestrian Crossing
Sidewalk
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1 inch = 40 feet
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Shea Blvd
90th Street
DESIGNING TRANSIT ACCESSIBLE COMMUNITIES study
URBAN RETAIL
90TH STREET & SHEA BOULEVARD
Lighting
Adjacent Land Use
Information Signage
Bicycle Access
Wayfinding
Bicycle Parking
Seating
Pedestrian Crossing
Shelter
Sidewalk
Landscape Shading
0 100 200 400 600 800 Feet
1 inch = 100 feet
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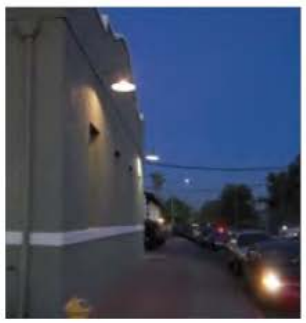
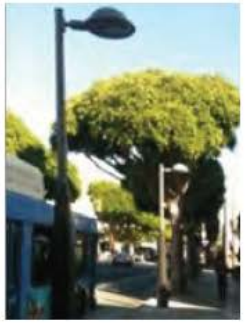
6.1 Implementation Checklist

Included in the following pages is a checklist of topics that have been recommended when considering the placement, replacement or upgrade of bus transit stops. The checklist is for all stakeholders in the design, development, installation, and maintenance of bus transit stops, including: planners, transit providers, city design review staff, and private developers. Below is a checklist illustrating all topics to be taken into consideration when planning for, locating, and building a bus transit stop. The checklist includes core elements identified in the DTAC study that make an effective transit stop.

Topics for Consideration	Check All That Apply
Have you **coordinated** with member agency staff?	☐ Transit operations staff ☐ Facilities staff ☐ Street planner/engineer ☐ Development review/services ☐ Safety/Safe Routes to School ☐ Bicycle/Pedestrian ☐ Other/parks and recreation/maintenance, etc
Did you consider **location**?	☐ At intersection (bus bay/acceleration lane). ☐ Mid-block (with pedestrian crossing). ☐ Close to targeted development. ☐ Ease of transit transfer. ☐ Potential conflict with pedestrian/bicyclists/auto users
Did you consider **lighting**?	☐ Reviewed applicable lighting standards. ☐ Freestanding street light located near bus stop. ☐ Freestanding pedestrian light. ☐ Pedestrian light attached to street light pole. ☐ Pedestrian light attached to building.

Lighting Examples



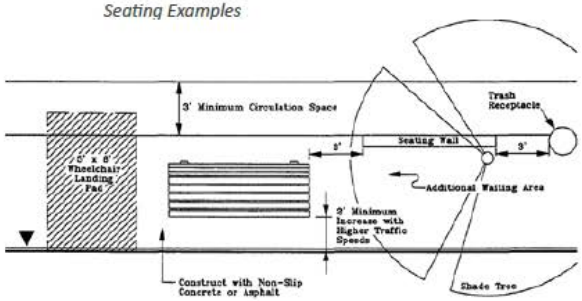


Did you consider **information signage**?	☐ Freestanding information kiosk with detailed route and schedule information. ☐ Pole-mounted bus stop sign with associated bus route number(s)/ destinations and NextRide information. ☐ Pole-mounted information box with route map. ☐ Wayfinding signage to local attractions, libraries, schools, public spaces, transit centers, light rail. ☐ Bicycle wayfinding signage to iconic routes (major crossings, off street paths, canals, etc).

Information Signage Examples

Did you consider **seating**?	☐ Bench under tree. ☐ Bench in shelter. ☐ Seating wall.

Seating Examples



Did you consider **shelter**?	☐ Shelter designed for southern climates. ☐ Enhanced paving/surface coating.

Shelter Examples

Did you consider **shade**?	☐ Street trees that also create a buffer. ☐ Adjacent building structure. ☐ Other shade structure. ☐ Transit shelter that is appropriately oriented for southern climates. ☐ Shade/landscaping that minimizes interference to pedestrian and bike access. ☐ Interference to built/natural environment.

Shade Examples

Did you consider **adjacent development (retail/ commercial)**?	☐ Sidewalk-oriented development. ☐ Pedestrian-oriented building entrance. ☐ Minimal setback with direct path. ☐ Path to building entrance. ☐ Shade at building entrance. ☐ Safe and shaded pedestrian pathway through parking lot. ☐ Awning or shade structure that shades the public ROW (TOD structures). ☐ Pedestrian and bicycle circulation between parcels. ☐ Multi use path or sidewalk easement (8-10' preferred). ☐ Safe pedestrian path from transit stop location to building access points.

Adjacent Development (Retail/Commercial) Examples

Did you consider **adjacent development (residential)**?	☐ Pedestrian and bicycle access from walled residential communities to the transit system. ☐ Pedestrian and bicycle infrastructure within the community and to transit access point.

Adjacent Development (Residential) Examples

Did you consider **bicycle access routes and multi-use paths**?	☐ On-street bicycle lane. ☐ Off-street bicycle path connected by wayfinding in catchment area. ☐ Local or collector road connected by wayfinding in catchment area. ☐ Bicycle crossings. ☐ Bicycle/pedestrian lighting. ☐ "Conflict zone" lane painting. ☐ Bicycle lane buffer. ☐ Pavement markings. ☐ Traffic calming and diversion.

Bicycle Access Examples

Did you consider **bicycle parking**?	□ Sidewalk bicycle rack. □ Bicycle corral. □ Bicycle rack at development entrance. □ Other bicycle parking (e.g. lockers). □ Transit frequency and use. □ Bike visibility and site location access. □ Shade for bicycles.

Bicycle Parking Examples

Did you consider **enhanced sidewalk**?	□ Urban buffer zone with tree wells. □ Suburban buffer zone with landscape strip (Only in suburban/ collector streets. Not preferred in locations limited R.O.W.) □ ADA accessibility. □ Maximize sidewalk width (8-10").

Enhanced Sidewalk Examples

Did you consider **pedestrian crossings**?	□ Provide safe connects between pedestrian desire lines. □ Curb extensions. □ Median refuge. □ Raised crosswalk. □ Rapid rectangular flashing beacons. □ HAWK signal at mid-block crossing. □ In-road flashing beacons. □ Transit stop placement proximity to safe street crossing. □ Diagonal/direct pedestrian crossing.

Pedestrian Crossing Examples

Draft Final Report

http://www.azmag.gov/Documents/DTAC_2013-07-08_Designing-Transit-Accessible-Communities-Study-Final-Report.pdf

Project Contact

For information, discussion and possible action for acceptance of the Designing Transit Accessible Communities Study.

Alice Chen
achen@azmag.gov