

Pedestrian Mobility and Safety Audit **Tucson, AZ, USA**

Executive Summary

AARP and the Institute of Transportation Engineers (ITE) joined together in a pilot project to evaluate the accessibility and safety of five intersections in Tucson, AZ, USA. The audit, which took place on May 14, 2008, brought together traffic engineers, AARP staff and four AARP members, who live in Tucson and routinely use the city's streets to get to where they need to go.

The primary goal of the AARP/ITE pedestrian mobility and safety audit focuses on elevating the importance of incorporating older driver and pedestrian safety needs into traffic operations and transportation planning work. It also stresses the mobility and safety needs of seniors in their communities. The joint relationship hopes to synergize and elevate specific goals within the respective organizations by:

1. Increasing the level of awareness for transportation planning/engineering professionals in addressing older persons' mobility issues and challenges.
2. Assisting AARP members in making their case to local transportation professionals and policy-makers when identifying their transportation needs through involvement and advocacy.
3. Establishing relationships between AARP volunteers and ITE professionals who can provide technical information needed to make community pedestrian and transportation improvements.

DEMOGRAPHY OF THE UNITED STATES SENIOR POPULATION

In 2005, 12 percent of the U.S. population was 65 or older. The U.S. Census estimates that by 2025 the number of seniors will increase by 79 percent and an estimated 18 percent of the population (62 million people) will be 65 or older. Many of those over age 65 will be very advanced in age—over age 80–85. In 26 states, more than 20 percent—one in five residents—will be over the age of 65. By 2030, one in eight of those over 65 will also be over 85 (NHSTA 2005). The population 65 and over will increase from 35 million in 2000 to 71.5 million in 2030 (an increase to approximately 20 percent of the population) (Administration on Aging 2005).

In total, people aged 65 and older will account for 25 percent of U.S. drivers (AAA Foundation for Traffic Safety, 2008). Older pedestrians also face high risks when navigating streets primarily designed for cars. In 2005, older adults accounted for 15 percent of all traffic fatalities, 14 percent of all vehicle occupant fatalities and 20 percent of all pedestrian fatalities (Traffic Safety Facts 2003, 2004). Because older persons consist of approximately 12 percent of the U.S. population, there is a proportional overrepresentation of older adult traffic, vehicle occupant and pedestrian fatalities.

Having few opportunities to walk on a daily basis can make it more difficult for older adults to remain active, and having to give up driving puts a great strain on their ability to live independently. Consequently, walking safely in a neighborhood and on a local street network is critical to maintaining mobility, livability and independent living.

The goal of this audit was to test a number of factors including pedestrian and vehicle traffic, crosswalk signage and the overall condition of sidewalks and streets, and to identify positive aspects and recommend improvements at each sample intersection. The transportation audit was initially conceived for older adults; however, the results demonstrate that safe sidewalks and intersections are critical for all community residents.

The city of Tucson is nationally recognized as a leader in innovative pedestrian treatments. Several of the intersections that were examined by the review team were chosen specifically to highlight these innovations. Members of the review team generally agreed that pedestrian safety and mobility were being addressed at the various intersections. In fact, few deficiencies were noted at the study locations. Therefore, this report will focus on highlighting these innovative pedestrian treatments.

PIMA COUNTY POPULATION AND AGE DEMOGRAPHICS

The following table illustrates the difference between Pima County and U.S. percentages of older populations for 2006/2007. As shown, in terms of the population base over 65 years of age, Pima County and the United States have 14.9 percent and 12.4 percent, respectively.

	Pima County, AZ 2007 (percentage)	United States 2006 (percentage)
Total Population	1,003,918 (100)	299,498,385 (100)
AGE 65+	149,583 (14.9)	37,137,799 (12.4)
AGE 75+	76,297 (7.6)	18,269,401 (6.1)

The Pima Association of Governments, in the development of the Regional 2030 Transportation Plan, has developed a number of statistics regarding older persons as shown below:

- Long term residents are aging-in-place, often within the Tucson city limits.
- Retirees from other areas who move to Tucson often live in the suburbs.
- Unlike many other U.S. metropolitan areas, the region has substantial in-migration of retirees and those nearing retirement age. Elderly persons who move to Tucson and other sunbelt communities are more likely to move to the suburbs than younger in-migrants.
- Compared to other metropolitan areas, the Tucson metropolitan area (the 57th largest in the United States) has:
 - The **2nd largest percentage** of suburban residents 55–64 years of age.
 - The **2nd largest percentage** of seniors over 75 years of age.
 - The **5th fastest growth** (between 1990 and 2000) of those over 65 in the suburbs.
 - The **7th largest percentage** of seniors living alone.
 - The **12th fastest suburban growth** of people 55–64 years of age and the **19th largest growth** of people 35–54 years of age, setting the stage for future aging-in-place.
 - Between 1990 and 2000, the number of older people declined in the city of Tucson, but significantly increased outside the city limits. For example, the number of people over age 75 outside the city of Tucson limits nearly tripled.¹

1. *2030 Transportation Plan*. Pima Association of Governments, August 2004.

INTERSECTION SELECTION

Edward Stollof, ITE safety program senior director and Richard Nassi, city traffic engineer, city of Tucson, met for a pre-audit meeting on March 10, 2008, in order to select the intersections and locations for the AARP/ITE Pedestrian Mobility and Safety Audit.

The criteria that were used to select the audit locations included the following:

- Evidence of pedestrians aged 50 and older in the area (where there may be adult/retirement housing);
- Walkability areas perhaps between governmental complexes and parking lots/structures, restaurants, grocery stores and entertainment venues;
- Multimodal transportation (e.g. transit stops and buses, bicycles, pedestrians of all ages);
- Traffic signals, sidewalks, or other aspects of the intersection that might be in need of repair or improvement;
- Diversity of land uses in the area surrounding the intersection (e.g. residential, commercial/industrial, institutional); and
- Accessibility and connectivity to pharmacies and grocery stores, doctor offices and hospitals and other medical facilities, banks and other destinations that an older adult might walk to from their home.

The following four intersections were selected for the audit:

- South 9th Avenue and West Irvington Road Pedestrian Crossing
- 8200 East Broadway Boulevard Pedestrian Crossing
- North Alvernon Way and East Speedway Boulevard
- University Boulevard and North Stone Avenue

During the pre-audit meeting field reconnaissance was conducted at the above intersection locations. Mr. Nassi arranged the following individuals to assist Mr. Stollof in the field:

- Robert Hunt, signal engineer, City of Tucson;
- Bookey Brymer, executive director, Interim Fellowship Square;
- Carol West, prior council member, Fellowship Square District; and
- Lorraine Hernandez, prior assistant to council member Carol West, Fellowship Square District.



Richard Nassi shows the inside of the traffic signal controller at the Fellowship Square/ 8200 East Broadway Boulevard signalized HAWK pedestrian crossing to the audit participants.



Initial field reconnaissance and pre-audit meeting of March 10, 2008.

The pre-audit reconnaissance is a critical and necessary step in gaining valuable information to provide to the audit participants. Digital photographs of the intersection locations were taken. In addition, the time it takes to travel from one location to another is estimated, along with other logistical requirements for the audit day. Special situations were noted for discussions that would take place in briefings on the day of the audit.

INTERSECTION ASSESSMENTS

South 9th Avenue and West Irvington Road Pedestrian Crossing

The total intersection volume is approximately 56,000 vehicles per day (vpd). The area as shown in the photo is low density suburban, and contains the adjacent Laos transit center. Irvington Road is a five-lane roadway (with a center left-turn lane). The pedestrian auditors believed that the traffic on Irvington was “civilized.”

As shown in the photo, this style of pedestrian crossing signal is termed a high intensity pedestrian activated crosswalk (HAWK). The HAWK device is a specialized treatment for pedestrian crossings that is currently being considered for inclusion in the Manual on Uniform Traffic Control Devices. When not activated, the signal is “dark.” When a pedestrian pushes the button to cross, the following sequence begins:

1. The yellow light on the bottom of the signal head begins to flash for a short period while the DON'T WALK is displayed to pedestrians;
2. The yellow light is displayed steady (not flashing) for a short period while the pedestrians still have a DON'T WALK indication;
3. The red indications come on simultaneously and the WALK symbol is displayed to indicate to the pedestrian they may begin their crossing;
4. The red lights flash back and forth (similar to a railroad signal) and the FLASHING DON'T WALK with countdown timer is displayed to the pedestrian; and
5. The signal goes dark again and DON'T WALK is displayed.



Aerial photo of South 9th Avenue and West Irvington Road.

In general, the review team felt very safe crossing at this location. Adequate time is given for pedestrians to cross and the countdown signals were very helpful. There was some concern about the potential for people using walkers, canes, or wheelchairs negotiating the crosswalk due to uneven and rutted pavement. In the short-term, the following recommendations should be considered to improve the safety of the intersection:

- **Improve** pedestrian accommodations by repairing cracked sidewalks, addressing ruts and other pavement issues.



A HAWK pedestrian signal.

- **Completing sidewalks** on the north side of 9th Street.
- **Trim** trees that block signage and the signal at the intersection.
- **Intersection pavement markings have faded.** The lines in the street need painting, especially for older eyes to see. The city paints the lines on the road every six months; however the sun is a factor that causes the lines to fade very quickly (sometimes in a matter of weeks).
- **Install** detectable warning surfaces to enhance the safety for visually-impaired pedestrians.

8200 East Broadway Boulevard Pedestrian Crossing

As shown in the first photo below, this style of pedestrian crossing signal is termed pedestrian user friendly intelligent crosswalk (PUFFIN). The PUFFIN signal is nearly identical to the HAWK signal in that the sequencing of the signal operation is the same. The primary difference is that the PUFFIN signal has a device that is able to detect the speed at which pedestrians are walking in the crosswalk. This device—a microwave detector—



A microwave detector mounted on a pedestrian indication at a Puffin Signal.



The pedestrian auditors walking within a crosswalk that has a HAWK signal at 8200 East Broadway Boulevard.



A marked BUS and BICYCLE ONLY lane in the right-curb lane approaching the mid-block HAWK signal.



A zebra or ladder crosswalk at the HAWK signal.



BE PREPARED TO STOP pedestrian sign prior to the HAWK installation.

determines if the pedestrian will not complete the crossing in the allotted time. If it determines that more time is needed to complete the crossing, it will give additional time before the signal goes dark for vehicular traffic.

This type of treatment works well in locations that have a higher degree of older pedestrians using the crossing. This particular location was near a retirement community.

The review team felt reasonably safe with the signalized crossing at this location. No serious deficiencies were noted in the short-term.

Other innovations or significant pedestrian or multimodal activities within the intersection environment are shown in the photographs on the preceding page.

North Alvernon Way and East Speedway Boulevard

This intersection is a typical four-leg signalized intersection. The total intersection volume is approximately 83,400 vehicles per day. Speedway Boulevard is a major east-west cross street in the city of Tucson.

The combination of a short-cycle length and very wide streets made traversing the entire crosswalk in one stage very difficult, especially for older pedestrians. To counteract this, the crosswalks were cut through medians with a separate pedestrian push button located on a pole in the median. However, several on the review team felt extremely uncomfortable being “stranded” in the median while waiting for the WALK indication to come again so they could complete their crossing.

In the short-term, the following recommendations should be considered to improve the safety of the intersection:

- **Repaint** crosswalks that have fading paint.
- The team believed that not much could be done to the intersection operations because of the way the intersection is designed. The pedestrian auditors acknowledged that the intersection operates quite well considering that it needs to serve multiple users in addition to large traffic volumes as shown in the photographs on the next page.



North Alvernon Way and East Speedway Boulevard is a high-volume intersection that serves many vehicles. Look how much pavement there is. “Puppy tracks” direct turning vehicles. The pedestrian auditors believed that the vehicles at this intersection behaved in a “civilized manner.”



A cut-through median at the intersection.



The intersection accommodates all users including younger/ utilitarian bicyclists.



Bicyclist-baby carriage combinations are served well at the intersection.



Pedestrians are assisted with crossing the intersection through the use of pedestrian countdown signals.



Pedestrians with disabilities are accommodated.

University Boulevard and North Stone Avenue

In keeping with the theme of naming treatments for birds, this style of traffic signal is termed a TOCAN, an abbreviation for the phrase “two can cross.” The “two” refers to the pedestrian and bicyclist groups, each of whom has their own signal indication for crossing the street.

The total intersection volume is approximately 25,300 vehicles per day (VPD). Of this number, approximately 23,800 VPD are on University Boulevard. Approximately 1,100 VPD are on the westbound and 400 VPD are on the eastbound sides of Stone Avenue.

Vehicles approaching on the side street are controlled by a STOP SIGN and can only turn right after coming to a stop. Traffic on the main street may turn left or right onto the side street.

Again, the review team generally felt safe at this particular crossing and did not identify any needed



A bicyclist crossing at a TOCAN signal.

safety improvements. It was noted that a few drivers approaching on the side street violated the right-turn only and instead went through the intersection.

Other innovations or significant pedestrian or multimodal improvements within the intersection environment include:

- Notice the bicycle icon on the traffic signal in photo A below.
- Environmental comfort: transit stops and benches are located within the intersection environment, as seen in photos B and C. As a positive, benches that are there are being used as shown. As a negative, notice how close the benches are to the roadway.
- Notice that the bicycle is being lifted and placed on the bus in photo D. This is an example of multi-modalism.
- Notice the distance between the roadway and the sidewalk in photo E. This makes for a comfortable walking environment for all users.
- Notice the “bus pull out” along University Boulevard in photo F.



A



B



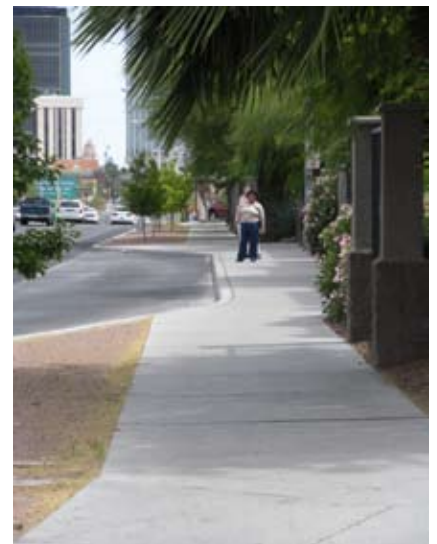
C



D



E



F

OTHER INNOVATIONS OR SIGNIFICANT ACTIVITIES

Regional Transportation Authority

Pima Association of Government manages the Regional Transportation Authority and its 20-year regional transportation plan. The \$2.1 billion plan was approved by Pima County voters on May 16, 2006, and projects scheduled to be completed within the first year of the plan have been implemented. The plan is funded by a half-cent excise tax, along with other regional and local dollars, such as developer impact fees. The multimodal plan includes roadway, transit, safety and environmental and economic vitality improvements in addition to improvements for pedestrian safety, elderly mobility and safe routes to school.² Specifics include:

- 35 major road improvement projects
- \$534 million in transit improvements
- More than 200 intersection safety improvements
- More than 200 new bus pullouts
- 550 miles of bike lanes and paths
- 250 miles of new sidewalks
- Modern street car system

Enforcement of Red-Light Running

The safety audit team was able to witness the City of Tucson Police Department Motor Cycle Unit ticket a number of red light running violators. Red light runners kill approximately 800 people each year in the United States.



City of Tucson Police Department, Traffic Enforcement.

Illumination

Illuminated signing at night is particularly helpful for older persons. The signs below are illuminated at pedestrian crossings.



Nighttime illumination sign at a HAWK signal.



Nighttime illumination PEDESTRIAN CROSSING sign.

2. The Pima Association of Governments Web site.
<http://www.pagnet.org/Programs/TransportationPlanning/RTA/tabid/484/Default.aspx>

Explanation of Pedestrian Push Button Signs

The city of Tucson uses yellow, black and white instead of the standard black and white signs for the explanation of pedestrian push button plaques to assist people to cross the street at signalized intersections (see the photo on the left). The photograph below on the right is a traditional pedestrian push button plaque.



Easier to read pedestrian crossing signs used by City of Tucson.



Traditional pedestrian crossing sign used in many U.S. cities.

CONCLUSIONS

As shown above, the city of Tucson uses both traditional and innovative pedestrian safety and mobility improvements throughout its geographic area that can be adapted to any area within the United States.

The audit involved the following steps:

- Pre-audit reconnaissance and intersection study;
- Identification of audit participants;
- Pre-audit logistics;
- Development of briefing books and briefing materials for audit participants;
- Development of a PowerPoint presentation for a briefing on the day of the audit;
- Conduct of the audit; and
- Audit debriefing.

One of the conclusions of the Tucson audit is that the AARP/ITE team should identify, to the extent feasible, where this Pedestrian Mobility and Safety Audit process might be able to be integrated into the state of Arizona's road safety audit process. Another significant conclusion of the Tucson audit is that there was significant participation from the city's Department of Transportation. We wish to thank Richard Nassi, retired city traffic engineer; Jim Glock, director, Tucson, Department of Transportation; Diane Swartz, engineering project manager; and Bob Hunt, traffic engineering manager, for their tremendous support. Another lesson learned is that the pedestrian safety and mobility audit team should have an enforcement representative. We wish to thank Lt. Michael Pryor, traffic engineering commander, Tucson Police Department, for his attendance and support of our effort.

The ITE professionals and AARP volunteers were able to forge relationships that did not previously exist. The ITE transportation professionals learned that many older volunteers were highly educated retirees who lived in their respective communities for many years. Each individual participated in the pedestrian audits as a way to have a greater voice in making their community, neighborhood and local streets more livable and safe for all users of the roadway.

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