



American Public Transportation Association

Streetcar Subcommittee

2019 Mid-Year Meeting

City of Tucson
Public Works Building
201 N. Stone Ave
Tucson, AZ 85701

Wednesday February 27, 2019
8:00 am – 4:00 pm
4th Floor Large Conference Room

Timothy R. Borchers	Chair (Not Attending)
Eric Sitiko	Vice Chair (Presiding)
James D. Schantz	Secretary

Summary Notes (formerly known as “Minutes”)

Pre-Meeting Events:

February 23rd- El Paso Streetcar Technical Tour 2-6pm – A group of about a dozen Subcommittee members were hosted by Assistant Director of Streetcar Operations, Carl Jackson and toured the line, maintenance facility, and administrative offices.

February 26th- Tucson Sun Link Streetcar Technical Tour 2-4 pm – Together with attendees of the Annual Streetcar Summit of the Community Streetcar Coalition- Subcommittee members toured the Tucson Sun Link streetcar line, maintenance facility, and administrative offices.

Meeting – February 27

- **Welcome & Introductions**

Eric Sitiko

Committee Vice Chair Eric Sitiko called the meeting to order at 8:45 am, and relayed regrets from Chair Tim Borchers, who was unable to attend as he recovers from an accident.

Welcome from City of Tucson

Ms. Shellie Ginn
Deputy Director, Tucson Dept. of Transportation

Thanks to breakfast and lunch sponsors

Tucson, HDR and Herzog

- **Meeting minutes from Nashville, TN**

Jim Schantz

Subcommittee Secretary Jim Schantz reviewed the main points covered in the minutes of the September 23, 2018 Nashville meeting (circulated by email in advance of the meeting). Hearing no comments or corrections, the minutes were deemed to be accepted.

- **Presentations**

- **Tempe Progress and Updates**

Dan Cleavenger,
Deputy Director, Corridor Development, Valley Metro

The Tempe streetcar, currently under construction, is a \$200 million project, being managed on a Construction Manager at Risk format to develop a 3-mile line connecting with the Phoenix Valley Metro light rail. The project has \$95 million of funding from a local transportation tax, \$75 million from Small Starts, \$95 million from Federal CMAQ, and \$13 million from local sources. Tempe is south and east of Phoenix and hosts Arizona State University and its 60,000 students. Many events are held throughout the year, including two major league baseball spring training locations, and the streetcar will help support them. The route surrounds the University and the downtown and business districts. A number of major

firms have offices in the business area. The southern terminus of the line ties into the LRT track so streetcars can be run to the light rail maintenance facility. The streetcar will have three traction power sub stations and will feature several single-track sections. Off wire segments will make up 25-30% of the line. The six cars will be hybrid (battery/overhead) from Brookville, with additional structural steel to raise crashworthiness when operating on the Light Rail line. Up to 1% of the project budget is to be spent on art. There was inadequate space downtown to provide a dedicated lane for streetcars so there will be a parking lane, a bicycle path, then a shared lane for autos and streetcars. As costs rose in the project, cuts were made to the TPSS, stops, and landscaping. A unique feature will be a roundabout with the streetcar turning through the middle of it. The Rio Salado business corridor carries heavy traffic and has significant underground utilities, so there is only space for a single track for much of that area. Construction is expected to continue to mid-2021 when vehicle testing can start, then opening should take place in 2021 after 14 years of preparation. Building light rail crossings at two locations will require a 16-day single tracking of light rail service. FTA letters of no prejudice have allowed long lead-time items to be procured while planning continues. Outreach to area businesses and residents. Outreach efforts are extensive to avoid conflicts and disruption. Planning is underway for future extensions on both ends of the line.

- **El Paso Streetcar Updates**

Carl Jackson,
Asst. Director of Streetcar Operations, SUN METRO

The El Paso streetcar project was funded with \$97 million from the State of Texas, which came with the understanding that there would be no increases, so any cost escalation would have to be covered locally. This put pressure on the project team to deliver within that amount, and they succeeded. The project rescued six PCC cars that ran in El Paso from 1950 until 1974, and which had been stored outside for most of the intervening years, in hopes that one day they could be resurrected. Brookville thoroughly rebuilt these cars, adding handicap lifts and air conditioning, and on board WIFI among other modern features. Funding from the State was routed through a regional mobility authority rather than the city, to avoid the temptation of city officials diverting any of the funds. The line consists of two loops capable of being operated in a figure-8 form. The University of Texas El Paso campus is at the northern end and downtown is at the southern end. The maintenance facility is located at the main bus transfer station. The line features a 10% grade on one stretch and the sharpest curve radius is 22 meters. Normal operations require four of the six cars to operate at peak. TPSS capacity is sufficient to operate all six at once. Headway management rather than a fixed schedule is used to guide car scheduling. The first car arrived in March 2018 and service was launched the following November. Operations staff are drawn from experienced Sun Metro bus drivers, to reduce the amount of time needed for recruiting and training. The maintenance facility is equipped with both a pair of pits (one narrow, one wide) plus roof access from the mezzanine. Air conditioners and brake resistors are on the roof of the cars.

- **Tucson Sun Link- 5 years of Streetcar Economic Development**

Ms. Shellie Ginn
Deputy Director, Tucson Dept. of Transportation

Streetcars returned to Tucson some years ago through the efforts of the volunteer Old Pueblo trolley line which its founders had hoped would inspire a larger system. That happened, and Tucson's modern streetcar system opened in July 2014, and is four miles long with 23 stops. The system has eight United Streetcar articulated cars and normally operates six cars with two as spares. Headways are 10 minutes during the day dropping to 15 minutes in the evening. The system cost \$197 million. It serves five neighborhoods including the University of Arizona, which specified that only a streetcar (not buses) would be allowed through the campus. The project worked closely with university researchers to limit EMI and vibration that could disrupt lab work. Economic development was encouraged in all neighborhoods except the historic residential University Boulevard and the 4th Avenue funky entertainment stretch. Businesses along 4th were skeptical of streetcar benefits so planners brought business leaders from Portland to allay their fears. The line runs in a one-way couplet through downtown. A developer working in the undeveloped parcels known as the Mercado paid \$3.2 million to extend the streetcar in a large loop through the parcel which is now seeing significant development. Key infrastructure additions included in the project were an underpass below busy railroad tracks and a new bridge over the Santa Cruz River connecting downtown to the Mercado. The key turning point for the streetcar system occurred in 2010 when the project was awarded \$63 million from the first TIGER program. An important step to inspire economic development is to make public sector investments first

(bridges, garages, etc.) and then to coordinate development incentives. Private investment went into high gear once federal money was allocated to the streetcar. The city is approaching \$2.7 billion in economic development, now growing at a rate of \$500 million per year. There is a large bio-med development on the eastern end of line near U of A. A huge amount of student housing is near the University Gate stop. In downtown there is more student housing, parking, the first hotel in 60 years, and a large number of mixed-use towers and some dedicated housing, hotel, and office developments. In the Mercado area a big win is a major Caterpillar facility now being finished. Extensions of the streetcar in several directions are being studied. Ridership is averaging 3600 per day.

- **Connected Vehicle - University of Arizona research**

Dr. Larry Head
Director, Arizona Transportation Research Institute

This session covered the University's Multimodal Intelligent Traffic Signal systems. The concept of connected vehicles dates to 1999 when 75 megahertz of spectrum was allocated by the FCC to intelligent transportation, so technology could be used to save lives. This spectrum would be extremely valuable for mobile phone and related uses, but its use for traffic related functions could allow vehicles to communicate with each other or with control equipment and therefore prevent accidents. Vehicles would be equipped with on board units that use DSRC (Dedicated Short-Range Communication) for these connections which can occur very quickly, as opposed to Wi-Fi which could not relay messages fast enough to avoid accidents. Car manufacturers are cooperating in development of this technology and will start delivering it on new cars in the next few years. Using this technology traffic signals can communicate with cars telling them how much longer a green cycle will last or telling cars to stop if an emergency vehicle is approaching. Standards have been set for roadside and vehicle mounted units and their communications. Prototype projects have been run in Phoenix since 2011 to demonstrate and test this technology with university researchers and a number of state DOT's participating. Demonstrations are given regularly to illustrate how this technology can help speed traffic. Different types of neighborhood (commercial vs. residential, etc.) give priorities to different types of road user at different times. Bicycles and pedestrians can be equipped with units that communicate with signals as well. Dr. Head is currently working with Arizona DOT to expand the area equipped with the technology. A further trial is being planned in Portland involving the streetcar system to gain real-world experience that can be used in future implementations. Various industries are challenging the allocation of spectrum to traffic use so introduce a level of risk to the future of this technology.

- **Work Program Update**

John Smatlak

The subcommittee's work program continues to feature discussion of the state of the art in tramway safety technologies. Streetcars are at other end of the safety spectrum from automated metros, given that streetcars must interact with traffic and pedestrians. Streetcars are in fact quite safe, but work continues to make them even safer. Most technology development is occurring outside the U.S., given that the U.S. market for streetcars is likely less than 10% of the world total. Safety technologies can be divided into baseline and innovation categories. The subcommittee has developed a baseline safety checklist. Innovation topics include the connected vehicle, driver assistance systems, and autonomous vehicle prototypes. Driver assistance is being studied as a step on the path to autonomous vehicles. Several fatal accidents have occurred due to trams running at excessive speed. APTA wants to address issues such as this so that self-regulation of the industry can be continued to the extent possible. Driver assistance includes technologies such as automatic brake activation, speed control and reduction, interrupting traction power, warnings, monitoring switches, among a growing list of others. Standards work is progressing in these areas. There are many advances in the field of driver visibility of the tram's path. An addition soon will be based on safety treatment of streetcar lines crossing light rail lines. Underrunning protection and driver vigilance are two other developing areas. The issue of how these new technologies get implemented on U.S. systems is also receiving attention. A question posed for further thought is how a U.S. demonstration of driver assist or autonomous vehicle operation could be implemented.

- **Autonomous Vehicle Update**

Veronica Siranosian
AECOM

The presentation covered the Oklahoma City Automated Streetcar Feasibility Study which was done

while the system was still under construction. The study was spurred by the then-mayor who wanted to understand how the streetcar system could be “future proofed,” and be compatible with autonomous automobiles. Benefits the study wanted to evaluate included safety of autonomous operation, reliability of the system, customer focus by drivers (using time freed by automatic operation), operational costs, and adoption of innovative technology developed by the industry (in some cases for buses). Concerns included heightened security, public acceptance, liability, and insurance. Different standard levels of automation range from simple driver assistance to full operation of the train without driver input in mixed traffic. Levels of connectivity include vehicle to vehicle, vehicle to signals, and vehicles to everything nearby. Various tests of all these levels are taking place in Europe and the U.S. Technologies needed for the pilot were sensing, the environment, seeing, thinking, and communicating. Vehicle requirements included propulsion and braking, operator controls, communication and safety, among others. For this study, operators would remain in the car, but spend time helping passengers. Cost estimates for broader installation of the tested technology were high level due to scarcity of products and reluctance of vendors to quote prices. The project was broken into phases, with more automation over time. The OKC system has a 1/3-mile maintenance facility track lead that could be fenced off and used for testing. The result of the study is that autonomous operation is feasible; there are significant complexities to address: and that OKC could help in establishing national standards. The prior mayor had been extremely interested in this technology and encouraged the test program, but his successor is less interested, so there has been limited progress recently.

- **Advanced Driver Assistance Systems**

Peter Tuschinski

Vice President of Strategy, Siemens Mobility Passenger Rail Systems

The presentation covered Siemens’ Advanced Driver Assistance Program (ADAP) which is a practical approach with today’s technology. It will take considerable time until adoption of the autonomous operation demonstrated recently in Potsdam is feasible. Siemens’ objective now is to follow and adopt available technology from the auto industry. The first step is collision avoidance, being tested in the city of Ulm. Development costs of a small radar detector component for highway use by autos is about one billion Euros, something the transit industry couldn’t duplicate. Adapting the technology to streetcars is difficult due to issues such as recognizing the rails in all weather and lighting; dealing with varied surfaces such as ballast, grass, and brick pavers; not over-reacting to passing close by fixed items like line poles; and recognizing bikes or pedestrians. So, auto components are a starting point, not the ending point, for developing transit solutions. Collision avoidance also requires cameras and a control unit adapted from autos. Key to these systems is pattern recognition of the back or front of vehicles and there are many types of road users to recognize. The same applies to recognizing cars or other objects from a side view. An interesting development is that with the assistance technology operator behavior changes as they try to minimize system intervention. European tram customers are already ordering some of these assistance components. Siemens’ conclusions based on this project is that assisted driving for trams is a reality, that detecting obstacles is easy but responding is difficult, and that assisted driving is a quick win to reduce accidents on shared tracks.

- **Updates**

- **Light Rail Technical Forum**

Tom Furmaniak

The forum has been less successful at creating a work program, however has been quite successful in attracting high quality presentations. The next forum will be in Toronto in June and will feature Bombardier describing the seven section cars being developed for Edmonton. Plans are to obtain presentations covering developments in the many other light rail projects underway in Canada.

- **Light Rail & Streetcar Conference -- April 7-9, 2019 Jersey City, NJ**

Tom Furmaniak

Registration is open for the conference and the agenda of this comprehensive conference is on the APTA site.

Web Site Update

Jim Schantz

The Subcommittee's site at www.heritagetrolley.org and www.streetcarcommitte.org continues to be updated regularly with news and other resources that could be of use to groups planning or implementing modern or heritage streetcar systems. The latest draft of the off-wire status paper and the level boarding white paper are among postings in the Technical section. The presentations from this meeting are also on the site in the Technical section.

Innotrans Report

Paul Grether & John Smatlak

The biennial conference in Berlin featured 55 vehicles on outside display and there were 161,000 visitors from 149 countries. APTA signed an MOU with the European consortium of vehicle manufacturers to promote information exchange. Trams on display were all low floor and generally five section cars. Many designs feature integration of more operator control functions into the operator's seat arm rests. Siemens offered the autonomous tram demonstration in nearby Potsdam.

Suggested topics for 2019 APTA Rail Conference June 23-26

All

Presentations for the upcoming meetings are welcome. Attendees were asked to submit ideas to subcommittee leaders. A future work plan topic suggested is to ask manufacturers to participate in discussions about vehicle cost reduction.

- **Next meetings:**

Light Rail and Streetcar Conference, April 7-9, 2019, Jersey City, NJ – 1:00-2:30 pm on Sunday

APTA Rail Conference June 23-26, 2019 Toronto, Canada

- **Presentations from the Tucson meeting are on the Subcommittee website at:**
<http://heritagetrolley.org/latestMain.htm>

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Summary Notes prepared by Jim Schantz