Portland Streetcar
A Two-Year Report Card

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The Portland Streetcar in the city of Portland, Oregon, is the first modern streetcar line built in North America in the past fifty years. The 7.7-km (4.8-mi) single track streetcar loop was constructed in a short, 2-year time frame and at a very modest cost. In adhering to the theme of simplicity, the entire project, including five streetcar vehicles manufactured in the Czech Republic, cost approximately $54.6 million, or about $7.1 million per track-kilometer ($11.4 million per track-mile). The concept of the service is single cars operating in mixed traffic on city streets, with stops every two or three blocks.

Service was inaugurated on July 20, 2001. In the 2 years since, Streetcar has enjoyed a steady growth in ridership and popularity. This report provides a summary description of the line. It presents ridership and service reliability statistics for the first 2 years of service, including the experience of operation in city traffic with high pedestrian activity. It also describes some of the design features which needed to be revisited based on observations, operating experience, and passenger feedback.

Overall, the streetcar line has been extremely well-received, and the positive experience of the first 2 years of operation is lending credence to the city's efforts to expand the line to other areas close to downtown Portland. It has also become a model that many other municipalities, large and small, have come to see in order to gauge possible application in their own communities.

INTRODUCTION

The Portland Streetcar story was first reported to colleagues of APTA and TRB at the 8th Joint Light Rail Conference in Dallas, Texas, in November 2000 (*1*). At that time, the streetcar line was still under construction and the vehicles still at the manufacturing plant. The line opened 8 months later on July 20, 2001. Since then, this project has gained notoriety and publicity, and is helping to spark streetcar planning in cities of all sizes around the country. A brief overview of the project will be provided, as well as reports on the experience of operating the line during its first 2 years of service.

PROJECT OVERVIEW

The streetcar line consists of a 3.8-km (2.4-mi) route extending from the campus of Portland State University south of downtown Portland to NW 23rd Avenue at Legacy Good Samaritan Hospital in the close-in northwest section of the city. It is actually a 7.7-km (4.8-mi), single-track loop running with the direction of street traffic on one-way couplets a block or two apart for nearly the entirety of the route, as shown in Figure 1.

For the most part, the tracks are situated in the right travel lane, and streetcars run in mixed traffic, with parallel parking preserved along the right curb.

The streetcar line crosses TriMet's MAX line, which itself operates on parallel one-way streets, at four intersections. Two of these are particularly complicated because they occur at TriMet's downtown storage and turnaround loop, the ladder tracks for which extend across the streetcar tracks. A third intersection has a nonrevenue track connecting the streetcar with the light rail system.

There are 32 streetcar stops on the loop and a storage yard and inspection and light maintenance facility located where the line crosses underneath the elevated Interstate 405 freeway.

FACILITIES

Right of Way and Track

All track is situated in the right driving lane with one exception where the existence of a large water main required a shift to the opposite side of the street. The track structure consists primarily of RI 52 girder rail encased in a rubber boot for stray current isolation and embedded in a 300 mm (12 in.) deep, 2.5 m (8.2 ft) wide concrete slab. The track gauge is 1430 mm ±3 mm (8.3 in. ±0.1 in.), slightly narrower than the standard 1435-mm (4-ft, 8.5-in.) gauge to provide for better wheel and rail wear. The shallow track slab was chosen to minimize interference with underground utilities, and thus to avoid the associated time and expense of relocating them. Done mostly in three-to-four block segments, each taking three to 4 weeks to install, the track construction was done with a minimum of disruption to adjacent residences and businesses.

Stops

Keeping with the theme of simplicity, streetcar stops consist of extensions of the sidewalk approximately 2.4 m (~8 ft.) out into the parking lane at the near-side end of the block. These "platforms" transition from whatever the sidewalk elevations are at the specific sites to 240 mm (9.5 in.) along the trackway edge at the accessible doorway of the streetcar and tapering to 150 mm (6 in.) at the leading edge of the platform. The lower height at this location enables buses with wheelchair lifts which cannot accommodate a curb height higher than this to use the platform. The horizontal gap between the streetcar and the platforms is 50 mm (2 in.), which can be spanned by extendable bridge plates on the streetcars to accommodate passengers using mobility aids.

The platforms begin approximately 4.5 m (15 ft) back from the intersection to allow space for pedestrian crosswalks, including curb cuts. They are about 13.5 m (45 ft) long, which is

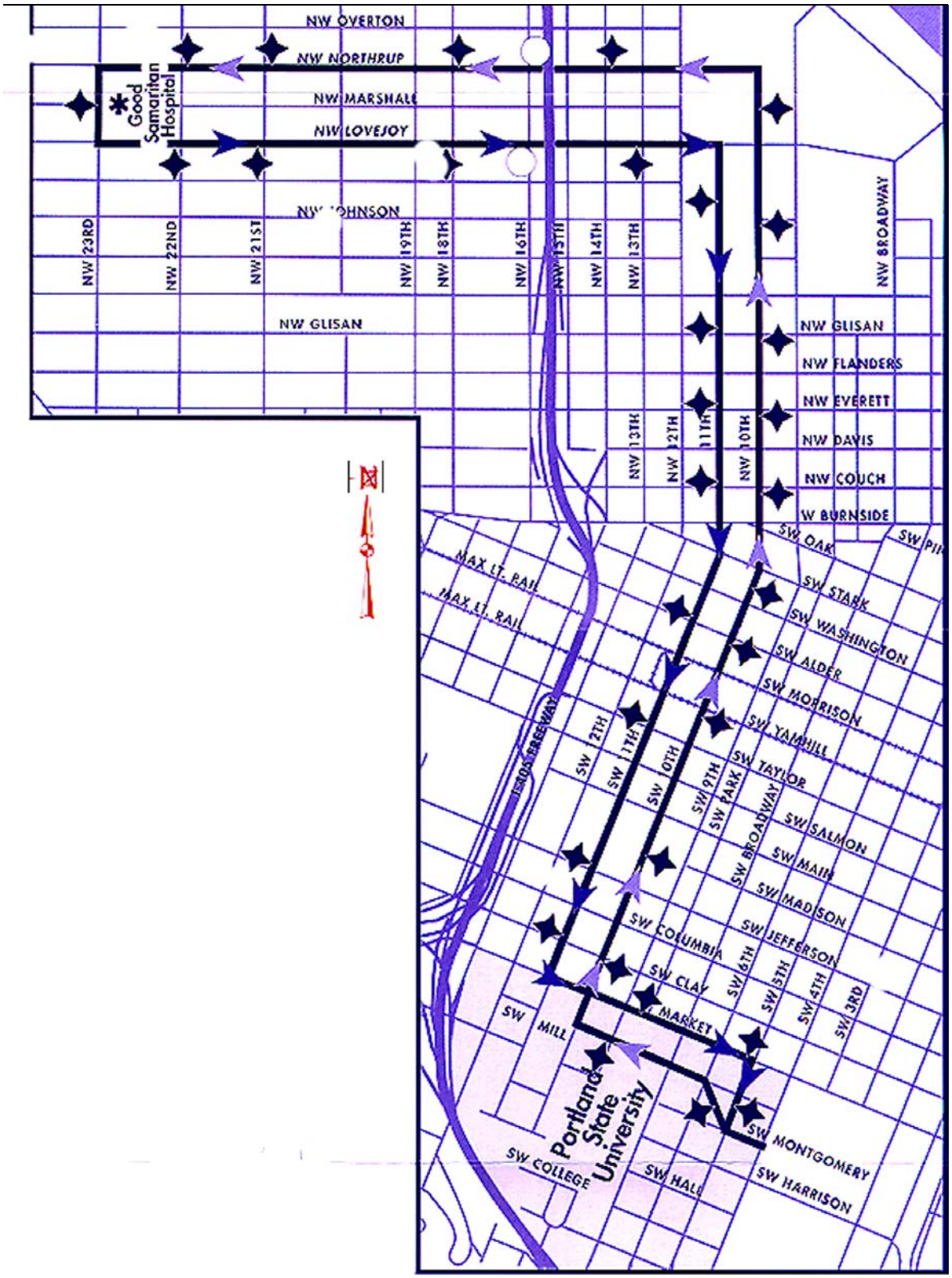


FIGURE 1 Portland Streetcar route map.

less than the 20 m (66 ft) length of the streetcar, but sufficient to serve all doors on the car. This effectively eliminates only three existing parking spaces at these locations.

Platforms are outfitted with only a modest shelter, leaning rails, transit signage, and a trash receptacle. Illumination is from existing street lighting. A Nextbus LED arrival time sign display was later retrofitted to 24 of the stops where power supply was readily available.

Yard and Shop

The functions at the yard and shop complex include vehicle storage, cleaning, inspection, running repairs, materials storage, and operations and maintenance staff accommodations. Heavy repairs and any major bodywork are contracted off-site.

The facility includes three parallel tracks for exterior vehicle storage for up to 10 cars, with space for two additional tracks in the future, and a 700 m^2 (7,500 ft^2) shop building. Two of the three tracks pass through the building, providing one car position on each track. Both positions have pits, one of which is also equipped with work platforms and an overhead crane to reach roof-mounted equipment. Portable jacks are used for lifting cars.

SYSTEMS

Vehicles

The city of Portland initially purchased five cars from Inekon/Skoda of the Czech Republic, a partnership of a project management and engineering firm and one of the country's largest and diversified manufacturers of industrial products. These cars were off-the-shelf versions of their Astra streetcar being produced for several Czech cities and modified for this project as a bi-directional streetcar.

As illustrated in Figure 2, the streetcars for Portland are 20 m (66 ft) long, 2.46 m (8 ft) wide, double-ended, and double-sided. With split articulation the cars have three distinct compartments: two end sections with floors 780 mm (31 in) above top of rail and a center section, suspended between the articulated joints, with a low floor 350 mm (14 in) above the top of rail. The low floor section represents approximately 60% of the total floor area of the car.

There are three entryways on each side of the car: a 700 mm (28 in) wide single panel door opening opposite the operator's position, with two steps of approximately 215 mm (8.5 in) up into the high floor area, and two double panel door openings 1,300 mm (51 in) wide in the low floor center section allowing level entry. One center door on each side is equipped with a movable bridge plate to accommodate wheelchairs and passengers who otherwise need assistance to traverse the gap at platforms. Similar to the front door area, there are two steps in the interior at each articulation connecting the center low floor section with the high floor end sections.

The cars have 29 seats and space for 127 standees at a density of 6/m^2. The latter includes two positions in each car which are designated for wheelchairs, bicycles, strollers, and the like. The cars are air-conditioned.

The streetcars do not have conventional couplers. Rather, folding towbars are housed behind removable panels and can be used to pull disabled streetcars.

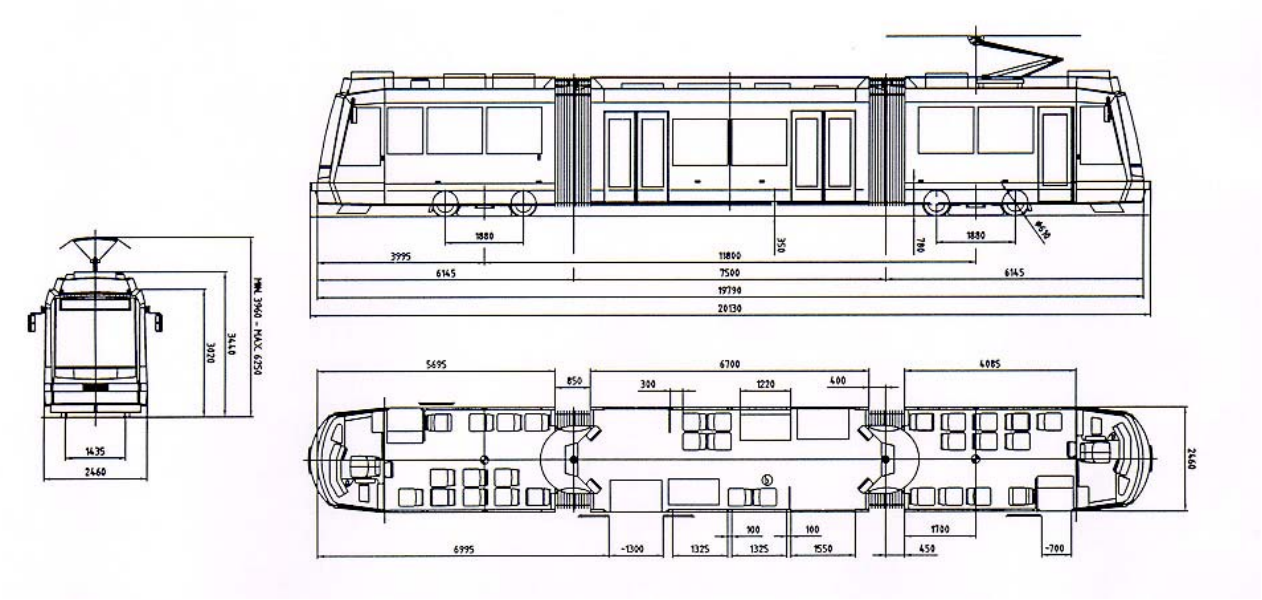


FIGURE 2 Portland Streetcar general arrangement. (Source: Inekon/Skoda.)

Propulsion is supplied by inverters feeding the AC traction motors that drive each axle. Rated at 85 kW each, these motors support acceleration rates of 1.3 m/s^2 (3.0 mphps) and a maximum speed of 70 kph (42 mph). Braking is provided in three steps: dynamic braking, friction braking through hydraulically applied disc brakes, and track brakes for emergency stopping. Additionally the track brakes are used in spin and slide control.

Power for heating, ventilation, and air conditioning (HVAC), lighting, and other auxiliaries is provided by two IBGT inverters producing a 3-phase, 400 Vac 50 Hz supply, typical in Europe.

Most of the equipment (propulsion controls, inverters, static converter, resistor grids, and HVAC) is mounted on the roof of the center section, while the pantograph is positioned over the truck center of one end of the car.

Each car sports a unique paint scheme, and there are no exterior advertisements save a tasteful logo identifying the current sponsor of the car. The interiors are bright and welcoming through a combination of large windows, lighting, and the patterns and colors selected for the various interior appointments.

Modifications from the off-the-shelf design included conversion to a double-sided, double-ended car, structural modifications to improve crashworthiness, dual versus single inverters, interior materials satisfying National Fire Protection Association 130 smoke and toxicity requirements, signage compliant with the Americans with Disabilities Act (ADA), and other features.

Power Supply

The concept of the traction power system design was to provide numerous small substations so as to limit the need for either unsightly overhead feeder or expensive underground conduit installation. Power is distributed to the streetcars at a nominal 750 Vdc from six substations, which are each rated at 300 kW, and spaced at 800-m (2,600-ft) intervals on average. The

substations receive power at 480 Vac, three phase, from the local utilities, and are housed in available spaces along the line. Installations include prefabricated stand-alone housings, under-sidewalk vaults, and a city-owned parking garage.

Streetcars take power from an overhead system comprised of simple, fixed trolley. With a single track in each street, most overhead wire is suspended from side poles with cantilever arms. In several areas, span wires anchored to adjacent buildings are used.

Signals and Train-to-Wayside Communications

Since the streetcar is running in mixed traffic and subject to rules of the road, there is no signal protection on the line. The only exceptions are the crossings with MAX. At these locations, simple interlocking circuits have been installed to protect against the circumstance of two trains trying to occupy a crossing at the same time. Clearance to proceed is processed on a first-come, first-serve basis and indicated by a rail traffic signal head.

Where streetcar movements conflict with the normal flow of traffic, train-to-wayside communications (TWC) is used to preempt traffic signals. The TWC system is compatible with that used on TriMet's MAX service.

Communications

Communication with the operations office is provided through hand-held radios compatible with the city of Portland's 800 MHz system. There is no central control per se; however, supervisors can observe streetcar location through a standard web link to the NextBus system provider, the same display which is available online to the general public.

Fare Collection

The fare structure, fare collection means, and ticket stock is integrated with TriMet's proof-of-payment system. TriMet tickets and passes are valid on the streetcar, in addition to those sold by the streetcar service itself. However, since about two-thirds of the streetcar line is located within TriMet's downtown free-fare zone, Fareless Square, and the remainder in TriMet's Zone 1, fare collection is not as intense an activity as might normally be expected. There are no ticket vending machines at streetcar stops. Rather, there is a simple, coin-only ticket vending machine installed on each car that dispenses single-fare tickets which, like TriMet's, are valid for 1.75 hours of use. A companion bill acceptor has recently been added. Canceling machines are also located onboard to validate TriMet tickets. A ticket purchased on the streetcar is also honored on TriMet trains and buses within Zones 1 and 2, but a streetcar-only annual pass currently sold for $75 is not.

OPERATIONS

Streetcars operate 18 h/day Monday through Thursday, 19 h on Friday and Saturday, and 16 h on Sunday. Headways are 12 to15 min during the peak and midday, and 20 min in early morning and during late evening hours.

Service is operated by single cars operating in mixed traffic. While the maximum speed capability of the cars is 70 kph (42 mph), they are speed-limited to not exceed 48 kph (30 mph), which is deemed adequate for the mixed traffic operation and passenger stops every few blocks. Even for regular roadway traffic, most of the traffic signals in downtown Portland are timed for about 24 kph (15 mph) in a free-flow situation. The one-way trip time is 28 min, deriving an average speed of about 8 kph (5 mph).

The streetcar system is operated and maintained under a city of Portland contract with Portland Streetcar Inc. (PSI), the private, non-profit organization which oversaw its design and construction. PSI, in turn, contracts with TriMet for operators, mechanics, and operations supervision. In all, the lean staff numbers only 25 positions fielded by the three organizations as listed in Table 1.

RIDERSHIP

During the planning stages, the streetcar service was expected to attract an average of 3,000 passengers per weekday. The actual experience has exceeded expectations. At first, there was very high ridership due to the novelty of the line, especially on weekends. Over the first several months, this settled down to a pattern whereby the average weekday ridership was 4,000 passengers, with 3,750 on Saturdays and 3,100 on Sundays. A significant portion of the weekday ridership occurred off-peak, both midday and in the evening. That has changed as the practicality of using the service during peak periods, such as for work and school trips, has evolved, growing to about 4,820 riders per weekday; whereas Saturday and Sunday patronage has leveled off. Figure 3 shows the monthly ridership trends over the past 2 years.

OPERATING EXPERIENCE

While not without its challenges, the operation of the streetcar line has gone quite smoothly since its inception. How well the streetcar fared in its mixed traffic operating environment, its interface with TriMet, passenger acceptance, and equipment reliability is described below.

TABLE 1 Portland Streetcar Staffing

Position		Organization
Chief Operating Officer*	1	PSI
Project Manager*	1	City of Portland
Operations Manager	1	City of Portland
Superintendents	3	TriMet
Operators	14	TriMet
Maintenance Managers	2	City of Portland
Mechanics	2	TriMet
Car Cleaners	1	City of Portland
Total	25	

*Part time

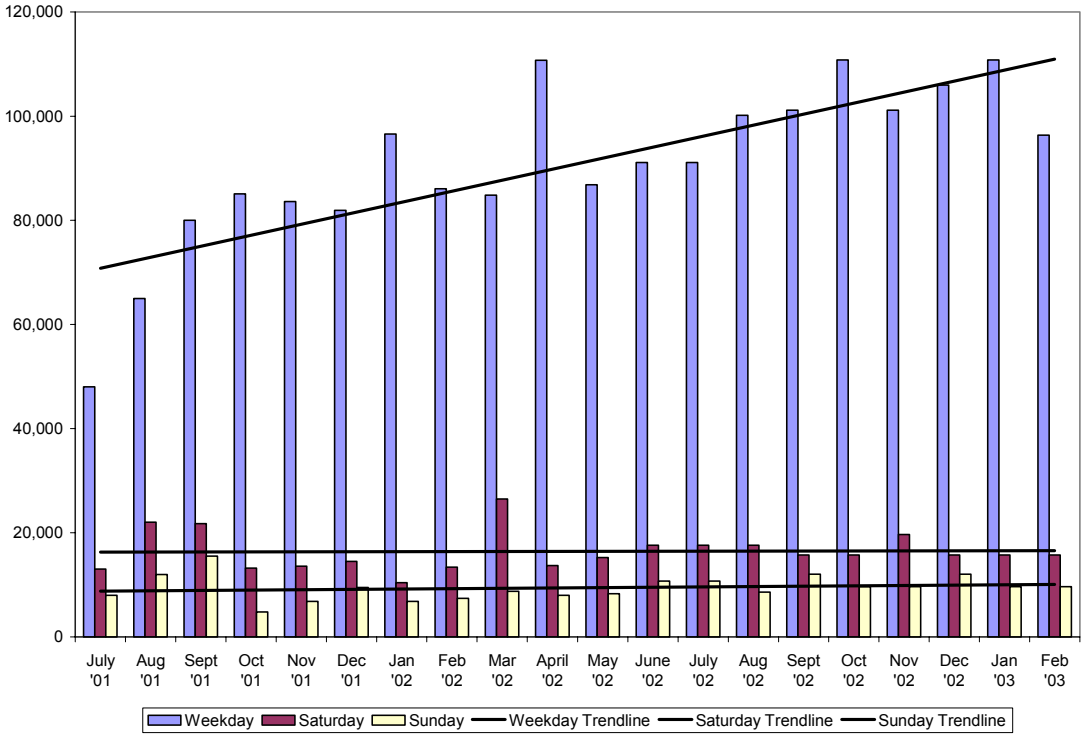


FIGURE 3 Portland Streetcar monthly ridership.

Operating Environment

The streetcar line operates in mixed traffic for the majority of its alignment. This suggests risks to traffic flow, and the potential for vehicle and pedestrian accidents.

An initial concern was that the streetcars would delay the flow of automobiles and trucks along its path as it halted at car stops. This has not materialized to any extent because the traffic signal progression for Portland's one-way streets is timed for about 24 kph (15 mph). While a streetcar making a stop may affect the flow of traffic behind it, drivers have grown aware of the potential and stay in the parallel running lane. Usually, the impact is only one light cycle at that one stop, and does not accumulate as the streetcar proceeds down the track because it, too, can catch the "green wave" for a few blocks. Sometimes it is the other way around; the traffic stopped at a light at near side stops precludes the streetcar from getting to the stop until the light has turned green and the traffic has cleared that location. In either case, the delay has not been significant enough to raise any major complaints from the driving public. Similarly, the scheduled travel time for the streetcar has not changed substantially from that originally assumed when the service was planned, with a round trip requiring about 56 min around the 7.7-km (4.8-mi) loop.

As with any nonexclusive rail system, there is exposure to conflicts with automobiles and pedestrians. Over the first 2 years of service there were 18 minor accidents, all of which involved autos turning in front of the streetcars. There have been three major accidents, one which involved a Jeep Cherokee that ran a red light in the late evening and literally knocked the streetcar about 8 m (25 ft) off the tracks. No major injuries were sustained by passengers in any

of these accidents. Also, there have been no accidents involving pedestrians crossing in front of the streetcars.

The overall low record of incidents may be attributed to several factors: the education of the driving and walking public prior to start of service; the acquired familiarity with the streetcar after service was inaugurated; the distinctive appearance of the streetcars; the relatively low speed of operation; and the attention and alertness of the operators to running in the Portland urban traffic and pedestrian environment.

Another aspect of operating concern was conflict with parked vehicles overhanging the traffic lanes. Prior to start of service, the city relocated truck loading zones to adjacent streets and informed delivery companies of the need to respect streetcar clearances. While trucks, particularly those of parcel delivery companies, still stop along the trackway, one can observe their drivers folding in side mirrors as soon as they park.

Interface with TriMet

The streetcar line crosses TriMet tracks at four locations, its one-way couplet of tracks on 10th and 11th Avenues crossing TriMet's one-way couplet on Morrison and Yamhill Streets. These crossings are interlocked, with clearance given on a first-come, first-serve basis. This has been more onerous on streetcar operation than on TriMet in that TriMet's frequency on each track is about 5 to 8 min, whereas the streetcar frequency is 12 to 15 min. It is further exacerbated when a TriMet Airport train (Red Line) is completing its trip to downtown and terminating at TriMet's turnback loop at 11th Avenue because TriMet holds that train at its 10th Avenue station until the operator can confirm that all passengers have disembarked. Streetcar delays can be as much as 5 min at these crossings, especially the southbound run at 11th and Morrison.

There is no imminent solution for this problem area, and the respective operating agencies and the streetcar passengers have accepted this reality. Some relief will come when TriMet extends its Airport Red Line service to Beaverton west of downtown, eliminating the need for a long dwell on Morrison Street.

Equipment Reliability

The streetcars selected for Portland were based on the Inekon/Skoda Astra streetcar recently introduced in operation in the city of Plzen in the Czech Republic. Therefore, there was some degree of comfort in being able to study the design and manufacture and witness the operation of these cars. However, the changes that were implemented for the Portland variant, namely adding a second cab and a dual inverter-based propulsion system, warranted a battery of static, dynamic, and reliability demonstration tests on the first completed vehicle. For the latter in particular, the vehicle was run in non-revenue service late night on the streetcar network in Plzen and experienced an unprecedented 2,415 km (1,500 mi) of operation without a failure on the first attempt to achieve this reliability requirement. This was the harbinger of the noteworthy reliability these cars have demonstrated in Portland.

The traditional statistic for expressing car reliability is mean distance between failures. However, this measure is somewhat meaningless for a service that has a small fleet and runs at low speeds and low frequencies on a short loop. Indeed, the streetcars average about 24,135 km (15,500 mi) and 3,000 h of service per year. Rather than just focus on equipment, the city of Portland records all incidents which lead to an interruption of service. This includes equipment

failures, power outages, traffic incidents, police and emergency vehicle actions, no operator, passenger situations, and the like, with no differentiation among them, giving a statistic of service reliability rather than equipment reliability. Figure 4 charts the experience over the first 2 years. Based on this information, some form of service disruption has occurred on average every 347 mi, or about every other day; however, the overall impact has been small, with the streetcar operating at over 99% of scheduled service consistently.

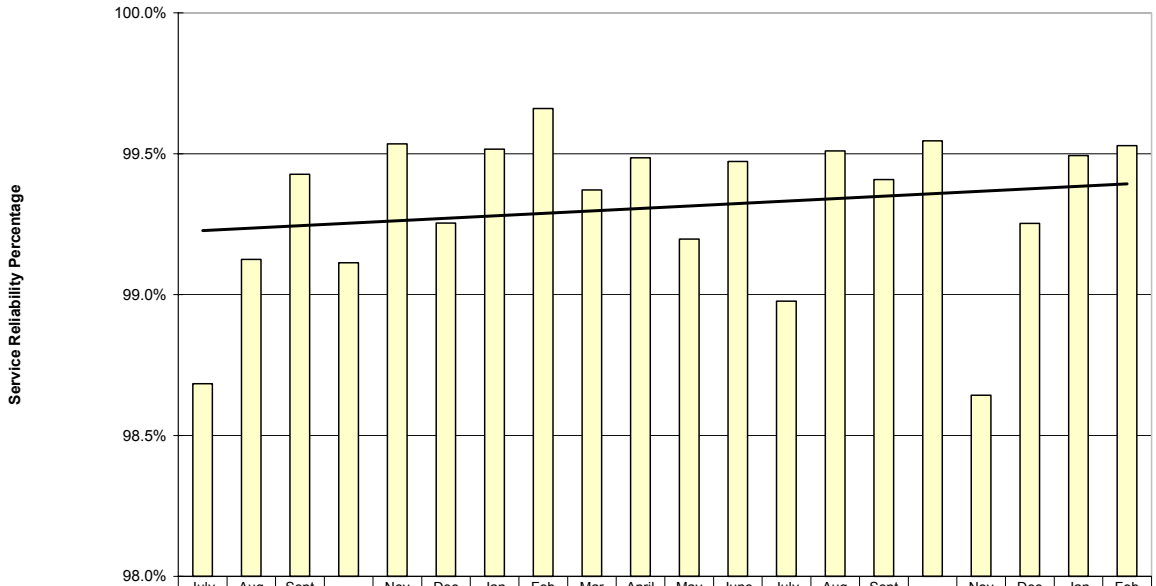
While the statistics do not measure equipment failures directly, PSI records failures and follow-up maintenance actions as a normal course of business. The largest number of unscheduled maintenance tasks has been with the door system. These have been primarily related to keeping doors adjusted properly. With 32 platforms, the doors average 288 cycles per side during a full 18-h service day

DESIGN ISSUES

As with any project of this nature there are always items for which hindsight dictates a different design. These were relatively few, being mostly features on the streetcars which relate to passenger interface with fare collection and ADA accommodations.

Fare Collection

The ticket vending machines were purchased for the streetcars through the vehicle procurement contract. The rationale was that there was not a domestic product available which could provide the needed functions (at least not without development costs), the quantity was small (five originally), and the vehicle manufacturer had a source of supply of proven equipment.



	July '01	Aug '01	Sept '01	Oct '01	Nov '01	Dec '01	Jan '02	Feb '02	Mar '02	April '02	May '02	June '02	July '02	Aug '02	Sept '02	Oct '02	Nov '02	Dec '02	Jan '03	Feb '03
Percentage	99.28	99.59	99.80	99.58	99.87	99.68	99.86	99.96	99.76	99.84	99.64	99.83	99.48	99.86	99.79	99.88	99.25	99.68	99.85	99.87
Hours of Loss Service	5.33	7.60	3.46	6.84	2.05	5.79	2.33	0.62	4.11	2.72	6.33	2.97	9.61	2.57	3.67	2.12	12.94	5.73	2.78	2.09
Hours of Service	739	1843	1719.5	1626.3	1629.3	1797.4	1680.1	1644.4	1713.3	1702.1	1749.6	1754.6	1861	1800.3	1712	1798.5	1725.2	1774.3	1800.5	1611

FIGURE 4 Portland Streetcar service reliability.

Unfortunately, these were coin-only machines. A bill acceptor was envisioned but there was insufficient time before start of service in mid-2001 to develop the recognition hardware and software for U.S. banknotes. The lack of a bill acceptor was immediately evident as numerous passengers, who were accustomed to using bills in TriMet vending machines and bus fareboxes, were observed attempting to buy tickets with bills. Fare revenue was lost because they had no means to purchase a ticket, yet they were already onboard completing their trip. This was remedied after the first year with the acquisition of a bill validator which could interface with the ticket vending machine.

ADA Accommodations

The off-the-shelf configuration of the streetcars found in the Czech Republic included a wheelchair ramp at one of the two double-width door positions in the center section to the car. For the Portland car, in which doors were installed on both sides, a second ramp of like design was included in the diagonally opposing doorway. Provisions were added to the interior of the car which included a parking area for wheelchairs and accessible tape strips for stop request. Accessible buttons for ramp deployment were already part of the original design. Interior seating layouts were sized and configured to assure the prescribed clearances for the movement of wheelchairs, including the possibility that a wheelchair-bound passenger might enter the car on one side and exit the other. In addition, an internal stop announcement sign was installed at each end of the car above the operator's cab door with two opposing display signs in the center section.

Several issues arose as the wheelchair-bound passengers began using the service. Two involved the ramp. First, several car stops were constructed slightly out of tolerance such that, when deployed, the wheelchair ramps exceeded the ADA-specified slope of 1-to-6 at 50% passenger load. For some wheelchairs, such as those with small diameter soft rubber lead tires, negotiating the transition from the platform to the ramp was difficult. PSI has corrected platform elevations at the ramp position to bring ramp slopes within tolerance. Second, the ramp is 254 mm (10 in.) narrower than the 1,300 mm wide (51 in.) car door opening. Unless their chairs are centered on the door opening, passengers can enter or exit the car and risk one wheel missing the ramp. As an interim step, PSI has installed warning signs and floor striping delineating the side limits of the ramp to emphasize the need to enter and exit cars in the center of the doorway. PSI is working with the car builder to replace the existing ramp with one that extends the width of the door opening, as well as being longer.

Another issue is the interior message display. Complaints have been that the sign lettering is not large enough to read. PSI is currently investigating this.

On the facilities side, there were several lessons learned in addition to the car stop elevation tolerances noted above. One involved the poles selected for the overhead contact system. While slender tubular steel poles were specified, a decision was made to select thin-wall galvanized poles at a significant reduction in price. The result was some poles of extremely large diameters failed to achieve the required strength. This use of these poles ceased after the initial supply was depleted. The extension through the Portland State University campus at the current southern end of the line, which was an add-on to the construction contract, has the originally specified poles. These will be the standard for future extensions.

Another facility issue is storage space at the maintenance site. To the credit of the frugal stewardship under which the system was designed, the maintenance and storage yard was

creatively placed under an elevated freeway, and woven around the structural columns supporting that roadway. The parcel dictated the installation. In practice, insufficient covered and secure storage was allotted for the materials accumulated on the project. This includes extra components and parts for vehicles and spare equipment for the infrastructure of the line such as poles, waiting shelters, and the like. PSI is installing used shipping containers to handle this overflow material.

Public Acceptance

Portland has embraced the streetcar line in various ways. In addition to achieving the ridership growth noted in Figure 3, the streetcar line continues to serve as an important element of the city's plans to strengthen existing neighborhoods, create new ones, and reduce dependence on automobile travel. Anecdotally, new housing and commercial developments along its path are thriving in what is an otherwise lackluster local economy; people are making lifestyle choices in which the streetcar is one of their choices for travel, including their work and school trips; and they are reducing use of their automobiles. Likewise, existing businesses along the line and new business locating there are advertising their proximity to it.

Transit-Oriented Development

The streetcar line has been a catalyst for development. Initially, this was focused on the Pearl District, an urban renewal area of former railroad yards and abandoned warehouses near the middle of the line and now the scene of explosive housing growth and neighborhood development. However, there have been numerous buildings and land parcels elsewhere along the line which have capitalized on the line's popularity. Through the first quarter of 2003, more than 40 new construction or renovation projects valued at over $1 billion have been started along the line, with more on the drawing board.

FUTURE EXPANSION

Even before the initial segment of the streetcar line opened, the city was studying its expansion. Next is the extension of the line from the Portland State University campus 1 km (0.6 mi) eastward to the Willamette River to RiverPlace, an area of housing, restaurants, shops, offices which is somewhat remote from the downtown. This $14.6 million extension is under design. Construction should begin in the latter part of 2004 and be completed for a mid-2005 opening. Two streetcars were purchased for this extension 2 years ago as an option to the contract under which the first five streetcars were acquired.

A second phase of this extension is planned to go southward another 1 km (0.6 mi) from RiverPlace to the North Macadam Urban Renewal District, a large plot of brown fields and industrial land along the river south of downtown. This area is targeted to accommodate expansion of the Oregon Health Sciences University (OHSU), whose main campus is in the nearby hills, along with complementary businesses and new housing. In all, 10,000 new jobs and 5,000 new dwelling units are anticipated. The streetcar line will intersect with a new aerial tram which will be built to link this area with OHSU's hillside campus.

Interest is also growing to carry the streetcar line over the Willamette River to the east side of Portland. Local eastside businesses have been in the forefront of an initiative to create a large streetcar loop which would connect them with the downtown on the west side. A number of proposals are being considered, including how far the loop would extend eastward and which bridges the streetcar would use.

Further on the horizon is a plan to extend the streetcar line south from the North Macadam Renewal District to Lake Oswego, a distance of about 11.2 km (7 mi). This extension would use the right of way of the Willamette Shore Trolley, an old interurban line on which vintage equipment is operated by the Oregon Electric Railway Historic Society as a tourist attraction. The right of way was purchased from the Southern Pacific Railroad, which abandoned the line in 1984, to preserve it for future transit use. Title to it is being held by the city of Portland on behalf of several local government entities.

CONCLUSION

By all accounts, the Portland Streetcar has performed well during its first 2 years of operation. Ridership started strong and continues to grow, currently averaging 4,800 riders on weekdays with no change in level of service since its inception; the equipment is performing very reliably; and minor shortcomings of the initial installation have been, or will soon be, addressed. Operation in mixed traffic has also worked well. While minor accidents have occurred, the streetcar has blended well with its traffic environment and vice versa. Moreover, the streetcar has successfully connected neighborhoods and complemented, if not catalyzed, growth in urban renewal areas. The success of the streetcar to date has reinforced the city of Portland's efforts and the public's interest to extend it to other locations close to downtown.

REFERENCE

1. Hales, C., and T. B. Furmaniak. Portland Central City Streetcar Line. Presented at American Public Transportation Association/Transportation Research Board 8th Joint Conference on Light Rail Transit, Dallas, Tex., 2000.