LRT news

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LRT news

on the Internet!

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OF THE NATIONAL ACADEMIES

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REGISTER FOR THE LIGHT RAIL TRANSIT CONFERENCE

April 9–11, 2006
Hyatt Regency • St. Louis, Missouri

Make plans to attend a light rail conference so wide-ranging that it took the collaboration of three cosponsors—the Transportation Research Board, the International Union of Public Transport, and the American Public Transportation Association—to coordinate.

Featuring more than a dozen technical sessions focusing on the design, management, and operations of light rail systems, the Joint International Light Rail Conference will bring together a prestigious group of public transportation industry leaders from the United States and Europe for a program covering all elements of this increasingly popular transit mode.

This North American and European joint event will provide attendees the opportunity to get a look at light rail transit from many points of view. Experts from around the world will gather in an international conference dedicated to light rail transit systems.

For information on the preliminary program, conference, and hotel registration, please see www.trb.org/calendar/event.asp?id=222.

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Photo courtesy of Russell E. Jackson.

PCCs RETURN TO PHILADELPHIA

On September 4, 2005, SEPTA PCC "II" service was restored to Route 15 in Philadelphia. From the outside they look like the familiar PCCs we used to know. But inside it is a whole new story.

The Southeastern Pennsylvania Transportation Authority (SEPTA) was faced with the challenge of obtaining the relatively small number of streetcars (18) needed to resume service on its rehabilitated and upgraded Route 15–Girard Avenue in North and West Philadelphia. The cars would have to be designed to work with Philadelphia's wide, 1581-mm ($62^1/_4$-inch) track gauge and negotiate sharp curves with an inside rail radius of 10 meters (33 feet).

Route 15 is an east–west line traversing the full width of the city. It passes through diverse neighborhoods, feeds two of the city's rapid transit lines, and carries passengers to such varied destinations as Girard College, the Philadelphia Zoo, and Fairmount Park. At its eastern end, the line connects the recently rebuilt Frankford elevated rapid transit line with an area that is seeing significant redevelopment.

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An attempt to acquire a modified existing articulated design proved to be beyond SEPTA's available budget. SEPTA, cognizant of the rebuilding of PCC streetcars that had been successfully accomplished by San Francisco's Municipal Railway, decided to evaluate that approach for equipping Route 15. An engineering analysis of the remaining PCC cars available indicated that such a solution was feasible. A flexible specification intended to entice a healthy quantity of competitive bidders was prepared. The winning bidder was Brookville Equipment Corporation of Brookville, Pennsylvania, at a total project cost of $23.4 million, including spares and test equipment.

The Brookville firm (www.bmec.com) began business in 1918 with locomotives for mine railway use. It continues in that business but has branched out into related fields and moved into a new plant in July 1998. Its first major venture into the public transit field was to supply a truck designed on the basis of PCC principles and dimensions for use under the car bodies being built for service on the reconstructed Canal Street line in New Orleans.

An important part of SEPTA's procurement process was to allow prospective bidders to examine the cars that it was planning to rebuild so that the magnitude of the work required would be clearly understood. Because of the impracticality of inspect-

Completed car—interior. (Photo courtesy of Russell E. Jackson.)

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ing all the cars and the impossibility of fully disassembling them to examine all structural areas before the work was commissioned, the contract contained contingency funding to cover the cost of work that could not be seen without full disassembly.

The PCC cars remaining on SEPTA property that were considered viable candidates for remanufacturing were from groups built in 1947 and 1948 by the St. Louis Car Company. All of these cars had received significant work as part of a general overhaul program between 1980 and 1985 and were in good operating condition until the end of PCC car operation in 1992.

After shipment of several of the cars to Brookville, where they could be completely disassembled before sandblasting of the car frame, it was found that corrosion was more severe than expected in the area where the cant rail and the roof carlines attach. The original design of the car wrapped the roof sheets over the side sheet top, with a spot-welded connection. Over the years water had wicked up into the area, which, together with condensation, had seriously rotted the cant rail and the carlines. It was decided to remove the entire carline and roof assembly and replace it with a new one. The cant rail was overlaid with a new member designed to provide the needed attachment strength for the new roof. The rest of the car body was found to be largely as expected, and new metal was supplied where corrosion had seriously weakened the existing members.

The specification allowed for the proposal of alternatives for the trucks and electrical equipment. After reviewing its options, Brookville proposed supplying its New Orleans truck, which fortunately was designed for a track gauge only 6 mm ($^1/_4$ inch) wider than Philadelphia's, and this was adopted. The truck uses an articulated frame similar in principle to some PCC car trucks built in Europe. The cross arms, which ensure rectangularity and carry the traction motors, are welded to one side frame and are flexibly connected by means of a rubber bushing to the opposite side frame. Rubber chevrons are supplied at the axles to provide cushioning of track inputs. The secondary suspension uses coil springs between side frame and bolster, and the bolster interfaces with the car body by using the standard PCC car kingpin. New SAB-type resilient wheels from Penn Machine, which are identical to those used on SEPTA's Kawasaki car fleet, are fitted to the axles.

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A spring-applied, electric solenoid–released disc brake is mounted on each right-angle gear drive unit at the motor shaft input. The actuating mechanism and the track brakes are supplied from the Czech Republic and are used on PCC cars there. The mounting of the brake on the gear unit—which was done on PCC cars converted from tread to shaft brakes—allows easy use of motors other than those that came with the cars, which had the brake mechanism mounted to the motor frame.

Brookville proposed replacing all the PCC propulsion equipment on the car with new AC traction motors and electronic controls from Vossloh/Kiepe Electrik of Germany, rather than overhauling the old motors, and providing a new chopper control as specified. The added cost was split between SEPTA and Brookville.

The equipment package used is minimally changed from that used on the Skoda-built cars operating on the Portland streetcar line. Two equipment boxes are used. One contains an IGBT traction inverter driving the AC motors of one truck and a 4.3-kW IGBT 12/24-volt DC supply, and the other contains a traction inverter driving the motors of the other truck and an IGBT 208-volt, three-phase, 28-kW inverter to supply power for the air conditioner and other auxiliary needs. Some underframe members of the car were modified in section detail and location so that the inverter boxes can readily slide out from under the car when repairs are needed.

Since the project required complete wiring renewal, the cost differential for AC equipment was not great and was economic from a life-cycle cost standpoint. The traction motors are of the totally enclosed type, with an external fan to push cooling air through external passages in the motor frame and an internal fan to circulate air and keep internal temperatures equalized. The arrangement is optimal for a streetcar service in which salt water and snow are experienced frequently. With each motor rated at 50 kW (67 hp), there is ample power to meet PCC levels of performance on the now-heavier 21,092-kg (46,500-lb) air-conditioned car. Loaded-car acceleration and service braking rates of 1.34 meters per second per second (3.0 miles per hour per second) are provided, with braking being regenerative whenever the power line is receptive. The Kiepe operator's control

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pedals and the Brookville console are all new and are patterned after the equipment on SEPTA's Kawasaki streetcars, the goal being to maintain as much similarity of operation as possible.

Car interiors are basically all new. Only the overhauled door operators and lights remain from the original car, and passenger seats are recycled from retired SEPTA buses. Interior lighting remains the "bull's-eye" type characteristic of PCC cars but now uses 120-volt AC lamps instead of being powered from the 600-volt DC line. Formed glass fiber–reinforced plastic panels that cover the interior structure and new flooring provide a contemporary appearance.

New windows were installed, which are sealed, as is typical with modern air-conditioned cars. Air-conditioning is provided by a roof-mounted 120,000-Btu (30,240-kcal) dual scroll compressor system supplied by ThermoKing and powered by the 230-volt AC supply. The use of roof-mounted distribution ducts has allowed preservation of the roomy interior typical of PCC cars and held noise to a minimum. Heating is a combination of overhead and floor heat.

Both front and center stepwells have been replaced with new stainless steel fabrications. At the center doors a Stewart and Stevens lift is fitted to provide Americans with Disabilities Act–compliant access, patterned after the installation in the Kenosha PCC car fleet.

The resulting rail car is a remarkable combination of heritage appearance and modern technology that will be able to supply comfortable, reliable service to the public for decades.

—Russell E. Jackson

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Light rail junction at interchange of 1-25 and 1-225 in Denver. (Photo courtesy of Richard F. Clarke.)

T-REX PROJECT NEARS COMPLETION IN DENVER

Voters in Denver approved FasTracks 7 years after rejecting a similar proposal. The transportation expansion project is moving at full speed.

The Transportation Expansion (T-REX) project in Denver is successfully nearing completion with revenue service scheduled for December 2006. The project is a joint effort between the Colorado Department of Transportation and the Regional Transportation District (RTD) and includes expansion of I-25/I-225 and 19 miles of new light rail transit in Denver's southeast corridor. This will more than double RTD's existing 16 miles of LRT.

Light rail components of the project include 19 miles of fully grade-separated, double-track alignment; 13 stations; more than 6,000 parking spaces that include five parking structures; a new 125,000–square foot maintenance facility; a new communications and control system; and 34 light rail vehicles (LRVs). An upgraded wayside signal system incorporates automatic train stop with the capability to convert to cab signals in the future.

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The LRT component of the project will cost $879 million, or approximately $46 million per mile. The entire T-REX project has a cost of $1.7 billion.

Most of the work is being accomplished under a $1.2 billion design–build contract awarded to Southeast Corridor Constructors, a joint venture of Kiewit and Parsons Transportation Group. The contract was 79% complete as of the end of December 2004. Integrated testing started in December 2004 on the first 2.5 miles between Broadway and University.

A significant part of the ongoing work is at the interchange of I-25 and I-225. The highway interchange is being completely rebuilt. Within the reconstructed interchange will be a grade-separated light rail junction with a full wye and No. 20 turnouts. This is a fairly unusual feature in new light rail systems. However, the grade separation and high-speed switches will provide a high level of operating performance and flexibility. The photo shows the junction, including major structural work with highway and LRT bridges and tunnels.

A major focus of the remainder of the project will be completion of track and systems work, with a continuing emphasis on project quality and integrated and prerevenue testing. The project remains within budget and on schedule for a December 2006 revenue service date.

The 34 SD-160 model LRVs are being manufactured under a $90 million contract with Siemens. Similar to RTD's existing fleet of 49 Siemens LRVs, this model incorporates AC propulsion, LED sign displays, and upgraded public address systems.

Also, in November 2004, Denver area voters approved the FasTracks initiative. This increased the RTD sales tax from 0.6% to 1.0%. It will fund a $4.7 billion, 119-mile expansion of fixed guideway in the Denver region to include LRT, commuter rail, and bus rapid transit. The passage of FasTracks by 57% reflects the popularity of LRT in Denver and a record of project and service delivery by RTD.

—Richard F. Clarke

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A three-section Red line car at Tallaght terminus. (Photo courtesy of John and Joyce Aurelius.)

LUAS MEANS "SWIFT" IN DUBLIN

First Impressions of the New Line in Ireland—Trip Report, January 2005

The new light rail system in Dublin, Ireland, is called Luas, which means "swift." It has two unconnected routes. The River Liffey runs east–west across the center of the city and empties into Dublin Harbor and Dublin Bay to the east of the city. In the central business district the river is about 50 meters wide and is crossed by several bridges. The Grand Canal also runs east–west, generally less than 1 kilometer (it varies) to the south of the river, connecting into it at its eastern end.

Luas is operated by Connex, a large multimodal firm based in France. Dublin Bus is a separate operation, and there is little sign of bus and rail coordination. There are no bus–rail transfers, but rail ticket machines offer bus and rail combination passes with a magnetic stripe for ticket readers on buses. The bus company machines at the airport do not offer these combination passes. There is also some fare coordination with the DART suburban railroad services.

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The Citadis cars are redlined at 70 kilometers per hour, about the speed PCC streetcars would balance at. Outside appearance is sleek, a metallic silver with a slight lavender tinge. Inside, purple is the dominant color; seat frames are purple and squabs are upholstered in purple with black and blue in a random pattern. Posts and handrails are bright Chinese yellow, which clashes with the overall decor. The aisle is all at or near entry level, but over the bogies the seats are on boxes, facing, with raised foot space. There are more standing spaces than seats. The low-floor cars allow level entry from station platforms. Most stops are at ground level and should present no difficulty to people using wheelchairs. Two stops we noticed on the Green line (Charlemont and Dundrum) are fairly high up at one end but may be ramp accessible at the other; we observed no elevators.

A fair amount of Luas downtown operation is on streets, most of it segregated from traffic but without priority at traffic signals. Outside downtown there is considerable private right-of-way. There are no railway signals, but distinctive light rail signal heads are placed at each traffic light; others show how crossovers are set, and so forth. All overhead wire is simple trolley. At least some power substations are underground. All trains we observed used single cars.

Fare collection is by proof of payment, and there are ticket machines at every stop. There is also a kiosk at each station with a display showing minutes until the next tram, which seemed generally accurate. The fare machines, as in many other cities, are not very intuitive to customers. There are six zones, Red 4, Red 3, Red 2, Central 1, Green 2, and Green 3. End-to-end six-zone tickets are available, but it is a 15-minute walk between the Green line St. Stephen's Green terminus south of the river and the Red line at Abbey Street stop north of it. We bought 1-week combo passes, good in all zones and on buses, at €23 each.

The Green line uses both five- and three-section Citadis cars. It goes southeast 9 kilometers from St. Stephen's Green West, south of the river in the heart of the city, to Sandyford, a 25-minute trip. It runs two blocks along the green, then four blocks on Harcourt Street (with a stop), to Adelaide Road. After a series of turns it crosses the Grand Canal at Charlemont (stop) and gets onto the former Harcourt Street heavy rail corridor. It

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runs along backyards, which generally are walled off from the right-of-way. There are 10 more stops to Sandyford.

The Red line uses three-section Citadis cars, which on Saturday evening were observed so full as to be passing up riders. It goes west from Connolly Station north of the river, crosses the river to Heuston Station, then continues southwest to Tallaght, 15 kilometers in all, a 45-minute trip. The Connolly stop is on Ames Street, and after a long block it turns right (west) to Abbey Street and stops at Busaras, the intercity bus station. It continues west on the street as its name changes, passing Abbey, Jervis, Four Courts, Smithfield (Guinness Storehouse and Jameson Old Distillery), and Museum stops. It turns south to cross the river with a stop in front of Heuston Station. Next there are some tight turns as it reaches the St. James's (Hospital) and Fatima stops. From this point the line is relatively straight past the Rialto stop. It continues west along the Grand Canal for 1 kilometer, making four stops. Then it follows NAAS Road for 2 kilometers to Red Cow with only two intermediate stops. Red Cow is a major (and notorious) highway interchange and roundabout where the N7 meets the M50 circular route. The LR follows the roundabout and runs south alongside the M50 for nearly 1 kilometer, passing the Red line car barn. It turns southwest for 1 kilometer and southeast on Cookstown Road for 500 meters. It finally turns east to end at the Tallaght stop, across Blessington Road from "the Square," a large shopping center.

—John and Joyce Aurelius

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http://gulliver.trb.org/publications/lrtnews/lrtv18n1.pdf (May 2003)

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Intercity Rail Passenger Systems Update
http://gulliver.trb.org/publications/irps/irps_10.pdf (Fall 2004)

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