

TRAM SYSTEM IN BORDEAUX
REPORT ON THE TRAM SYSTEM
AND UNDERGROUND POWER SUPPLY (APS)
FOR
DUBLIN CITY BUSINESS ASSOCIATION
PREPARED BY : BRENDAN FINN, ETTS LTD.
7TH DECEMBER 2007

Communauté urbaine de Bordeaux

Bordeaux city centre is compact with a relatively high level of residential density compared to Dublin. The City has high historic importance, with much of the core city dating from the 17th and 18th centuries. There is a high priority both nationally and locally that the character of the city is retained. Over the past decade, there has been an ongoing and substantial program of refurbishment and enhancement of the city.

CUB has set four key priorities for the city, one of which is to improve the transportation system and to achieve a mode shift to public transport. Within this priority, a key theme is to optimise the travel.

Passenger Transport in Bordeaux

The CUB is the transport authority for Bordeaux and holds all authority for planning, implementation and regulation of the passenger transport. As in most French cities, a single franchise has been granted for the operation of the passenger transport services. The franchise covers both the tram and bus services. Veolia (Connex) currently holds this franchise.

The public transport consists of three main elements, all of which are operated by Veolia :

- ◆ 3 tram lines
- ◆ 100 bus lines
- ◆ 9 Park'n'Ride sites

The investments for the public transport are made by the CUB. In addition to the investments in the tram and bus systems, there is a current program of constructing passenger interchanges between the tram and the SNCF (national rail) at the main stations, and between the tram and inter-urban buses.

There is a single trip tariff of €1.30 which allows transfers during a fixed time period. 10-journeys tickets are available at €10, and there are also weekly and other period tickets for regular travellers. The park'n'ride sites are charged at €2.60 per visit, covering both parking and tram travel. An interesting aspect is that the travel is allowed to as many people as are in the car. CUB provides financial assistance for these parking sites.

There is some access restriction for cars in the city centre, mostly related to the pedestrianised and core shopping streets. There are no financial disincentives (e.g. access charges). Underground parking has been provided in the central area to replace on-street parking.

History of the Tram in Bordeaux

Bordeaux had an extensive tram system in the past, but this was systematically closed by the early 1950's. Mayor Jacques Chaban Delmas was Mayor for 46 years and strongly promoted a roads program, but by the mid 1980's Bordeaux was suffering badly from traffic congestion. Delmas then supported an underground railway (VAL) and opposed surface options such as tram. However, the soil conditions in Bordeaux would have presented serious technical challenges, and the cost was deemed to be very high.

When Alain Juppé became Mayor in 1995, the VAL concept was dropped and the decision was taken in 1997 to develop a tramway system. It was decided to implement in two phases :

Phase 1 : Three lines totalling 24.5 km (opened in 2003)

Phase 2 : Seven extensions bringing the total to 43 km (already underway)

The decision was taken to build all three lines of Phase 1 together. They knew this would cause serious disruption, but decided to press ahead since the city was under serious pressure from traffic, and they felt it was better "to annoy people only once".

The construction period lasted 4 years, and there was considerable disruption. Services were launched in late-2003.

Characteristics of the Bordeaux tram system

Trams

Trams are of Citadis type, manufactured by Alstom at La Rochelle. They are the same type as the trams used for Luas in Dublin.

The Bordeaux trams are of two lengths :

- ◆ 65 trams of 44-metre length
- ◆ 12 trams of 33-metre length

Trams are fully open internally so there is effectively a continuous carriage space. There is skirting around the base of the tram so that the perimeter of the tram virtually reaches the ground and excludes the possibility of people falling under it.

(Ed: The NSW R or VIC W6 trams proposed for Manly are around 14.3 metres long and would alter the required conductor rail segment length)

Power Supply

Power is supplied in two different ways.

- ◆ APS system, where the power is picked up from a third rail, is used in the central area and architecturally/aesthetically sensitive areas. In total, about 14 km of the system uses APS
- ◆ Overhead wires are used for the remainder of the network

Service Characteristics

- ◆ Service starts at 0500 every day
- ◆ Service finishes at 0000 on Monday through Thursday, and 0100 Friday, Saturday and Sunday
- ◆ Headways are typically 4 minutes in the peak, and about 8 minutes in the off-peak
- ◆ Commercial speed of 18 kph

Operating Speed

The commercial speed of 18 kph is relatively low, but much of the service operates in the central area with curves and close stop spacing. In these circumstances, this is a reasonable performance.

Ticketing

There are ticket vending and smart card top-up machines located at the platforms. Validators are located inside the vehicle. Single and multi-journey tickets are magnetic stripe tickets and must be inserted into the validator. Smartcards are also used and touched against the validator.

Interchange

There are planned interchanges as follows:

- ◆ 3 between tram lines
- ◆ 5 with SNCF (national rail)
- ◆ 3 with inter-urban bus

Passenger Information

Extensive Passenger Information is provided throughout the system. There is high quality printed material at all stops, especially at interchange stops.

Real time passenger information is provided at tram platforms. The normal mode is to provide the number of minutes to the next tram. It also provides information on disturbances, updates for passengers, and even information about jobs available on the tram and bus services.

Maintenance

The maintenance of the vehicles, track and power supply (except APS) is done under the contract to Veolia.

APS - Underground Power Supply

The power supply is an innovative aspect of the Bordeaux tram system. The APS system, 'Alimentation Par le Sol' (power supply from the ground) was developed for Bordeaux.

Motivation

The decision was taken primarily to preserve the cultural heritage and aesthetic quality of Bordeaux.

- ◆ The French Ministry of Culture had requested that the 18th Century buildings should be preserved
- ◆ The buildings are made of friable materials, so drilling the support for the catenaries into the walls would have damaged the materials and might not have been structurally sound
- ◆ The aesthetic value of the prospect along the banks of the Garonne and the bridge, as well as the central area was not consistent with prominent overhead wires and their support

Third rail technology has long been in use in metro systems, but passengers are excluded from the running way. The challenge was to find a safe way to have the power available to the trams, while ensuring there was zero risk to citizens who could walk freely over the rails. After some technical difficulties, a reliable, safe solution is now in place.

Principles

The APS system works on the following principles :

- ◆ An underground cable runs along the tramway, and acts as a power feeder
- ◆ A 'third rail' is aligned between the two running rails
- ◆ The rail consists of many short sections, each of which is connected to the main cable

- ◆ Power is only drawn down to the section when the tram is over it, otherwise it is grounded and passive. Therefore there is no dangerous area which needs to be protected, including in wet weather or flood conditions
- ◆ Ceramic insulators means that power cannot pass from one section to another, so only the part under the tram can ever be live
- ◆ The underside of the tram is fitted with two current collectors which pick-up the power

Switching between APS and catenary power supply is activated by the driver who presses a switch in the cab. This is done at tram stops. It takes about 15 seconds, or less than the normal stop dwell-time, so the switchover is not evident to the passengers.

Safety

The system is designed as a fail-safe system and it is not considered possible for pedestrians, road-users, passengers or others to come into contact with live rails. The record in Bordeaux is that there has not been a single such incident or accident involving the APS system.

Reliability

The system now has a high degree of reliability, meeting the contract level of 99.8%.

When the system was first implemented, there were teething problems. The CUB readily admit that they had the mandate and instruction to proceed before they had the mature technical solution, so there was quite a bit of 'learning by doing'. While the initial system worked reasonably well, there were reliability problems. In particular :

- ◆ The main cable had to be upgraded to improve connectivity. This was due to a combination of design problems and how the work had been executed. The cable had to be replaced.
- ◆ There were problems of seepage and moisture, so some aspects of the electrical units and housing, as well as insulators, etc. had to be redesigned.

The tram was launched in 2003. It took about two years to identify and resolve all the problems. They feel that performance data from early-2006 would reflect the stable system and the current level of performance. CUB is satisfied that they now have a robust, reliable system.

Investment Costs

CUB state that the APS costs about €1.5 million per km, covering all elements.

Other Cities using APS

Bordeaux was the first tram system to use APS, and were very much the guinea-pig. They were happy to play this role, since it showed Bordeaux as a city willing to innovate.

Since then, the following other locations have opted towards APS :

- ◆ Angers, Orleans and Rheims have already implemented APS
- ◆ Toulouse have implemented their current tram system on conventional catenary power supply, but have provided the capability to use APS in future system expansions
- ◆ Dubai is currently signing a contract to use UPS for their new tram system

Could APS be used in Dublin?

All of the experience and information at Bordeaux indicates that APS could be used successfully in Dublin, and there was no evident factor which would make a strong case against doing so.

From “Dublin City Business Association” published on <http://www.dcba.ie> on 05/05/2008.