

# INTERNATIONAL ROAD TRANSPORT CONFERENCE NANTES – LINE 4 BUSWAY©

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## SUMMARY

The line 4 BusWay© has expanded the dedicated lane public transport framework system, composed of 3 tramway lines, to serve the south eastern section the greater Nantes area. The line was built in the context of the master plan for public transportation, which is one of the initiatives of the urban transit plan.

Line 4 is 7 km long and has 15 stations. It connects the ring road (Porte de Vertou) to the centre of Nantes in less than 20 minutes, with a frequency of 4 minutes at peak times. Four park-and-ride car parks with a total capacity of 800 parking places are located along the line, which was placed in service on 6 November 2006.

The line 4 BusWay© took the elements that made the tramway a success (dedicated lane, stations, priority at intersections, high frequency and extended hours) and applied them to a bus system.

## 1. THE BUSWAY© IN THE NANTES PUBLIC TRANSIT SYSTEM

Nantes Métropole is a conurbation of 24 communes and has nearly 600,000 inhabitants. In 1990, the conurbation developed its first urban transit plan. The latest plan, drafted in 2000, aims to reach a balance between private cars and other modes of transit.

The first modern tramway line was opened in 1985, followed in 1992 by a second line, and in 2000 by a third. The tramway system has been extended several times (figure 1), and today, at 40 km, is the longest in France.

To complete the network, composed of 5 branches radiating out from a central hub, it was necessary to build a line serving the south eastern section of the conurbation.

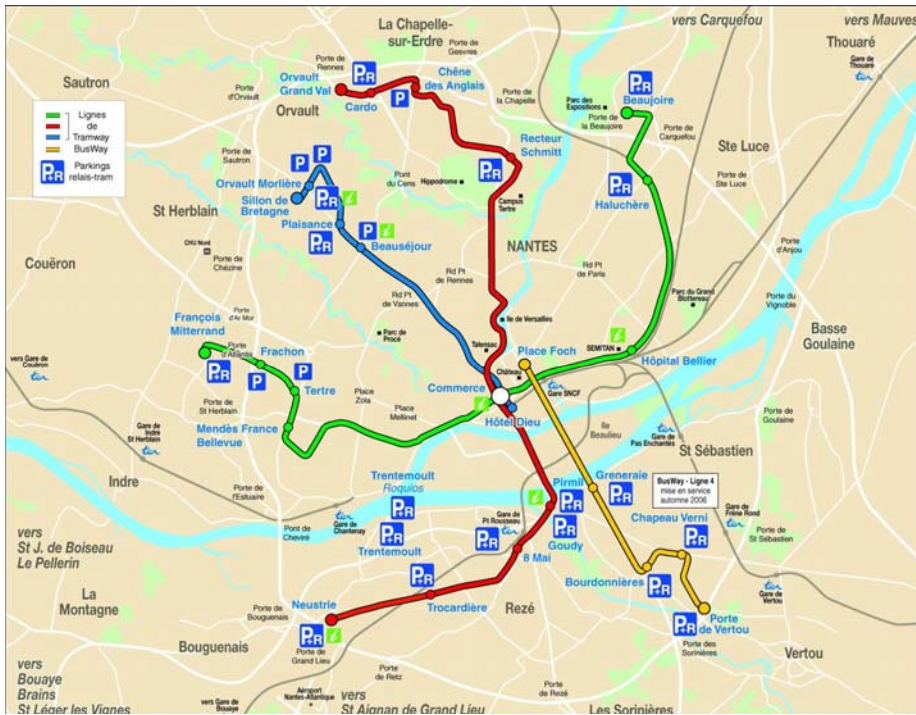


Figure 1 – Map of the Nantes Tram and BusWay© System

However, based on studies on the expected users of this section, and because the central government no longer provides funding for dedicated lane public transit systems, local officials began looking for a less expensive solution, using buses, that would perform as well as the tramway.

## 2. THE CHARACTERISTICS OF THE LINE 4 BUSWAY©

Along most of its route, line 4 runs on a former expressway that has been converted into an urban boulevard, providing access (including disabled access) to adjacent roads and public spaces.

### 2.1. Using the features that made the tramway a success

#### 2.1.1. A dedicated lane along virtually the entire route

On virtually the entire 7 kilometre route, the BusWay© runs in a dedicated lane enabling it to circumvent traffic conditions. Several types of systems were used:

- The two-way central dedicated lane, raised (6 or 14 cm) or level (on bridges), delimited by a light coloured border, with or without a central island

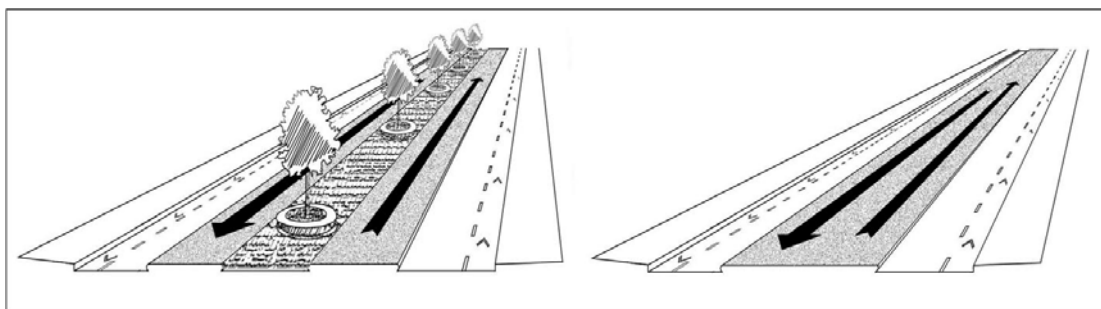


Figure 2 – Dedicated central lane with and without central island

- The alternating one-way central dedicated lane: When there is not enough space, this system allows the bus to have priority when approaching intersections, as the other direction is with the flow of traffic.

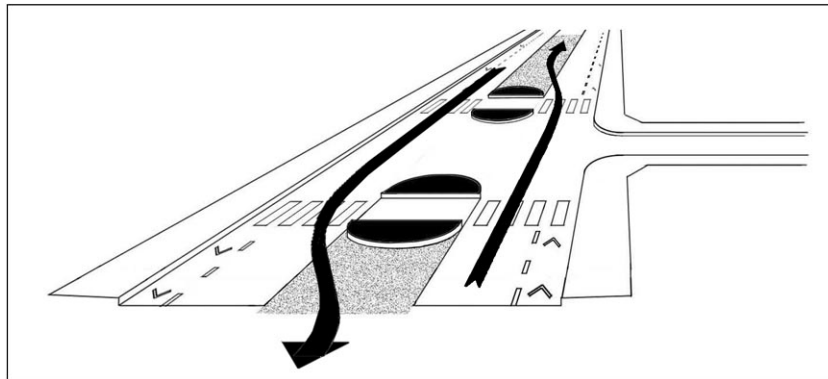


Figure 3 – Alternating dedicated central lane

- Mixed traffic: The BusWay© shares the lane with normal traffic, but has priority thanks to a traffic signal at the approach to intersections.

### 2.1.2. Well-Equipped Stations

The stations are designed with wide platforms (3 m minimum) for the users' convenience, with all the necessary equipment (shelters, real-time information panels, ticket distributors, system plan). The stations are treated as plazas, with the speed limited to 30 km/h, and the traffic flow in both directions is slowed by means of horizontal and vertical speed bumps. Pedestrians cross the street between the sidewalk and the platform at street-level crosswalks located 27 cm above the BusWay© lane. Level crosswalks are located at the station entrances and exits.

The platform height allows direct accessibility to the BusWay© for all users.

Tickets are not sold on board (distributors are located on the platform) and passengers can use any of the doors to enter and exit, for faster flow.



Figure 4 – Central view of a station

### 2.1.3. Priority at Intersections

A dedicated lane is not enough to ensure the performance level desired. The BusWay<sup>©</sup> must also be able to cross intersections safely and quickly.

The vehicles are equipped with transponders that signal loop detectors at the approach to intersections, which triggers red lights to stop traffic. Loop detectors located at intersection exits turn off the red lights so that traffic can resume its normal flow. The BusWay<sup>©</sup> is given signal priority, which means it stops only at the stations. And normal traffic is hardly disrupted (the BusWay<sup>©</sup> takes only about 12 seconds to cross an intersection).

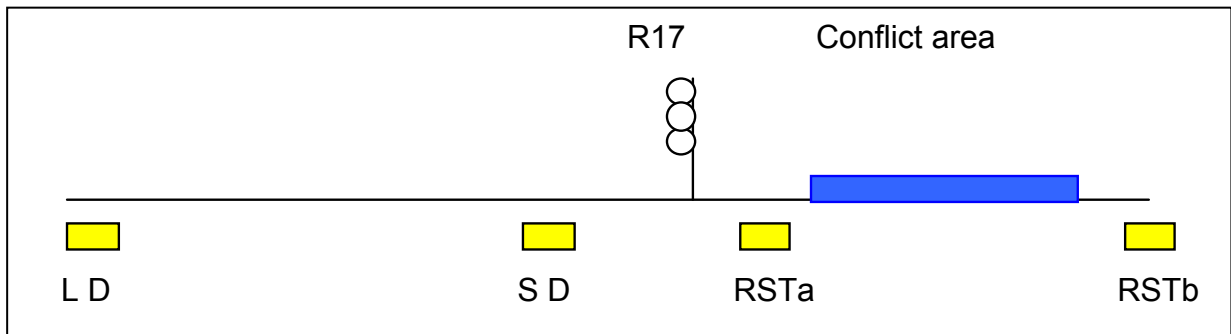


Figure 5 – BusWay<sup>©</sup> sensor system for priority at intersections

The BusWay<sup>©</sup> uses a railroad type signalling system (R17 signals equipped with a driving assistance system [Figures 9 and 10]) as well as standard traffic signals (R24 flashing red lights, in pairs so there is always one on [Figure 11]).

Most of the intersections are treated as roundabouts, with the BusWay<sup>©</sup> driving straight through the middle.

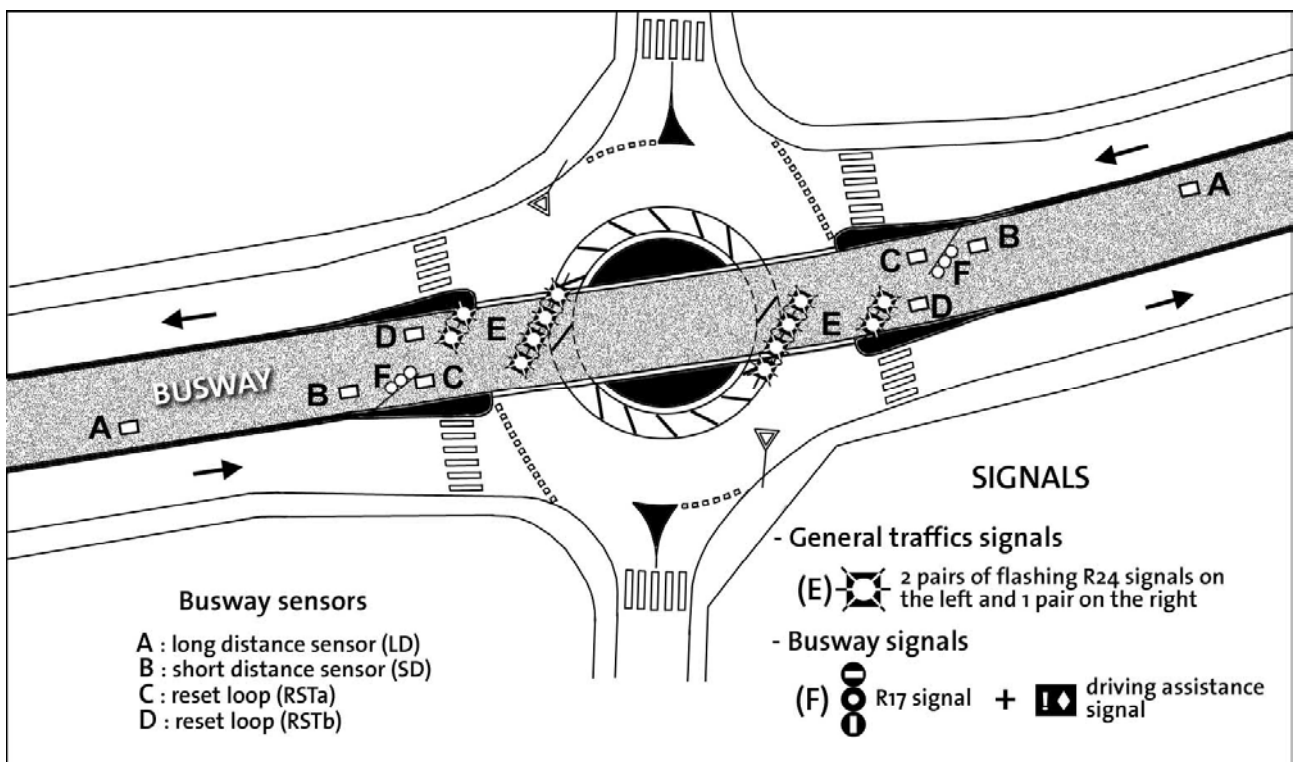


Figure 6 – Example of a roundabout crossing

### 2.1.4. Expanded Hours and High Frequency

The BusWay© line is part of the conurbation’s framework transit system, and has the same operating hours as the tramway, from 5 AM to 12:30 AM (2:30 AM on the weekends). It is also a high-frequency service during peak times (4 minutes) as well as in off-peak hours (6 to 7 minutes).

### 2.1.5. Park-and-Ride Car Parks

Along the line, park-and-ride lots enabling drivers to switch over to the public transit system are located at the intersection of major arteries, which now carry much less traffic (one expressway has been reduced from 2x2 lanes to 2x1 lane). The car parks have a total of 800 parking spaces.

## 2.2. Bus Features

### 2.2.1 The Bus Lane

The BusWay© drives on tyres, not on a track. So it was necessary to design a lane that could withstand very heavy use, especially in and around the stations (breaking and acceleration) where there is a significant risk of rutting. The lane is therefore composed of a heavy structure, with a special asphalt layer on the driving sections (asphalt with shot blasting) and at the stations (percolated asphalt with concrete grout).

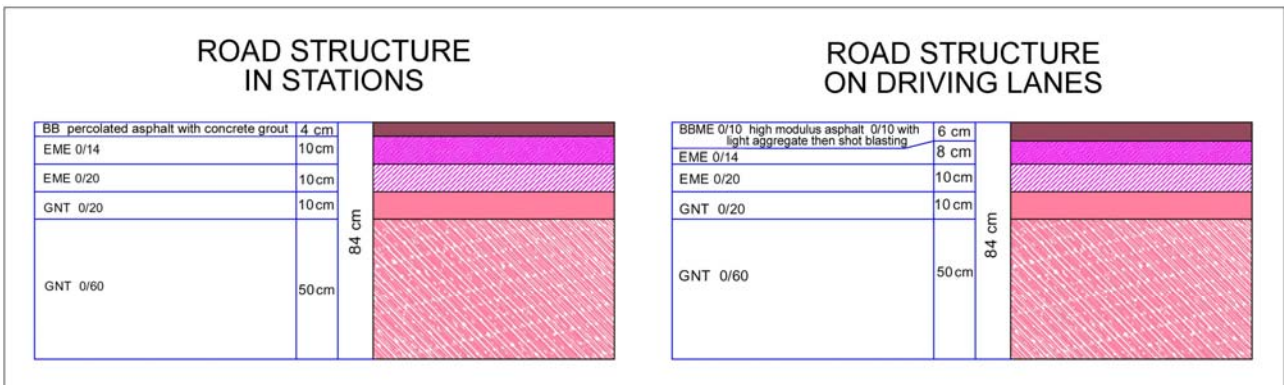


Figure 7 – Cut-away views of typical road structures

### 2.2.2 Station Docking

The BusWay<sup>®</sup> is not equipped with a guidance system. However, it is important to keep the space between the vehicle and the platform to a minimum to facilitate access for all users. This is why the stations are all positioned on straight sections, with straight approaches. Along the stopping area, there is a bevelled, polished granite curb where the bus types can rub without risk of damage. On the upper part, a shock-absorbing neoprene system prevents damage to the body of the vehicle.

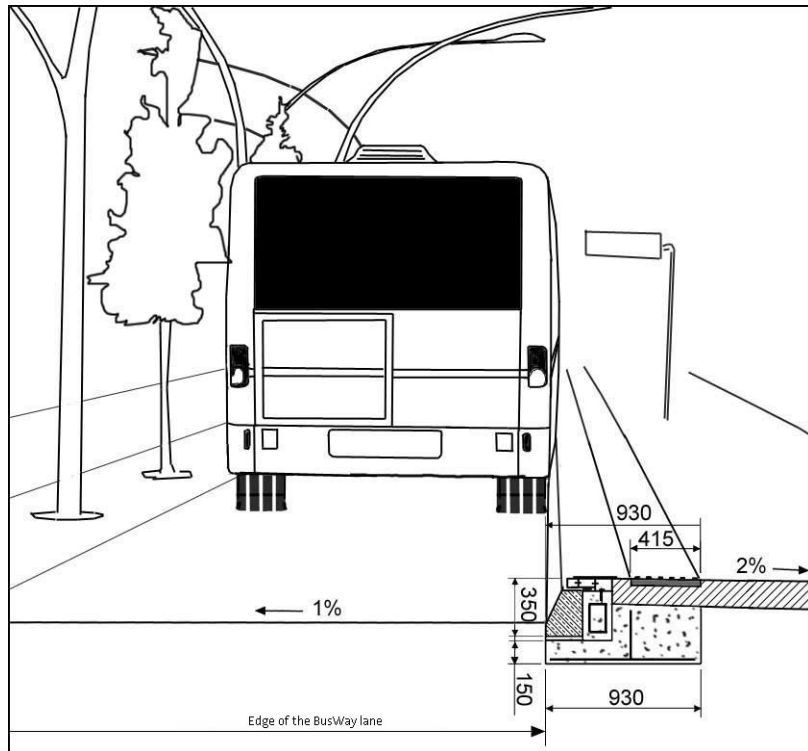


Figure 8 – View of station docking

### 2.2.3. Railroad Signals

Line 4 has received a special waiver from the Transport Ministry as an experiment in using railroad type signals (R17 signals equipped with a driving assistance signal and R24 lights). For the Nantes system, this means that the BusWay signal system is the same as for the tramway lines. At a national level, the experiment will test whether this type of signalling is as effective for the bus as for the tramway if the dedicated lane is used in the same way.



Figure 9 – R17 Light



Figure 10 – SAC – Driving Assistance Signal



Figure 11 – R24 Light

## 2.3. The Vehicles

In order to avoid problems associated with new equipment (break-in period), the vehicles are based on a standard 18-m articulated bus running on natural gas.

However, several options distinguish them from the other buses on the network:

2.3.1 *A specific colour scheme* (metallic grey, black, with an orange border, instead of green and white like the rest of the network) with streamlining on the wheels and roof



Figure 12 – BusWay©

2.3.2 *Four sliding doors* to facilitate entry and exit

2.3.3 *A mini exit ramp* on the central doors for direct access to the platform (accessibility for all). There are two wheelchair spaces next to the second door.

2.3.4 *Interior improvements* with comfortable seats, large open spaces near the central doors featuring fold-up seats that free up space during rush hour and provide comfortable seating at other times.

2.3.5 *A closed area for the driver* (no tickets are sold on board so the driver can concentrate on his driving, especially at the stations, to ensure precision docking and pedestrian safety).

2.3.6 *Indirect lighting* that gives a different atmosphere.

2.3.7 *Double-glazed windows* to help maintain a comfortable temperature inside and prevent the windows from fogging.

2.3.8 *Animated line diagrams* so users can tell where they are at all times

2.3.9 *Screens* that provide connection times with the other lines as the vehicle approaches transfer stations

### **3. THE FIRST RESULTS**

The SEMITAN, mandated by Nantes Métropole, conducted the operation. The line was placed in service on 6 November 2006, after two years of construction (including 18 months that severely disrupted traffic) and is operated by the SEMITAN.

#### **3.1. Ridership**

The line quickly drew substantial ridership, increasing from 17,000 users per day when it went into service, to 21,000 after four months. The park-and-ride lots are always full, and expansion projects are under way.

#### **3.2. Safety**

Drivers of private cars respect the dedicated lane, and they also understand and respect the traffic signals. There have been no accidents to date. A special effort was made to enable pedestrians to cross the street to and from stations safely. The notion of “30 km/h zone” was not explicit enough, so traditional pedestrian crossing signage was implemented.

#### **3.3. What's Next ?**

Given the crowding at peak hours, the frequency is going to be brought down to 3-1/2 minutes in September 2007. With the current fleet of 20 vehicles, it will be possible to decrease the frequency to 3 minutes.

After that, larger capacity vehicles may be required, such as bi-articulated vehicles (24 m). The route may also eventually be converted to a tramway line.