EUPAVE
EUROPEAN CONCRETE PAVING ASSOCIATION

"Concrete: a Sustainable Partner of Urban Transport Infrastructure"

In the beginning of the 20th century, many European cities had a tramway, but those disappeared around the 1950's when the car became the modern way of transportation and metro lines were built in the big cities. However, tramways made their come-back in the 1990's when the cities started rethinking their mobility concept and spatial planning. Together with bus transport, cycling and walking, they are today the dominant transport modes in urban areas. Both trams and buses require a high quality and, if possible, dedicated infrastructure, for which concrete offers safe and reliable long life solutions.

Tramway in Saint-Priest (Lyon), France

(Photo: Cimbéton, Revue Routes 84, 2003)

Cities worldwide are facing problems of traffic congestion in their centres and suburban areas as well as on access roads. Everyone is familiar with the disadvantages of traffic jams: delays, the economic and social price, air pollution etc. This situation is no longer acceptable for many road users and certainly not for city residents. Policy makers are therefore opting for a sustainable transport policy by reducing car traffic in and around cities.
As regards short journeys, there is a focus on cyclists and pedestrians, for example by creating car free zones and cycle paths. Public transport is the main solution for longer journeys inside and outside cities by providing new or bigger capacity bus, tram and train links.
Adapted infrastructure is needed to optimise these modes of transport, in particular dedicated lanes that enable buses and/or trams to travel without impediment.

HIGH QUALITY BUSCONNECTIONS

A bus lane has to meet an exceptional combination of requirements. Buses come into the category of heavy vehicles with their specific axle loads, which depend on the type of bus (public transport, tourism, double-deckers, articulated...). The frequency on bus lanes, particularly near bus stations, can rise to several vehicles per minute and the daily traffic load to over 500 buses a day.
Bus traffic in cities travels at a relatively low speed and is channelled, i.e. the tyres always travel along the same track. These conditions are very deleterious for flexible road surfaces and lead to rutting. The braking and torsional forces on the road surface also create additional loads, causing surface problems on asphalt pavements.
A road in general and a bus lane in particular must comply with the following criteria:

Reliability

A passenger transport company wants an infrastructure, in this case a bus lane, of which the use in the best possible conditions can be guaranteed during the anticipated periods of operation. After all, this has a direct impact on the reliability and punctuality of the public transport system and consequently on passenger satisfaction. This can be achieved by a durable pavement which needs little or no maintenance over its lifetime.

Economics

The limited budgets which most road managers and transport companies are being faced with are obliging them to make economically feasible investments. A prudent manager will not just take the initial costs into account but also the costs during the entire service life, including all maintenance, repairs, structural improvements and end-of-life phase.
It is known that concrete pavement can have a long service life requiring minimum maintenance. Higher investment costs are therefore easily compensated for during the operational phase, particularly when financial penalties are foreseen for non-availability of the system.

Safety

The skid resistance and transverse evenness of a road surface are very important as far as safety is concerned. The skid resistance determines how much grip a vehicle has on the pavement and is directly related to the braking distance. A typical issue of transverse evenness is rutting of asphalt layers, which is a problem for a stable road-holding of the vehicle and a possible cause of aquaplaning in wet weather conditions.
A well-designed concrete pavement maintains very

Brussels, dedicated buslane (Photo: A. Nullens for FEBELCEM)

Tramway in exposed aggregate concrete on the boulevards des Maréchaux in Paris, France (Photo: Cimbéton, Revue Routes 97, 2006)

good skid resistance from day one for decades. Rutting does not occur with concrete bus lanes.

Comfort

The most relevant factor for a comfortable pavement is the longitudinal evenness. After all, undulations, corrugations and potholes are easily felt by road users, particularly by passengers in a bus. A concrete pavement, if properly built, will have a smooth surface that remains smooth throughout the entire surface life.

Aesthetics

It is often desirable, particularly in an urban environment, to integrate the pavement in aesthetic terms into the cityscape. Coloured or patterned surfaces offer considerable possibilities. The recognisability of the lane can be another reason for selecting a coloured concrete surface.

Modern high quality urban transport systems are flexible, comfortable, safe and environmentally-friendly. Buses can be guided in a mechanic or electronic way or alternatively, a tramway on tyres, guided by a central rail, is possible. Concrete platforms in either plain or reinforced concrete offer adequate infrastructure.

LIGHT-RAIL AND TRAMWAYS

Already in the 1990's tramway construction projects were going on in several European cities e.g. Sheffield, Munich, Nantes, Grenoble and Utrecht. Many of them were built following the "slab track" design, which is basically a concept for (high speed) rail where the aggregate ballast is replaced with a concrete base slab. Different technical solutions exist to combine the rails with the concrete structure:

- Embedment of the rail in a groove in the concrete slab;
- Discrete fixation of the rail on the slab;
- Use of prefabricated elements (beams, slabs) with integrated rails;
- Embedding precast concrete sleepers in the structure by pouring concrete around them.

Urban public transport often combines buses and trams and infrastructure can be shared by both systems. The design must take into account a large number of technical and operational requirements such as the resistance to channelled bus traffic, the control of vibrations caused by the tram, the possible replacement of the rails and a minimal disruption during construction.

Buslane for a trolley-bus, The Netherlands

Dedicated buslane in Sénart, France (Photo: Cimbéton, Revue Routes 118, 2011)

Tramway on tyres in Caen, France (Photo: Cimbéton, Revue Routes 86,2003)

Combined bus-tramway in Antwerp, Belgium
(Photo: FEBELCEM)

Imprinted concrete for a tramway in Brussels, Belgium
(Photo: FEBELCEM)

This can be achieved through the slab track concept with on top of it a traditional road pavement in doweled reinforced slabs or in continuously reinforced concrete. As desired by architects and urban landscapers, a decorative surface finishing with a coloured exposed aggregate or pattern imprinted concrete makes it a visually attractive public space.

Exposed aggregate concrete for a tramway in Reims, France
(Photo: Cimbéton, Revue Routes 119, 2012)

Red resine coated concrete lane for trolleybuses,
Avenida del Mar in Castellón, Spain (Photo: CEMEX)

Concrete platforms are the choice for the future.

A sustainable transport mode can be linked to sustainable construction by selecting concrete as pavement material. A concrete pavement achieves outstanding scores in both LCA (life cycle assessment – environmental impact) and LCCA (life cycle cost analysis – economics) studies because it contains natural constituents, it is completely recyclable, it is not harmful to the environment, it is available close to the project and above all it has excellent functional performance throughout an exceptionally long service life.

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