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6. Liefkenshoek Tunnel, Antwerp (Belgium)

Owner:	*Community Ministry for Public Works and Transport*
Concessionaire during the Construction Period:	*Joint Venture De Meyer – Van Laere – Betonac*
Concessionaire during the Operation Period:	*Tunnel Liefkenshoek Ltd.*
Construction started:	*July 1987*
Construction Period:	*4 years*
Service Date:	*July 1991*
Operation Period:	*18 years*

General

After the Waasland Tunnel and the Kennedy Tunnel, the Liefkenshoek Tunnel is to be the third road link under the Scheldt River in Antwerp. All transport can use this tunnel, even transport of hazardous products.

For the first time in Belgium the authorities, for budgetary reasons, have granted a concession to private persons allowing the construction of part of the public road network.

A group of Belgian contractors, the temporary joint venture De Meyer – Van Laere – Betonac, is building the tunnel at their own expense and in exchange they have been given the right to operate it for 18 years under a toll system. The users of the tunnel pay toll to the concessionaire thus allowing the latter to make up for his costs.

Design and Construction

The Liefkenshoek Tunnel is a motorway tunnel with two traffic tubes. In each direction there are two traffic lanes with a width of 3.75 m. On the walls of the traffic tubes a sprayed fire resistant coating and a fire resistant cover are applied; by this means a structural fire resistance for four hours is provided.

On both sides of the traffic tubes there are two ventilation ducts for the cross ventilation. Below them, there is a service shaft, where various public utility pipes are housed.

These shafts will serve also as emergency exits.

Escape passages are provided every 50 m in the traffic tubes by self closing fire proof doors.

Fig. 1: View of the construction dock

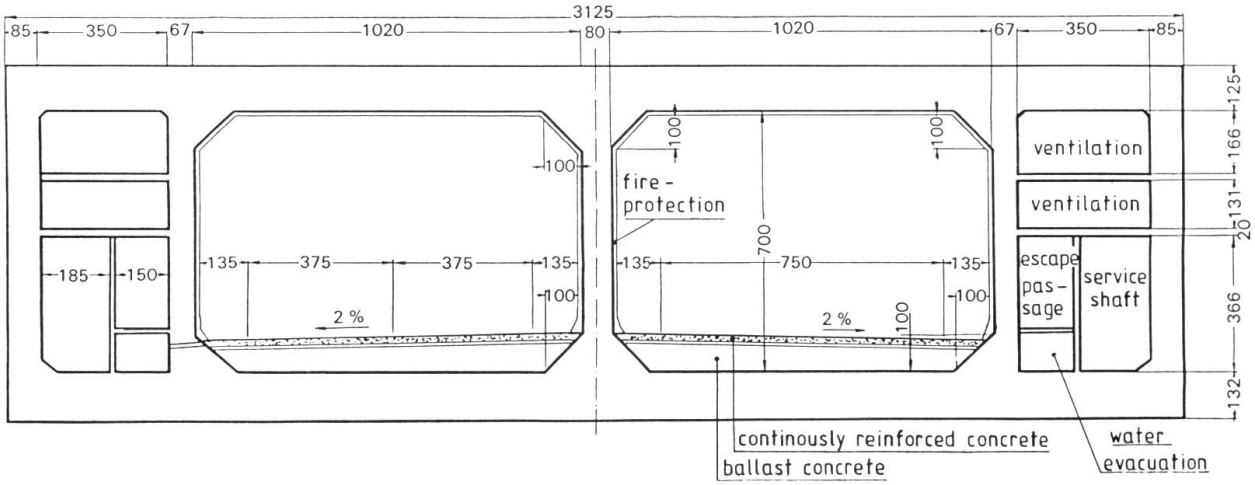

Fig. 2: Cross section

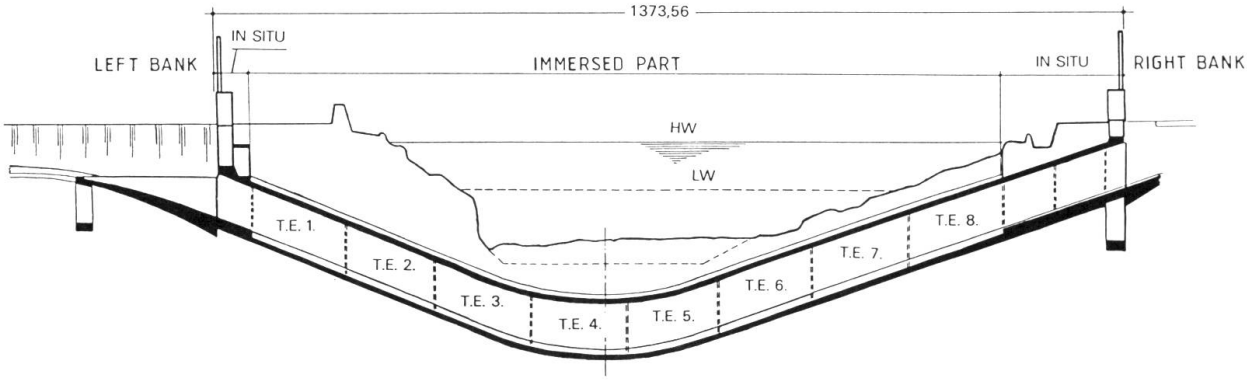

Fig. 3: Longitudinal section

All modern equipment is used in the Liefkenshoek Tunnel.

The 1373 m long tunnel consists of three parts:
An immersed part of 1136 m, in situ constructed tunnel-ends respectively of 50 m on the lift bank and 187 m on the right bank.

Eight tunnel elements are immersed. They were built in a dry-dock in the future Verrebroek dock in the Waasland harbour, on the left bank of the Scheldt.

Each element is 142 m long, 31 m wide and 10 m high.

The cement mixture is carefully chosen: waterproof concrete must be made, because no external water tight cover is used. 270 kg of blast furnace cement and 80 kg of fly ash are processed in the mixture.

Also a concrete-cooling system, to prevent thermal cracking, has been applied to the outer walls.

The tunnel is designed to resist also an internal static pressure of 5 bar as prevention by possible explosions. This action, together with extensive fire safety measures, is the reason for using about 160 kg of reinforcement per cubic meter of concrete.

After construction, and after installing the immersing facilities, each element is floated and tugged approximately 15 km to the immersing area.

The eight tunnel elements must be immersed in a previous dredged trench in the Scheldt. The immersion, started September 1989 and lasted 4 months.

Finishing works will be completed, so that in July 1991 the Liefkenshoek Tunnel will be a safe and fast link for all motorway traffic.

(M. Deplae)