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## 1. «Eau Rouge» Viaduct, Stavelot-Malmédy (Belgium)

**Owner:** *Ministry of Public Works*  
**Engineers:** *Bureau d'études Greisch*  
**Contractors:** *Ass. Mom. CEI – Galere – SBBM – Delens – Euro Jambes – Bageci – Franki – ABT*  
**Work duration:** *420 working days*  
**Service date:** *June 1991*

### General Description

The viaduct is being built on the motorway E42, which will connect the Belgian city of Verviers to Frankfurt in the Federal Republic of Germany.

At the bottom of the valley of the «Eau Rouge» the soil is saturated with acid carbonate water, whose pH-value is lower than 3. In order to avoid foundations in such an aggressive environment, the main span of the viaduct has to be increased up to 270 m. This span is bridged by twin 14 m spaced steel box arches: the gravity loads are transferred from the deck to the arches by a series of posts and diagonals. There are several lateral spans: one of 33.75 m and another of 45 m on the North approach, two of 45 m and one of 33.75 m on the South one. The total length of the bridge is 652.5 m.

The steel-concrete composite deck is 27 m wide in order to make allowance in each direction for two 3.75 m wide traffic lanes and an additional emergency lane.

### Infrastructure

Intermediate piers are 18 m to 42 m high. They are made of two hollow circular concrete columns built on separate foundation slabs. The outer and inner diameters of these columns are 3.6 m and 3 m respectively.

The springings of the arches rest on reinforced concrete bodies, the dimensions of which are 13 m × 20 m on the right bank (P6) and 20 m × 26 m on the left bank (P7); their slopes to the horizontal are 20° and 25° respectively. Each of these foundation slabs also supports twin circular concrete end piers having an outer diameter of 4.2 m and a height of 51.3 m and 44 m respectively.

Since they are located in an aggressive soil environment, the foundation slabs of the arches and of the piers are protected with a polyurethane membrane so as to prevent the concrete decay.

### Superstructure

The two steel arches of 270 m span are parabolic. Their minimum radius is 150 m while their height reaches about 50 m at the crown. The two box arches, which are spaced at 14 m, are not interconnected by bracings, except temporarily during erection. The spacing of the posts which support the deck is 33.75 m.

At the crown, the arch and the deck join together to form a single box girder of variable depth over a length of 67 m.

Each arch is composed of a square 2.7 m × 2.7 m steel box girder.

The deck is composed of a continuous composite steel-concrete girder, made of a U shaped steel section (with vertical webs) connected to a reinforced concrete slab by means of shear studs. The depth of the deck girder is constant (2 m) over 80% of the deck length; it varies from 2 m to 6.7 m where the crown of the arch and the deck join together.

The 26.7 m wide concrete deck slab is supported by the two webs of each of the two U shaped steel sections. Its thickness varies from 18 cm to 50 cm. The cantilevers are 5 m wide so that the clear span between the U sections is 11.3 m.

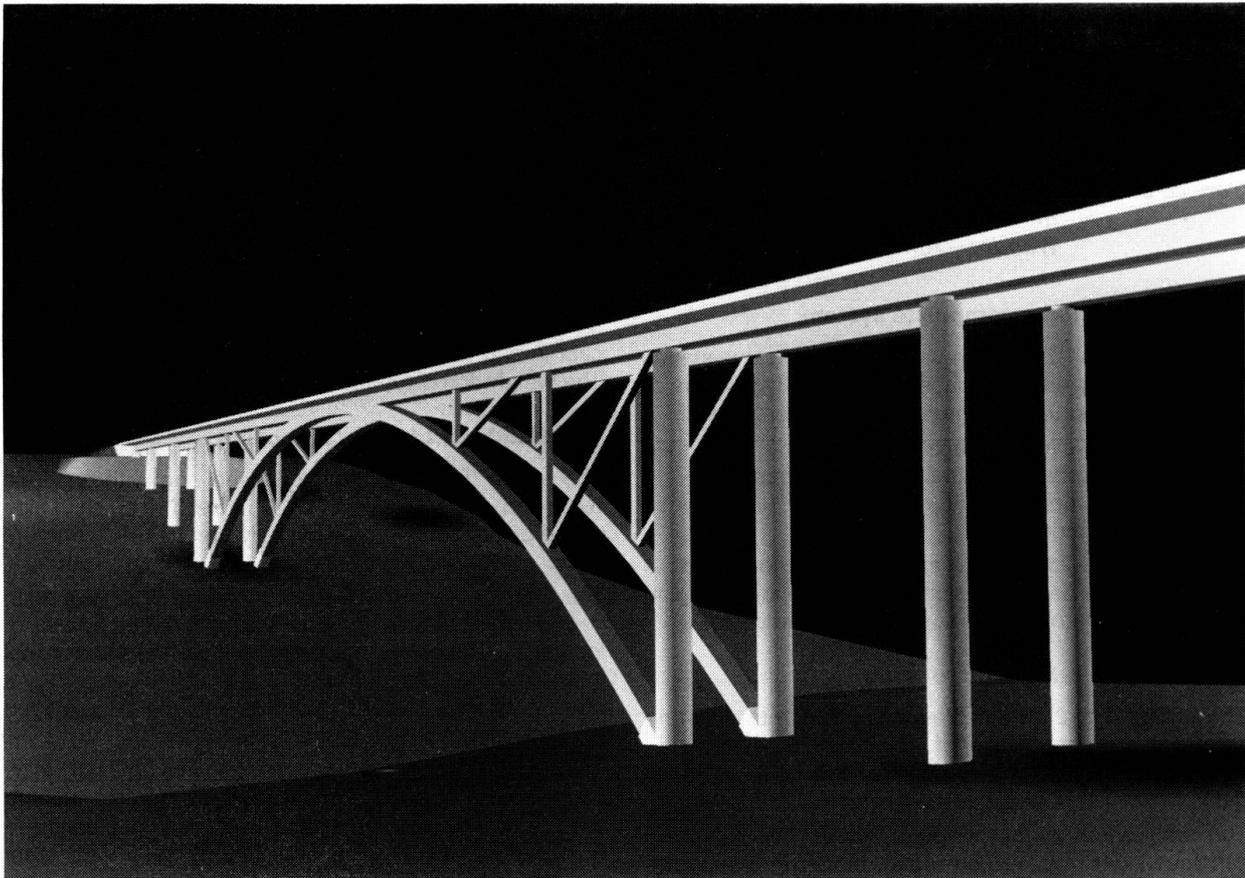
### Fabrication and Erection

The U shaped elements of the girder of the deck and the arch boxes of the main span are fabricated in a constructional steel workshop. The section length is determined so that the weight of each section does not exceed 65 tons.

The girders used for the lateral spans are assembled on the site by means of high strength bolts. They are brought in their final position by the incremental launching erection method.

The arches are built by cantilevering from the springings up to the crowns. They are kept in position by ropes anchored in the rock.

*(J. M. Cremer)*



*Viaduct «Eau Rouge» – Computerized model*

### IABSE STRUCTURES – Publication Programme in 1990

<b>Publication</b>	<b>Theme</b>	<b>Editorial Deadline in IABSE Secretariat</b>
May 1990	Footballstadia in Italy Stades de football en Italie Fussballstadien in Italien	
August 1990	Cable railways (structural analysis and construction aspects) Téléphériques (aspects statiques et constructifs) Luftseilbahnen (statische und kon- struktive Aspekte)	May 1, 1990
November 1990	Recent Structures, worldwide Constructions récentes dans le monde Neuzeitliche Bauwerke in der gan- zen Welt	August 1, 1990

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