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## 20. Viaduct of Lake Gruyère / FR

*Owner: Canton Fribourg*

*Consulting Engineers: E. & A. Schmidt, Basle  
B. Bernardi, Zurich  
I.C.A. SA, Fribourg*

*Contractors: Losinger SA, Fribourg  
Antiglio SA, Fribourg*

*Years of construction: 1975 – 1979*

### Design of the Bridge

On the west bank of Lake Gruyere between Fribourg and Bulle the national highway N 12 lies on a viaduct of 2043.75 m length and 23.70 m width. The viaduct crosses a first inlet of the lake at a height of approx. 70 m and extends across country at a height of 5 to 35 m to cross a second inlet at a height of approx. 80 m. The structure is visible in its full length from the east bank of the lake and it has a strong influence on the landscape. From the west bank, only sections of the bridge can be seen and especially where it crosses the inlets the lower parts of the piers are hidden by forest.

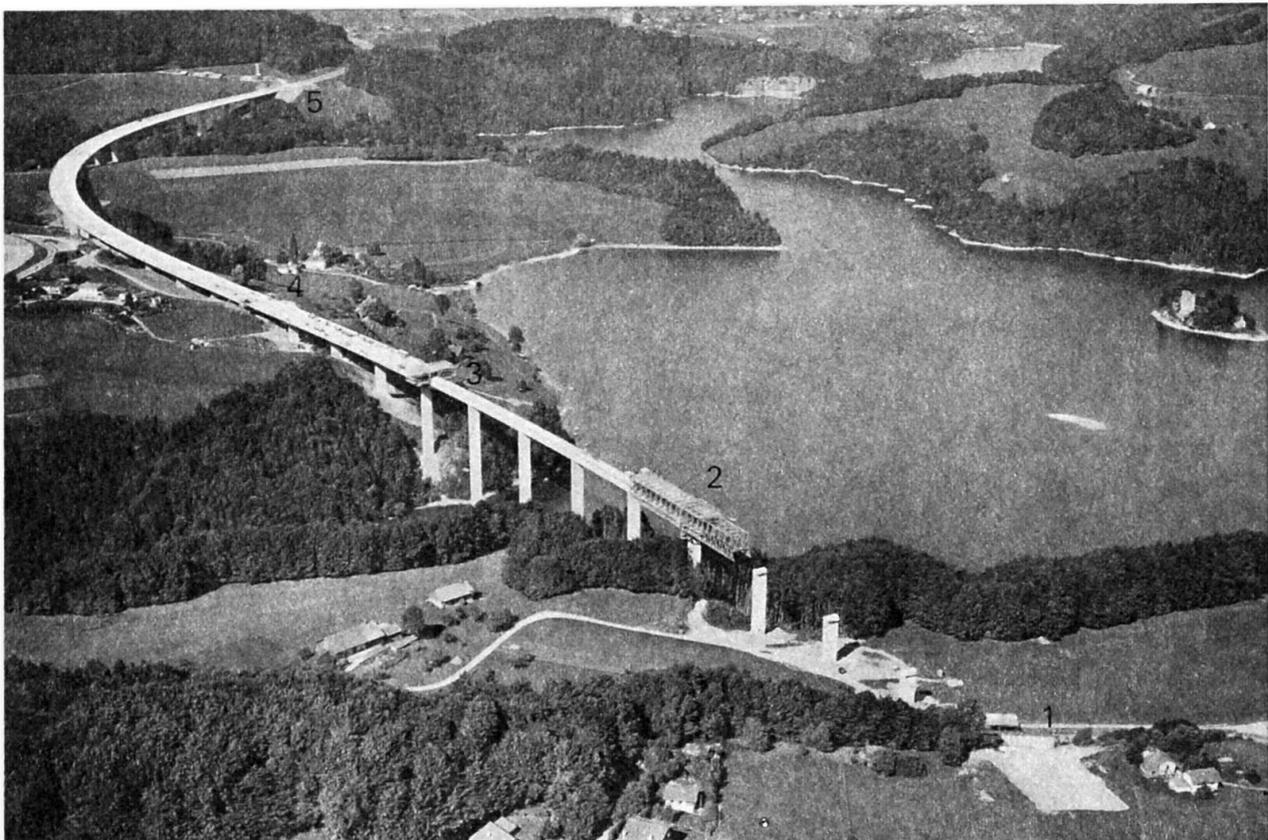
The main idea of the architectural design of the bridge was the harmonic unity over the total length of the structure. An enlargement of the spans in the area of the inlets was omitted, because the resulting necessity to increase the height of the beams through splays by the piers would have considerably disturbed the overall picture of the viaduct.

Considering the large number of supports required by the equal spans, a bridge system was chosen which allowed an arrangement of a central row of columns, so that even by an oblique view-point of the structure the impression of a forest of columns would not occur. It consists of a torsional resistant box girder of constant height with widely projecting cantilever beams which support the deck slab. The total length of the bridge, with spans of 45.78 m, 32 x 60.48 m and 62.61 m, is divided in three sections of similar length. The two expansion joints have been designed as hinges in the 1/5 point of a span and are hardly visible from a distance. Caused by the equal spans on the uneven terrain, the height of the 33 columns range from 6 to 77 m, whereby two columns are based in both lake inlets.

In order to achieve an even overall picture, all columns are of equal rectangular shape despite their largely varying heights.

### Construction

The **main beam** consists of a box girder with a width of 6.00 m and a height of 4.00 m. It is prestressed by 385 t cables (VSL System). It was not only strived for a statically favourable arrangement of the cables, but also for one which was simple and foolproof regarding the positioning and tensioning procedure. In each span there are eight cables (four per web) which are subsequently anchored beyond the supports. This arrangement leads to double as many cables over the columns (16) as there are at mid span (8). This is not disadvantageous for the structure, because over the supports a



1) abutment Bulle side

2) mechanized launching beam for box-girder

3) mobile scaffolding for cantilevers

4) mobile formwork for edge-beam

5) abutment Fribourg side

