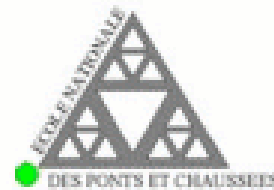


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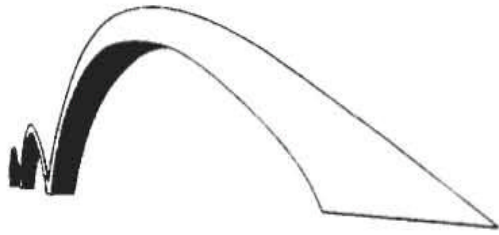
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Fifth International Conference on  
Concrete under Severe Conditions  
Environment and Loading

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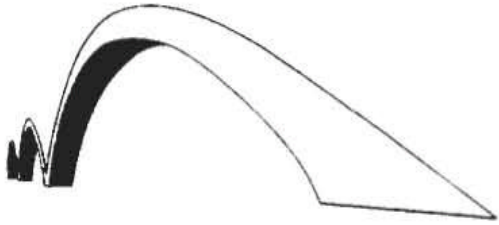
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# **CONCRETE BRIDGES BUILT BY EUGÈNE FREYSSINET**

**Authors:**

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<b>Patrick O'MAOLAIN</b>	<b>Paris</b>
<b>Carlos DE LA FUENTE</b>	<b>Hyères</b>



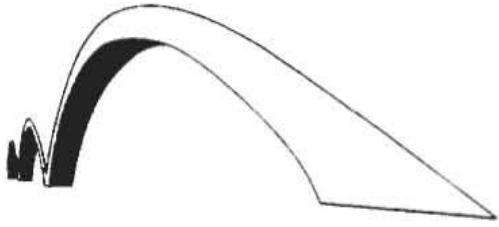
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## Reinforced concrete bridges: 1905 - 1930

*“ Thus I draw a structure in minute detail, convinced that it is above all in its details that a structure is good or bad”.*





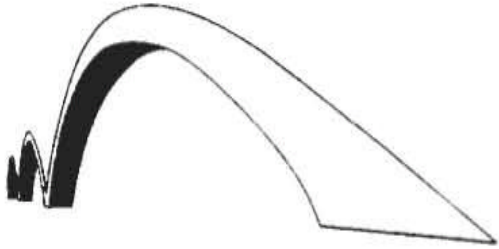
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## Préréal-sur-Besbre Bridge : 1906







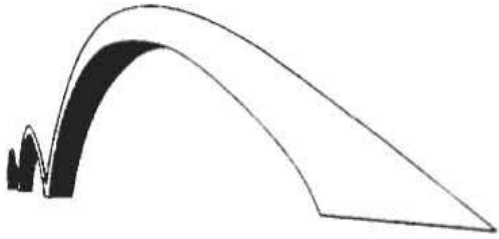
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## Two examples of shapes allowing good mouldability

Top right : the lattice-work of the Boutiron bridge (1912) and Bottom : detail of piers for the Dompierre-sur-Besbre bridge ; one may observe rounded angles which allow good placing of concrete without mechanical vibration. Those shapes are also compatible with to a very good spreading of stresses into structure. These dispositions are a probable explanation of the long-life behaviour and the current conditions of ageing of these 100 year old concrete bridges.





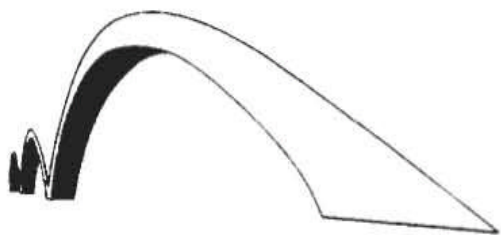
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*« As from that time (auth. Note 1907) I was convinced that the strength of the concrete depends more on how the cement is used rather on its intrinsic qualities »*



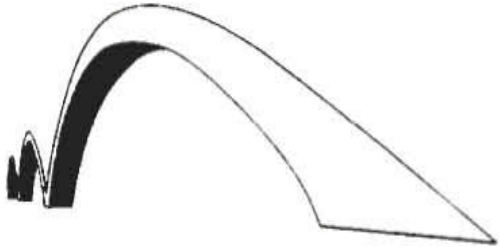




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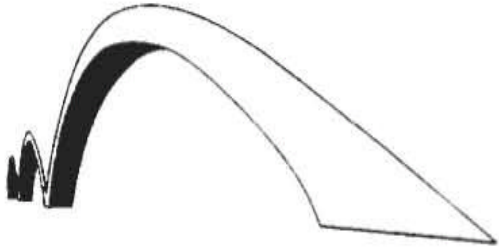


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**Both bridges on the two previous slides (Boutiron on river Allier and Ferrières sur Sichon – rail bridge) were built before the first world war. Even today in service with minimum maintenance, they are still in very good condition. The reasons for such behaviour are both design and building : severe instructions adhered to for a simple working procedure. Many other examples may still be seen in the centre of France : Malavaux (two bridges on the Jolan), Bayet on the Sioule, Dompierre sur Besbre as on following slides.**



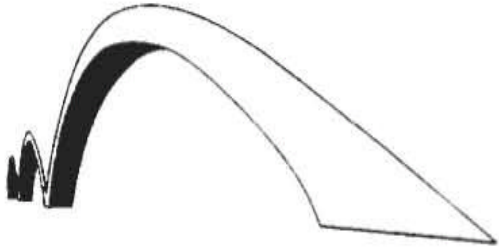


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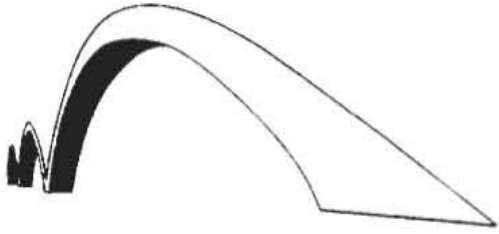


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**No bridge decks were treated for watertightness before the fifties.  
Yet one may observe that the soffits show no water- leakage.**

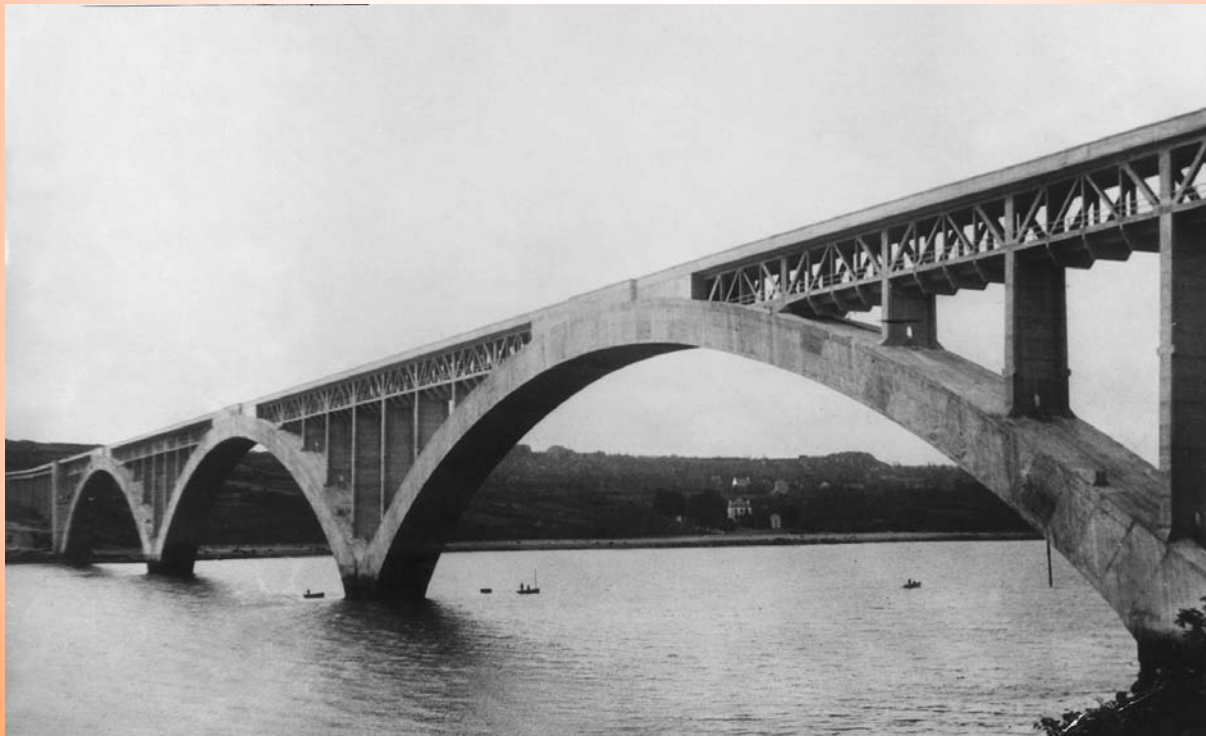




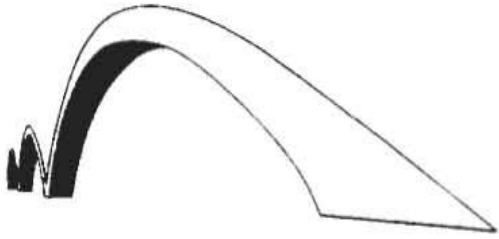
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The Albert Louppe bridge marks the end of that part of Freyssinet's career dedicated to reinforced concrete bridges. 1928 is the year he invented Prestressed Concrete and the beginning of a new era in his extraordinarily creative life







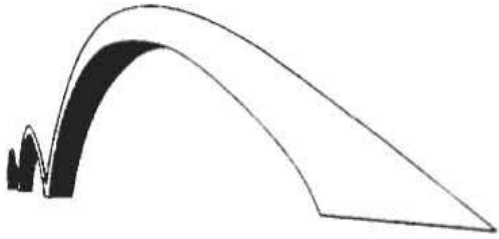
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## Prestressed concrete bridges : 1928 untill his death

*« In 1928, I decided to devote all my energy to the development of the concept of prestressing which had never ceased to occupy my mind ».*

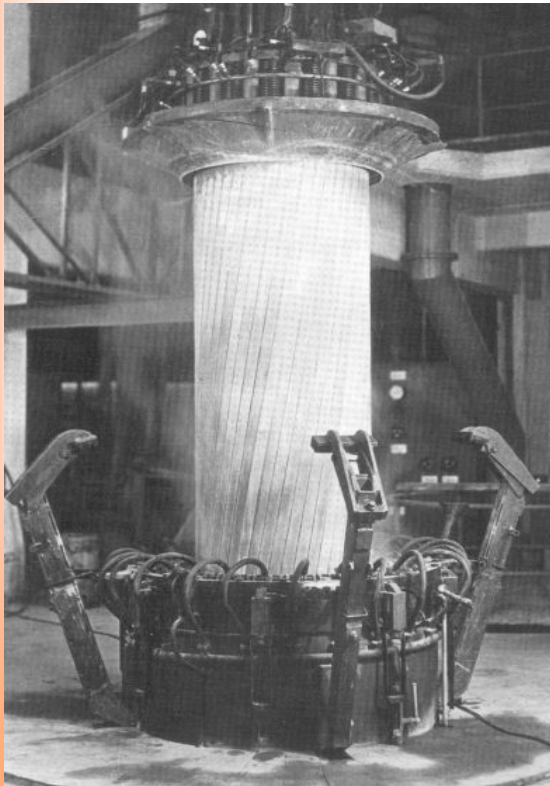
He abandoned design and construction of concrete bridges, so as to turn *« the idea of prestressing into an industrial reality ».*



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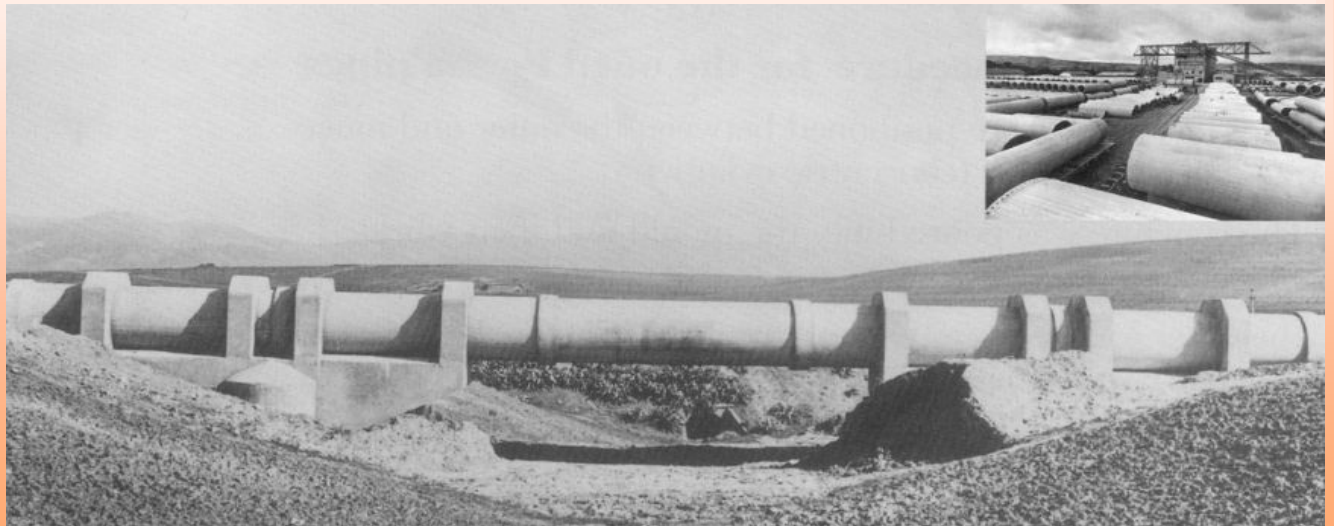
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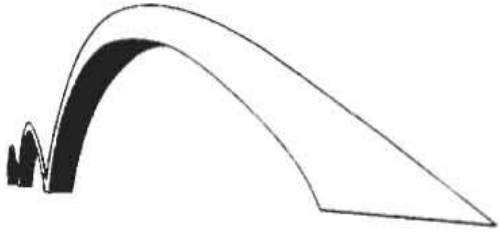
**First application of prestressed concrete:  
after salvage of the Maritime station at Le Havre, precasting of  
water pipes for Oued Fodda dam (Algeria).**



Expanded core of pipe mould (on the left)

Water pipe bridge of 18 m span (below)



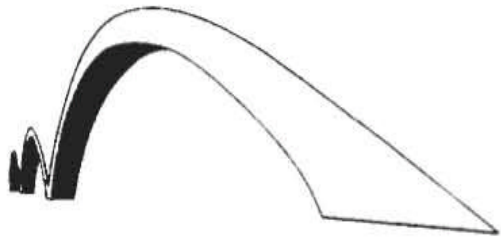


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After the construction of pipes in Algérie, before the second world war, the true development and success story of prestressing lies in bridge construction . Precasting of pipes enabled Freyssinet to develop compact concrete, waterproofed and gas-proofed too. The addition of permanent compression introduced by prestressing enabled proper control of cracking. These facts explain the exceptional resistance against ageing of all the bridges built after the 40's. Following Luzancy , the five bridges on the river Marne are a classical example of the construction of long-life concrete structures. The following photos are examples, though the list is not exhaustive...!



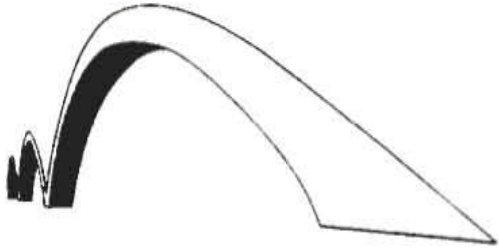


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## Luzancy bridge : 1946

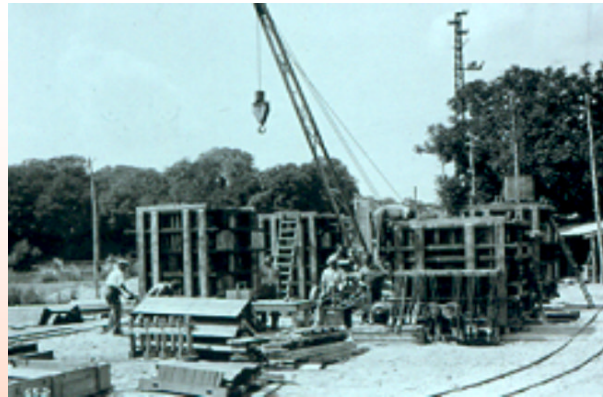




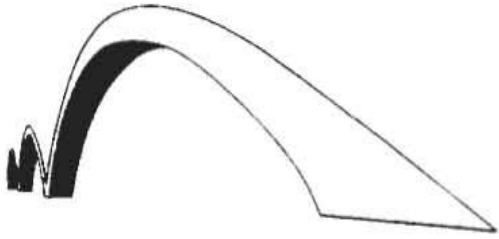
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## Some details of temporary precasting installations







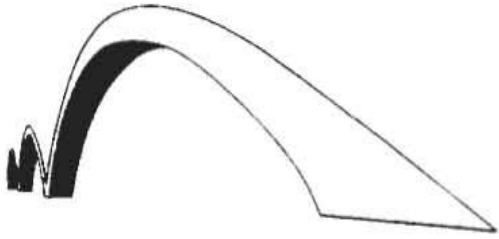
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## **Esbly bridge : 1947 - 1951**





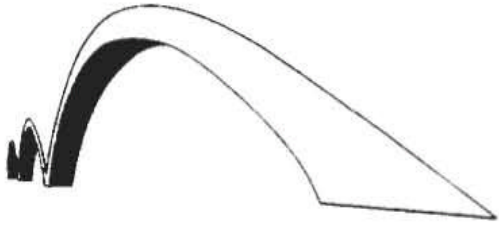


## Esbly bridge : details of current state

In this picture one can see, on the right, the layout of a packed joint. It consists of caulking the joint with a mortar consisting of a simple, lightly humidified mix of sand and cement. It is immediately capable of withstanding the stresses of prestressing.

One must observe the quality of the concrete skin which was poured more than 60 years ago.



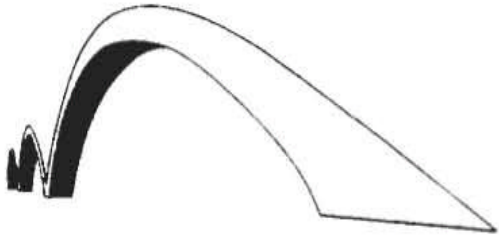


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## Marne bridge : Trilbardou and soffit of Esbly Bridge





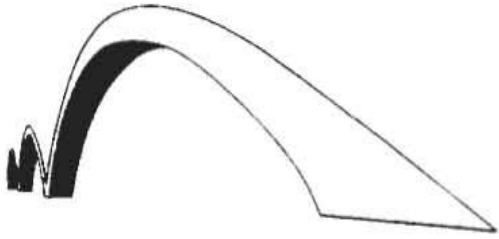
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## Precast beams : Tancarville approach viaduct (1958)







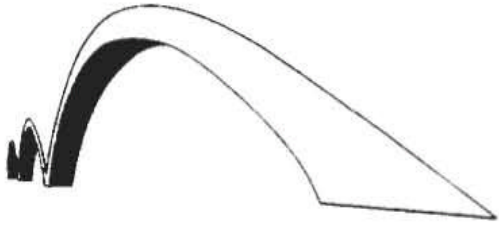
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## **Precast beams : Tancarville approach viaduct**

**Recent arrangements of rainwater collector to avoid staining on the concrete surfaces; one must remark that this bridge is situated in a petroleum industry chemical environment.**





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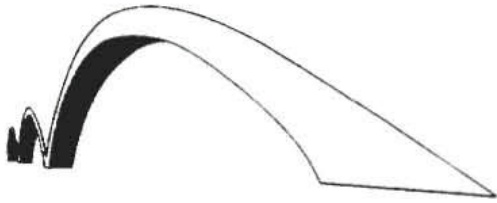
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## Precast beams : details of reinforcing steel and layout of prestressing cables

Two examples of precasted beams of more than 50 m length: Tancarville (on the right) and La Briche (below). One must remark the very light net of reinforcing steel of between 10 and 30 kg/m<sup>3</sup>!



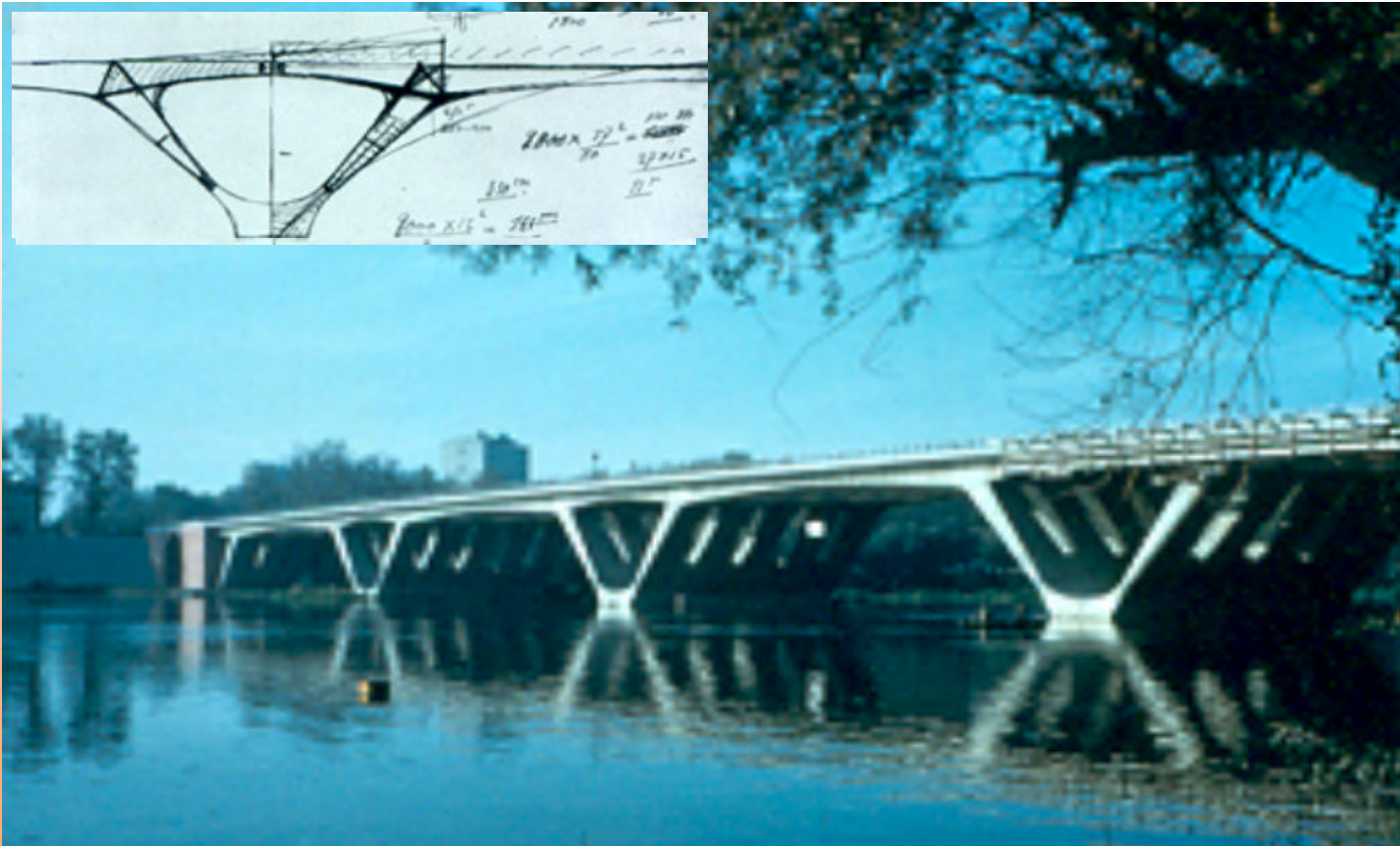




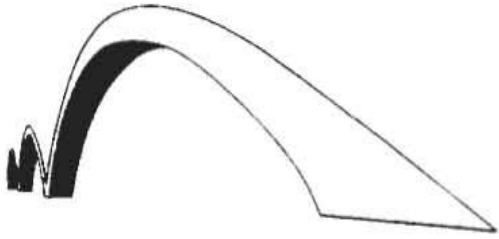
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Other examples of prestressed structures designed by Freyssinet  
Saint Michel bridge in Toulouse





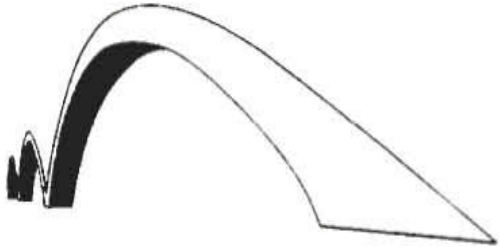


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**Again, examples of prestressed structures designed by Freyssinet:  
Basilica at Lourdes and bridge N° 10 at Orly**





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## Our messages for the future

1 – It would appear of interest, to carry out practical tests on samples taken in-situ in order to verify whether the concretes in place would have conformed to these current criteria (compactness, porosity, permeability, chemical aggression, freezing, aso...).

2 – From E. Freyssinet himself : « *If any of you are on the way to Vichy to take the waters for your liver, along the valley of the Sichon ...you can take a look at some of the things I was doing between 1906 and 1909* ».



3 – If some of you are interested in this trip to the Bourbonnais country , near Vichy and Moulins, our association can gives details of bridge locations ;

e-mail : [association freyssinet@wanadoo.fr](mailto:association_freyssinet@wanadoo.fr)