

Roche-sur-Yon Footbridge



«Les structures triangulées sont basées sur la dissymétrie existant entre les membres comprimés et tendus. Deux attitudes opposées sont admissibles dans une recherche de structure: soit, en partant d'un bloc, travailler par excisions, ou au contraire, partant d'un noyau central pour arriver à la forme définitive, par addition.»

Approche topologique du choix des formes, Robert Le Ricolais 1894-1977



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CONTEXT

CONCEPT

The extension of the TGV train network involves the creation of a new link between Paris and the popular sea-side resorts of the west coast of France through the town of La Roche sur Yon. The arrival of the train in the city is considered an important event and an expression of an image of modernisation. The new bridge replaces an existing one that is a standard railway bridge design that can be found all over France. This bridge type was contemporary with and inspired by the work of Eiffel. It involves the using lateral beams composed of a diagonal mesh of small plate strips that are riveted together.

The design of the new bridge uses the same language of a diagonal mesh, but in a tubular from, to create a complete cylindrical volume through which the users pass. Footbridges over railways require lateral protection for safety of both the users and the trains below. The complete volume provides a single structural solution that possesses the necessary inertia to span between the available support points as well as provide support for the required protective screens and a canopy cover.



d footbridge



New footbridge





HISTORICAL KNOWLEDGE

Robert le Ricolais, a distinguished thinker and innovator in architectural and engineering design was born in La Roche sur Yon, worked in France before WW2 and then moved to the University of Pennsylvania. He is known for his research work in the development of spatial three dimensional structures, having as his objective 'Weightlessness and Infinite span. His work extended beyond architecture and engineering to painting and poetry. The bridge design is an homage to him.







G. R. Le Ricolais, 1894-1977

Robert Le Ricolais, Experimental structures

The triangulated mesh of the Roche sur Yon main structural tube is articulated to distinguish between the tensile and compression forces by using simple tie rods for the tensile members. The ties have no compressive capacity and express therefore the tensile zones. The compressive members are in 'T' or 'H' sections corresponding to the magnitude of forces in them. The section sizes of the members vary as a function of the loading to optimise the steel mass and further express the forces in the system. Mid-span, the lower chords are tensile, while the upper members are compressed. The inverse is true at the support points, where the bending moments are inverted. The shear forces in tubular truss are generally greater at the support points and tending more and more vertical the closer one approaches the supports. The pattern of triangulation of the truss follows this change in direction of forces.

The general objective is to find a harmonious geometric composition that expresses the natural passage of forces.





Compression





Model HDA





Mock up of Garnier



Tension Compression elements

Transversal section



Longitudinal vue



Finite element analysis



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TECHNICAL DATA:

Length of the bridge :	67 (35+32)	m
Deck surface:	201	m^2
Tonage :	160	t
Stell Tonage :	130 t : 1,9 t/ml	
Circular diaphragms	76	u
Compressive diagonals	2100	u
Tensile rods	600	u
Profiles	4300	u
Welding	10	
Conical nodes	1800	

Roche-sur-Yon, footbridge

Roche-sur-Yon, France ORIGINAL PROJECT NAME: Pole d'echanges multimodal - passerelle accessible pietons, cycles et personnes à mobilité reduite

Architects:	Bernard Tschumi (BTuA) and Hugh Dutton (HDA)	
Structural Design:	HDA	
Client:	City of Roche sur Yon	
Project Team:	SNCF - Engineering Departement	
Contractor:	Renaudat Centre Constructions	
HDA Design Team:	Pierluigi Bucci, Francesco Cingolani, Pierre Chassagne, Pietro Demontis Gaëtan Kolher, Cathy Shortle, Romain Stieltjes, Carla Zaccheddu	







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