

Transrhumel Viaduct and its access



Constantine, Algeria

**Large Diameter
Bored Piles**

Micropiles

Geotechnical survey

Owner :

Direction of public works | Ministry of public works

Main Contractor :

Construtora Andrade Gutierrez S.A.

Duration of works:

2010 – 2014

Introduction

The **Constantine Viaduct is a new bridge, crossing the River Rhumel in Constantine, Algeria.** Constantine is situated on a plateau at 640 metres above sea level.

The city is framed by a deep ravine and has a dramatic appearance with a number of bridges and a viaduct crossing the ravine. Artist's impression of completed cable stayed bridge (*Pylon P4 to the left*). The main bridge features a cable-stayed bridge as well as access and ramp bridges.

The construction of Transrhumel viaduct has been considered as the greatest project since independence in Constantine city.

rance over the river bed.

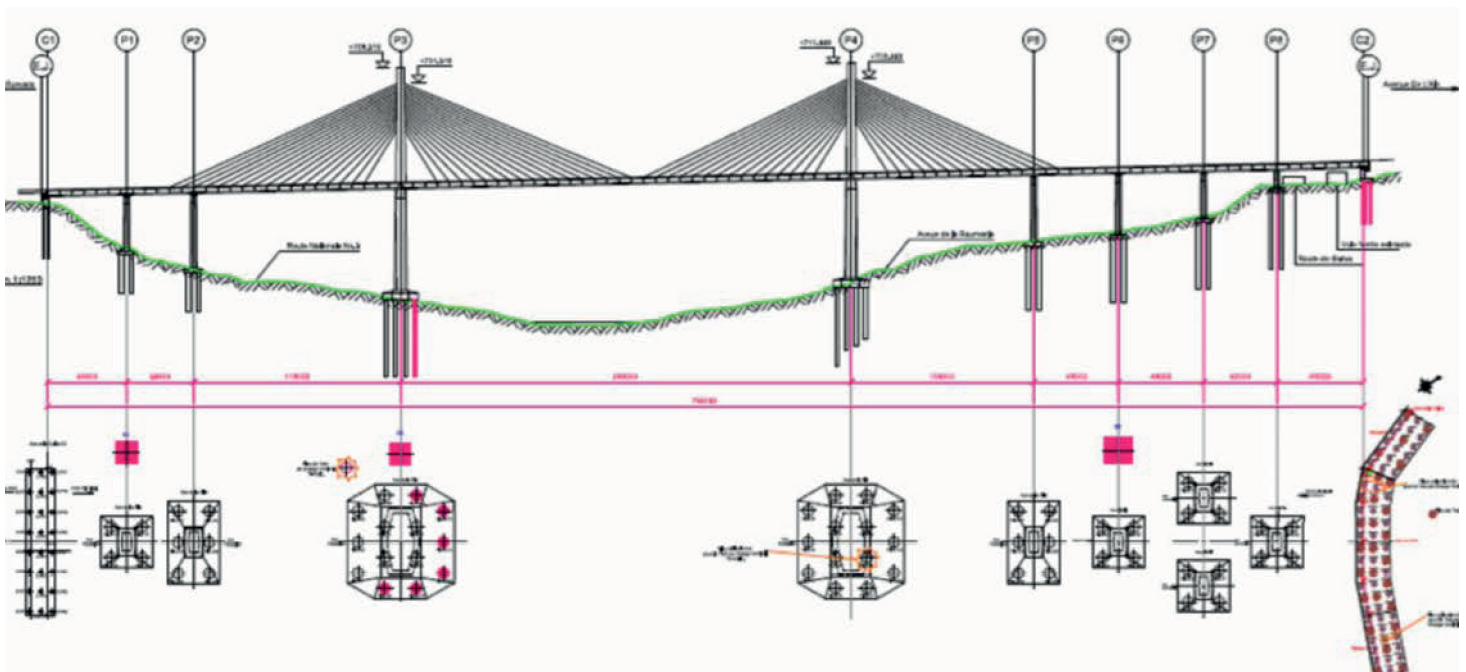
The Owner is Direction des Travaux Publics de la Wilaya de Constantine - DTP and the contractor is Andrade Gutierrez - AG from Brazil with COWI A/S Denmark as designer.

Geology

Algeria is highly influenced by previous seismic activities and the erosional feature by the river Rhumel.

The soil/rock deposits are dominated by Marls of different strength underlain by Marlstone and very competent Lime-

General view of the viaduct



This viaduct is already the “eighth wonder” of the seven bridges city. With a **length of 1.119 m, this viaduct has a futuristic design that has changed the urban configuration of the city.** The work consisted of building the supported spans for the main viaduct, as well as a viaduct and an access ramp to the south of the main viaduct. It included equally the construction of several retaining walls around the main viaduct.

The project includes very extensive road works of approximately 10 km, with 13 over and underpasses, 1 km of up to 45 m deep steep cuts stabilised with ground anchors and soil nails, 4 km retaining walls of which 1 km embedded retaining walls were stabilised with ground anchors (*up to 32 m retained height*). The total length of the bridge between the main abutments is 749 m with an 80 m clear-

stone. However, exploratory boreholes for the foundation piles of Pylon P4 indicated the presence of possible cavities of up to 1 m high within the Limestone at the base of the upper weathered zone. To save 15 m of time consuming drilling of the 14 m Ø 2000 mm foundation piles into competent Limestone it was decided to end the foundation piles above the possible cavity feature in the Marlstone.

The paper describes the innovative remedial measures carried out to safeguard the capacity of the individual foundation piles and ensure acceptable individual and overall displacements. The cavity feature was pressure grouted and transfer of axial load across the cavity into Limestone was facilitated by insertion of grouted steel reinforcement assemblies.

Trevi works

The worksite is located at Constantine, which is 430 km far to the east of Algiers.

The work planned by COWI Consultancy & Engineering (DK) which length is about 750 m over Oued Rhmel, is made up of 8 pylons. Supports are founded on piles Ø 2000 mm.

Structure is 130 mt higher starting from the oued bed.

The left bank on which piers n°1, 2 and 3 are located, is composed of clay marl and marl limestone.

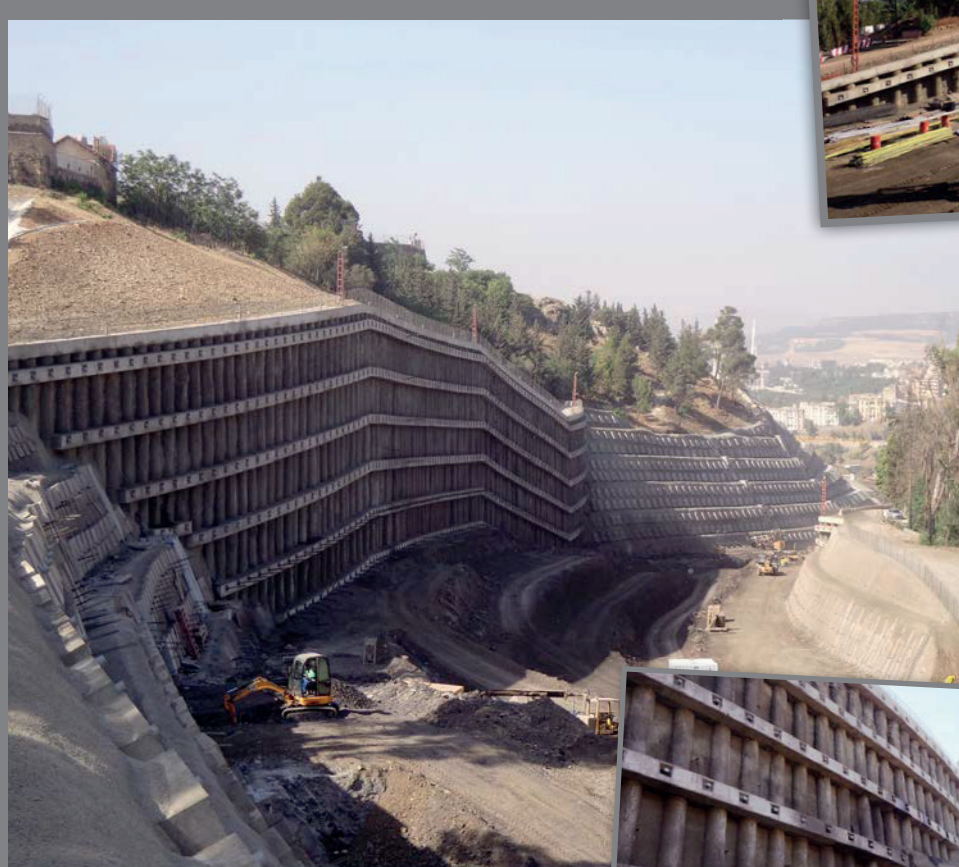
The rock on the right bank is composed of limestone and

Half of the piles of the project are equipped with 4 reservation tubes made of steel for sound auscultation.

2 abutments : **6046,66 LM of piles diameter 800 mm at maximum depth of 37 mt.**

Access ramps : **4.702,92 LM of piles diameter 800 mm at maximum depth of 36 mt.**

08 retaining walls, over pass and under pass:



capped by marl limestone of clay marls.

- **February 2008:** geotechnical investigations campaign (8886 LM): core drilling, inclinometer, pressure meter.
- **September 2010:** piles dia. 800 mm for abutments and access ramp foundations.
- **December 2010:** piles dia. 2000 mm for piers. An Osterberg cell loadtest has been done on pier n°3.

Concerning the 8 piers: **3122,05 LM of piles with 2000 mm as maximum diameter and 48 mt as maximum depth, and 2121 LM of micropiles.**

Excavation of piles dia. 2000 mm have been done with polymer mud. Concrete used for piles is type C 40/50 S5.


16.610,47 LM of piles dia. 800 mm at maximum depth of 39 mt.

Conclusions

Several organizations have collaborated together with Trevi in order to solve the traffic problems caused by the downtown congestion and hustle life.

In the early 2000s, the idea of constructing a bridge was a little by little imposed.

Today, the longest bridge exists and the city had breathed a sigh of relief.



30.482,10 km
of bored piles
(\varnothing 800 mm, \varnothing 1000 mm and \varnothing 2000 mm)

8.886 km
for geotechnical survey

2.121 km
of micropiles



5819, via Dismano - 47522 Cesena (FC) - Italy
Tel. +39.0547.319311
Fax +39.0547.318542
e-mail: intdept@trevispa.com
www.trevispa.com



09, Rue des jardins, Hydra - Alger - Algeria
Tel. +213 234 865 02 | Fax N/A
e-mail: trevalgerie@trevispa.com
www.trevispa.com