

## Strengthening and rehabilitation of two damaged bridges in the motorway m-410 in Madrid (Spain)

Carlos Jurado Cabañes  
Civil Engineer (PhD in course)  
Professor of Polytechnic University of Madrid  
School of Civil Engineering  
Polytechnic University of Madrid  
C/ Alfonso XII, 3 y 5, 28014 Madrid, España  
e-mail: [cjurado@ciccp.es](mailto:cjurado@ciccp.es)

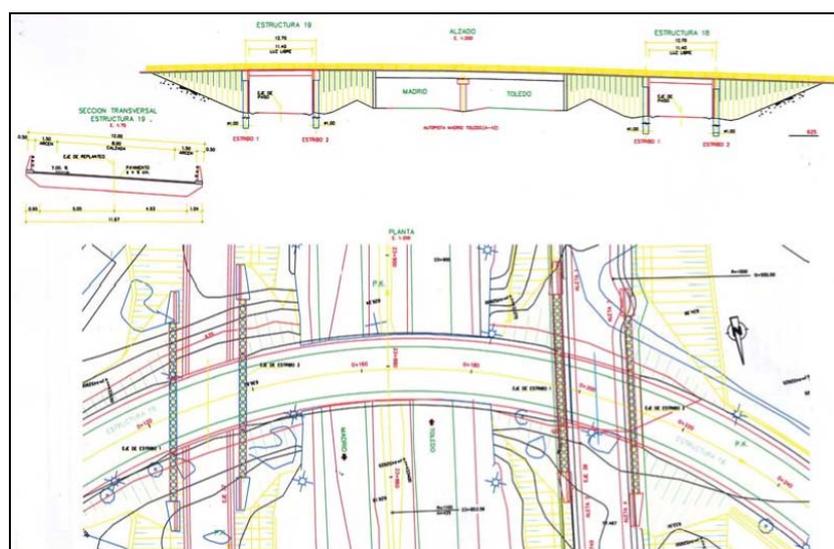
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### **ABSTRACT**

The new highway M-410 in Madrid was constructed in the year 2007. This motorway near to Parla city crosses the road from Madrid to Toledo.

To solve this crossing it was needed to constructed three bridges, the central with two spans over the existing motorway and the other two with one span at each side of the previous one. All the bridges where with deep foundations with piles of 1,00 m of diameter separated 1,25 m.

In the two lateral bridges, after constructing the piles, it might be removed the earth under the concrete slab to make the two lateral roads.



**Figure 1** The two bridges in the crossing of M-410 with the motorway Madrid-Toledo

Just after the construction, it was made sonic transparency essays, which it shows some anomalies in the tip of the piles of the two lateral bridges called PS-18 and PS-19, which implies the necessity of a more deep investigation.

It was decided to make two boreholes one at each bridge in order to obtain samples of the terrain near to the tip of the piles. This investigation shows that the earth at the level of the tip of the piles, was sandy and with a great water flow, so the conclusion was, that it was impossible to retire the earth under the concrete slab on the top, because the piles are not correctly founded.

This paper shows the project and the construction of the solution, consisting of two sheet of deep micropiles at each of the bridges, to resist all the loads and after this, before removing the earth under the concrete slab.