Design of the Tsakona Arched Bridge

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Summary

An extended landslide cut the National Road Corinthos-Tripoli-Kalamata in Southern Greece and emerged the need for the construction of a large singular structure, capable to bridge the whole landslide in an area of high seismicity. In order to address the challenge, a bridge with length of 390m was designed. The main span 300m long, which passes over the landslide, consists of two vertical steel arches with rise of 45m and a steel-concrete composite deck, 22,80m wide, fully suspended by the arches with 2x20 vertical hangers. The approach to the main span of the bridge is achieved by a V-shaped prestressed concrete bridge 90m long and 20,40m wide.

Keywords: bridge; design; construction; arch; steel; concrete; composite, full locked coil ropes; prestress; seismic isolation

1. Introduction

When a huge landslide (more than 6 million m^3 of soil) destroyed a 300m long part of the National Road Corinthos-Kalamata in Southern Greece, a crucial decision had to be taken. Either to abandon the current alignment, disusing more than 12km of the existing Road or design and construct a structure which could bridge the whole landslide area. As the second choice was selected, the bridge had to fulfil, among others, the following basic criteria:

- Safe crossing of the whole -currently active- landslide area, without any kind of sliding soil-structure interaction.
- High seismic resistance; the bridge should resist an earthquake with peak ground acceleration 0,31g and return period 1044 years.
- Capability to withstand a longitudinal and/or vertical potential tectonic movement of the right edge (towards Kalamata) up to 20cm.

In order to assess the most appropriate solution, an extensive geotechnical investigation of the whole area had been carried out. Its results showed that within a length of 400m only one semi-rock peninsula was safe to bear significant loads without any interaction with the landslide. Thus, the need for the construction of a singular structure with spans approximately 100m and 300m was emerged. Many different solutions (e.g. stay-cabled and cantilevered type bridges) were examined at the stage of the preliminary design, however the chosen one fulfilled, in a safe and cost effective way, the aforementioned criteria in combination with the geotechnical restrictions.

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