

The new Fornello viaduct: method of seismically strengthening the piers and replacing the deck without interrupting traffic

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Summary

The old Fornello viaduct, on the Orte to Ravenna state highway in northern Italy, consisted of two parallel precast concrete bridges, one running in each direction; either bridge has a central span of approximately 115,0m and two lateral spans of 53,0m, and rests on two piers about 33m and 18m high. The high deformability of the deck determined discontinuities in the vertical alignments at mid-span due to permanent loads and vibration phenomena caused by live loads; this created serious traffic problems. Static strengthening was also required to meet new seismic requirements.

This paper reports on the solutions adopted, focussing on the ways in which the new requirements of strength and serviceability were addressed, particularly with respect to durability and the relationships between the new structures and the setting, which is a landscape of special value.

Keywords: seismic actions, steel-concrete structures, slab cracking control, seismic retrofitting, creep, shrinkage.

1. Preface

The Fornello viaduct, situated in the locality of Verghereto in the province of Forlì, was built between 1968 and 1970 as part of the E 45 Orte - Ravenna state highway. It consists of twin p.c. bridges, one for each direction of travel. The structural scheme of each bridge consisted of two cantilever frames made by box piers, about 33m and 18m high respectively, and two cantilevers for each frame of about 53m, with an infill beam between the ends of these cantilevers, seated on Gerber-type bearings and spanning approximately 9,0m. The overall length of each bridge is approximately 219,0m, divided into 3 spans, about 52,0m, 115,0m and 52,00m in length, respectively.

Each bridge deck was of the single-cell box type in prestressed concrete, of constant width 9,50m and varying in height from 7,0m at the piers to 2,0m at the midpoint of the central span. It was constructed using the incrementally launched segmental method.

Each pier has a shaft foundation, elliptical in shape, approximately 20,0m deep, with dimensions on plan of 28,00 x 16,40m. The bearings at the ends of the bridge, on the Orte side, are placed on an abutment reinforced with active anchors, and on the Ravenna side, on a box pier that also acts as the bearing for the terminal span of the access viaduct.