

## Innovative Developments of Steel and Concrete Composite Plates for two Recent Bridges in France, St Lazare Bridge and Viaduct of Guerville

Didier Guth, Claude Remy, Boris Fabre, Régis Boutes

Arcadis, Le Plessis-Robinson, France

Contact: [didier.guth@arcadis.com](mailto:didier.guth@arcadis.com)

### Abstract

Arcadis recently designed and completed two complex bridges using the concept of composite plates (see EN 1994-2, section 9). The first bridge using this method, the Saint Lazare Bridge, crosses the busiest railway network in the city of Paris. The bridge consists of a 125 m long steel box deck with a deck width of 17,5 m resting on V-shaped piers. The thickness of the concrete slab is 120 mm. The second bridge, currently under construction, is the viaduct of Guerville. This viaduct is a 360 m long concrete-steel composite bridge with two I-shaped girders linked together by floor beams. The design of the central part of the deck, which is governed by the central span length of 116,5 m, required a lighter and thinner slab than the typical reinforced concrete top slab. This led to the use of a composite plate, 160 mm thick for the 157 m central part of the bridge. This paper presents the general design of both bridges along with the specific methodologies and calculations used for the composite deck plate designs.

**Keywords :** Composite plates ; composite steel-concrete bridges ; innovative design ; EN 1993 ; EN 1994.

### 1 Introduction

During the 1950's and 1960's, several bridges were built with slabs using a technology known as Robinson's deck, which consists of combining a thin steel plate (with a thickness approximately 6 to 10 mm) and a thin concrete slab (with a thickness approximately 100 mm). The main goal of this system was to reduce weight for long-span suspended bridges (Aquitaine Bridge in Bordeaux - Figure 1), Tancarville Bridge in Normandy), movable bridges (Recouvrance Bridge in Brest), or girder bridge decks (Dancourt Bridge on the Meuse River).



Figure 1. Suspended bridge "Pont d'Aquitaine" in Bordeaux (France) © Structurae N. Janberg

This approach has recently been revisited through the design of two complex girder bridges using the technique of composite plates. The guidelines for