



Crossing motorways under traffic without intermediate piers

Jacques BERTHELLEMY
Director of bridge projects
CEREMA (Setra), France
Assoc. Professor at Entpe
Jacques.Berthelley@cerema.fr

David SCHAVITS
Charlotte ERRE
New Caledonia, France
Road Directorate
of the Southern Province

Edward PETZEK
Director of the structural office
SSF - RO, Romania
Assoc. Professor at the University
Politehnica Timisoara, Romania
epetzek@ssf.ro

Born 1957, Entpe civil
engineering degree, experience in
steel bridges and their pathology,
designed many innovative
bridges, Prix AFGC 2001.

David.Schavits@province-sud.nc
Charlotte.Erre@province-sud.nc

Born 1973, civil engineering
degree, PhD, competence fields –
bridges, fracture mechanics and
safety of structures against
fatigue, 2010 ECCS Award.

Summary

European research program SBRI attempted to reveal the costs caused during the service life of a bridge, direct costs for the building owners as well as indirect costs for the users. The principal results of SBRI should make it possible to better take account of the true costs of a central pier, by taking into account the risks in phase of construction, as well as those which may threaten the highway overpass during its cycle of service.

CEREMA developed two economic solutions to reach the objective of avoiding the central pier.

1) The implemented solution at Ko Wé Kara in New Caledonia is a steel-concrete composite tied-arch bridge with innovative and economic details :

- innovative radial hangers made of welded plates,
- innovative reinforcements against accidental impact of over-height vehicles

2) One other possible solution is the composite steel-concrete gantry bridge. The European research program PRECOBEAM allowed to realize tests, experimental projects and to finalize a new system of connection allowing to lower the cost of this type of structure : strip along which the cutting line of the steel dowels is made in a clothoidal shape (CL) are used to improve the fatigue resistance. CEREMA introduced this innovation in the research program.

The composite structure can take various forms. It can associate for instance the steel web of a beam directly with a concrete flange. It can also constitute a composite deck with a bottom plate, stiffened by connecting CL-shape indented strips. Several outstanding projects of this type, both in New Caledonia and in Europe are described in detail. Of course this type of bridge is an integral bridge and the article delivers some recommendations for the design and the realization of integral bridges.

Keywords: steel-concrete composite bridge, tied-arch bridge, integral bridge, safety, overpass motorway crossings, CL cut for dowel connection.

1. Crossing of highways under traffic

1.1 Taking into account all the costs of a central pile for a highway overpass

The impacts of trucks on the intermediate piles of bridge are not rare events. The side obstacles have been involved in approximately 1/4 to 1/3 of the fatal accidents in France, proportion which remained stable for several years. A third of the trucks which leave the road leaves it for the central reservation side of the motorway to often cause fatal and generally far more serious accidents, that those caused by the exits on the lateral motorway side.