Shear test on full scale auxiliary pier columns used in the viaduct construction process

Laura ANANIA
Ph.D Engaged Professor
Department of Civil and Environmental Engineering
University of Catania –Italy

lanania@dica.unict.it
Laura Anania, born in 1969, received her Ph.D in structural engineering from University of Catania in 1999. Actually she is Professor in Precast And steel Structures for Structural Engineering courses at university of Catania

Antonio BADALA'
Full Professor
Department of Civil and Environmental Engineering
University of Catania –Italy

abadala@dica.unict.it
Antonio Badalà born in 1943, he is full professor in Structural engineering at University of Catania. He is specialized in experimental investigation. In the last years he is interested in composite materials.

Sebastiano COSTA
Ph.D Assistant Professor
Department of Civil and Environmental Engineering
University of Catania –Italy

scosta@dica.unict.it
Sebastiano Costa, born in 1969, received her Ph.D in structural engineering from University of Catania in 2002. Actually he is Professor in Bridge Construction for Structural Engineering courses at university of Catania

Summary

The paper describes an original technology used for onsite shear tests. The test determines the shear stiffness in both the principle directions of an auxiliary system employed during accelerated construction process of the prefabricated bridge. The auxiliary pier system is constituted by the coupling of two temporary truss towers working as auxiliary pier columns to carry and erect the prefabricated pieces during the bridge construction procedure. By this experimental investigation we are able to redesign the whole temporary auxiliary systems affected by some faults in the flanged connections. A good correspondence between numerical and experimental investigation was obtained.

Keywords: Structural monitoring, design assisted by tests

1. Introduction

The experimental investigation represents one of the most effective methods to understand the behaviour of a structural system as well as to validate the numerical forecasts. The experimental investigation is commonly used during the monitoring and the "safe test" of the system, both served to evaluate its effectiveness and to guarantee its correspondence to the design requirements even beyond any uncertainty in planning and realization. Sometimes, the use of experimental investigation seems proves very useful also in the construction process and in all those cases where a hazard construction complexity or some faults are recognized. In the paper we discussed a shear test carried out on temporary pier columns used in "accelerated construction method" of bridge. They are formed by a modular steel truss structure realized by assembling L100x100x10 profiles for the column, and IPE 80 profile as beams. The profiles are bolted connected to each other but the mapping of the bolted connection, carried out on the towers on site, had shown the presence of some damaged and deformed elements, and, also, either the absence of some bolts or their under tightening [1]. The bad assembling process found onsite leads us to evaluate the true shear stiffness of towers in order to re-design the construction project of the bridge by taking into account the real mechanical parameter of the auxiliary structure.

Shear test on the transversal direction: the absolute averaged stiffness $K^a_{i,j}$ was defined by (1) this obtained once the absolute stiffness K^a_i determined by (2) is known:

$$\overline{K}^a_{i,j} = \frac{K_i + K_j}{2} \qquad (1)$$

https://doi.org/10.2749/222137810796063616