

FEATURE OF TECHNICAL SERVICE

Subject	Executive design of New Bridge along the ex S.S.413 «Romana» - Restructuring Executive project of the bridge over Po river in the municipalities of Bagnolo San Vito and San Benedetto Po (province of Mantua) built between 1964 and 1966.	
Carried out by	ATI SGAI Srl of E. Forlani & C. (Main agent) - Infra Engineering - Hydrodata	
Client	ATI Toto S.p.A. COSTRUZIONI GENERALI - VEZZOLA S.p.A.	
Service length	2016 - 2017	
Value of works	€ 24'173'016,14	
Categories value	S.03	€ 5'958'293,07
	S.04	€ 14'452'615,80
	S.05	€ 2'603'683,35
	V.02	€ 985'407,78

PO RIVER BRIDGE - Computational aspects - Simulation, results and checks

The analysis and study of the static and dynamic behavior of the substructures of the new and existing bridge was conducted by simulating the structure with a 3D FEM numerical model, solved with SAP 2000 calculation code (C.S.i. Computer & Computer & Structures, Inc.: "SAP2000 Integrated Software for Structural Analysis and Design" Ver. 8.2). Undermining and soil-structure interaction analyzes were conducted using the software PLAXIS. In detail, various numerical models were created in the various construction phases:

- separate decks during the launch phase;
- decks united in temporary configuration (traffic diversion) and in final configuration;
- temporary and launching substructures in the launch phase and in provisional configuration;
- substructures in definitive configuration with different loading conditions and undercutting phenomena.

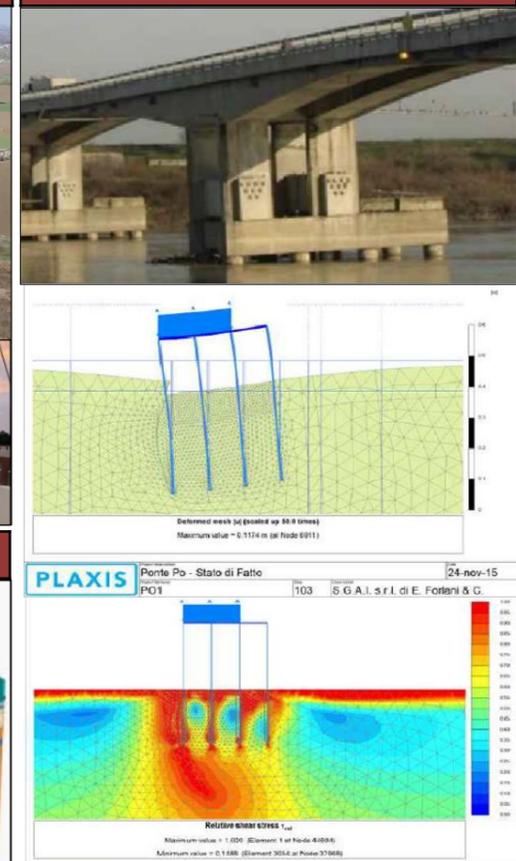
General infrastructure plan



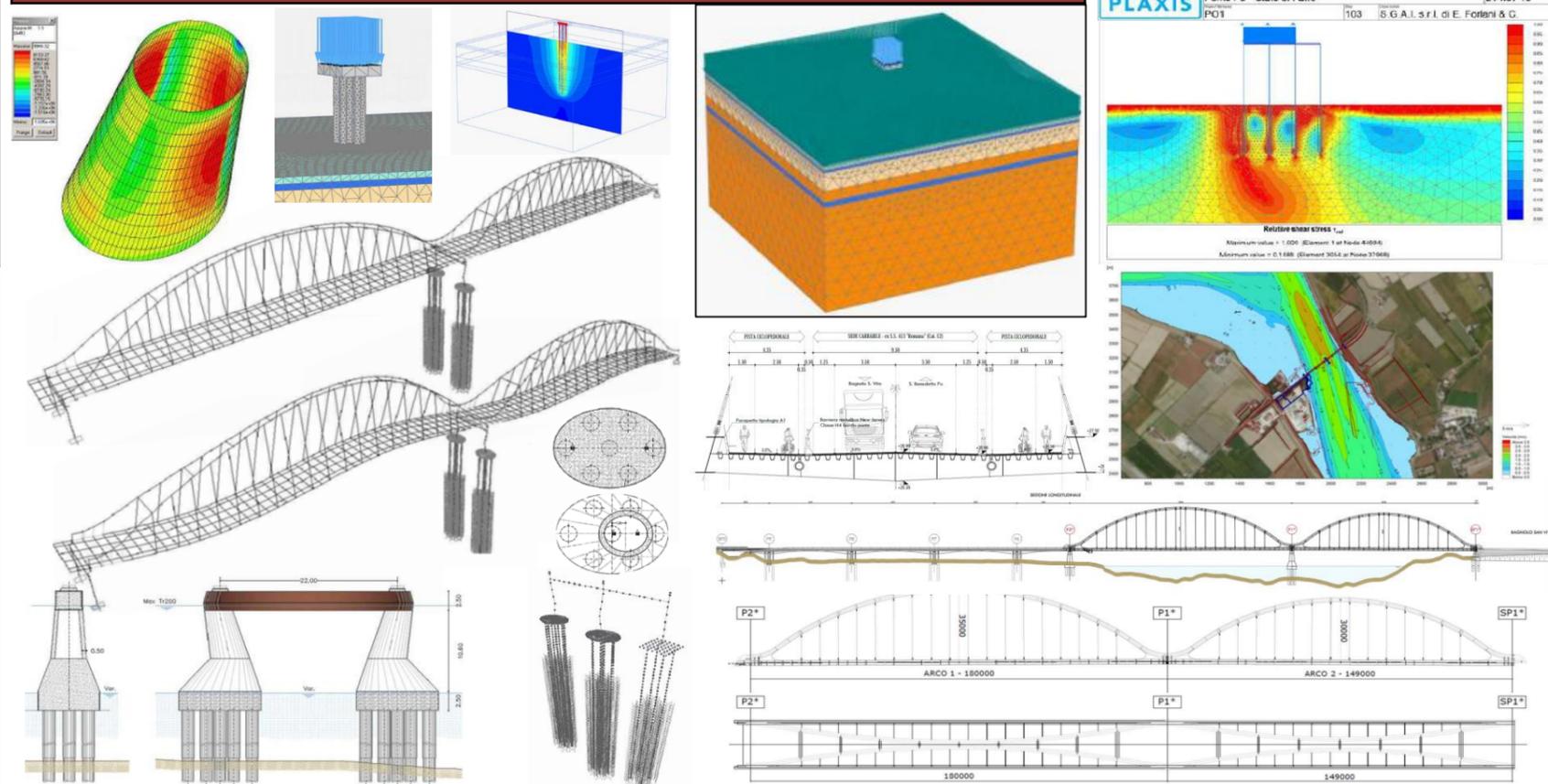
Photomontage of the new infrastructure



Back analysis on existing bridge



PO RIVER BRIDGE – 3D structural analysis and FEM numerical modeling



PO RIVER BRIDGE - Design issues and their resolution

The project consists in the construction of a new bridge over the river Po in the municipalities of Bagnolo San Vito and San Benedetto Po (Mantua), adjacent to the existing crossing, which extends for a length of about 613m along the ex S.S.413 "Romana". Following the seismic events of 2012, the deformation of the existing bridge was accentuated, which led to the limitation of traffic for heavy vehicles. Following the analysis of the current state of the bridge, carried out by specific back-analysis geotechnical modeling, it was possible to reconstruct the stress-strain framework of the foundation and the kinematics measured by monitoring. Furthermore, the evolution of the undermining and the progressive evolution of the eccentricity of the loads has been considered, which in turn establishes conditions of local and global instability, from which further confirmation was obtained on the need to proceed with the construction of the new bridge. The superstructure of the new structure is made with a pair of lower-way arch-bridges, with push eliminated and deck connected in continuity and made of corten steel. The arches are made with a pair of tubular Ø1800 and a suspension curtain consisting of ropes with a spacing of 8m that support two double T chain beams with a height of 2200mm placed at the edge of the deck with span of 22m. The deck is made with an orthotropic slab stiffened with channels, which allows to be kept low the seismic masses and the usability of the work to be immediate in a temporary configuration and to facilitate the operations of translation during the launch phase.