

## FEATURE OF TECHNICAL SERVICE

### Subject

Executive Project – Detailed executive design and variant construction design of - ANAS GE 34/08 S.S. 1 «Nuova Aurelia» - Access to the port hub in Savona interconnection between the A10 toll booths of Savona and Albisola and the ports of Savona and Vado: Variant at S.S. 1 Aurelia in the stretch between Savona Letimbro creek and Albissola Marina and Albisola Superiore

### Carried out by

ATI (SGAI - D'Appollonia - Eletec2000)

### Carried out by

SGAI S.r.l. of E. Forlani & C.

### Client

Letimbro scarl

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Letimbro scarl

### Service length PE

2010 - 2011

### Service length PE-PC

2012 – 2019

### Value of works PE

€ 130'164'012,19

### Value of works PE-PC

€ 145'373'827,00

### Categories value PE

S.05 € 102'860'118,82

### Categories value PC

S.03 € 553'405,37  
S.04 € 3'661'579,06  
S.05 € 5'785'766,34  
S.06 € 850'217,45  
D.04 € 1'437'574,66  
V.03 € 80'749,00

### performed totally by SGAI

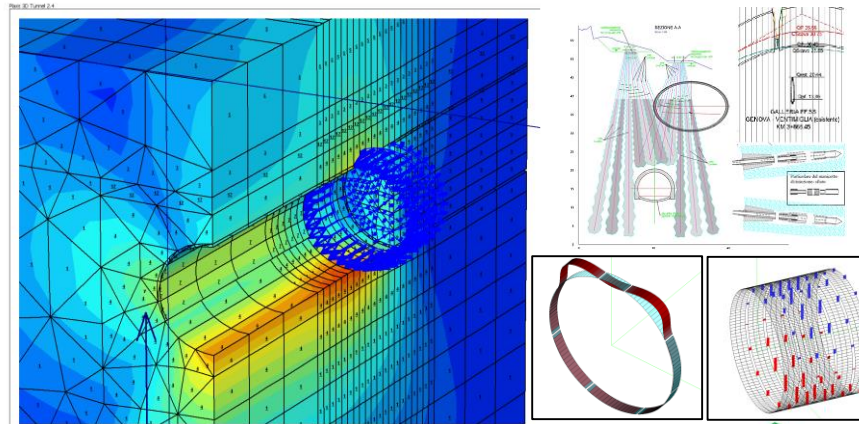
## SOIL-STRUCTURE INTERACTION - Computational aspects - Simulation, results and verifications

The analysis and the study of the stress-strain framework were carried out by simulating the interaction of the soil-structure with numerical models with finite elements both in 2D-3D by means of the PLAXIS software. For the study of the sustain works in correspondence with the entrances and the stability of the excavation fronts, the modeling was carried out using the CEAS PARATIE Plus software. The progress of the mechanized excavation was monitored in real time during the execution.



## Mechanized excavation with TBM - Consolidation of excavation front and foundations of interfering buildings

The infrastructure project envisages that over 75% of the road layout develops underground with 4 natural tunnels: G. Cappuccini, G. San Paolo, G. Basci and G. Grana; the first three tunnels were carried out by means of an **Tunnel Boring Machine (TBM)** with a diameter of 13.70m while the last one, G. Grana, with traditional methods. Given the complex morphology of the territory and at the same time its strong anthropization, it was necessary carry out numerous investigations, modeling and monitoring that would allow us to confirm the conditions of the expected rock mass, defining more precisely the tense-deformation framework and the behavior in act, foreseeing the evolution with the progress of the work. In this way it was possible to define reference thresholds, beyond which to take preventive actions over time to protect adjacent buildings and works.

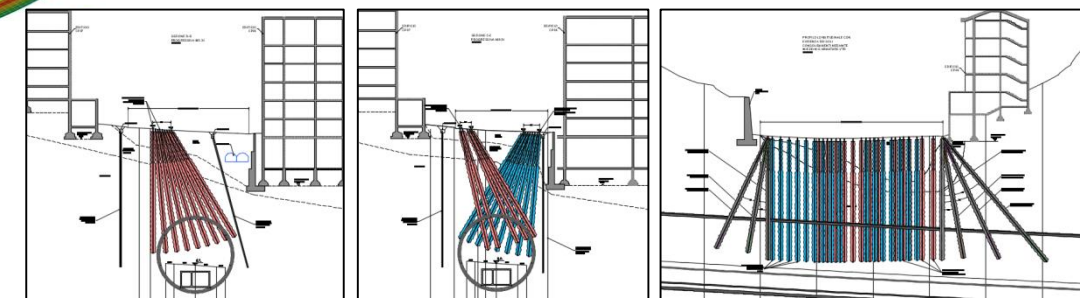
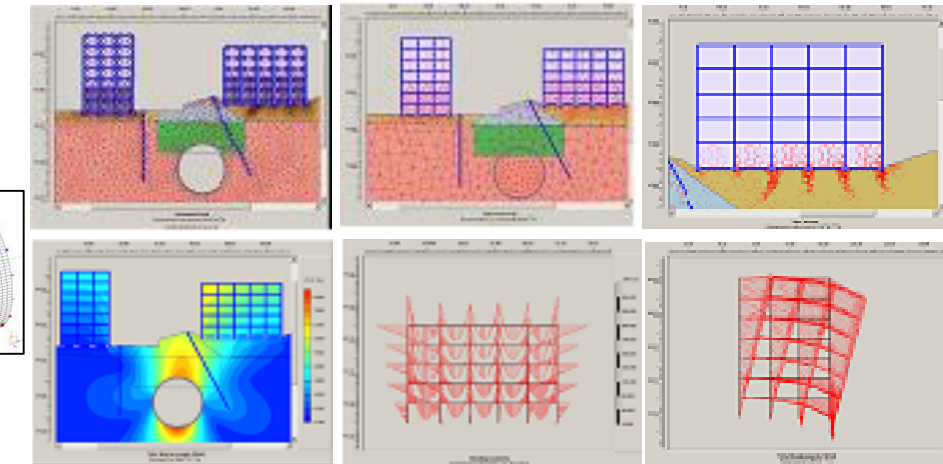


PLAXIS  
Savona-3D-25  
16  
25/06/09  
S.G.A.I.

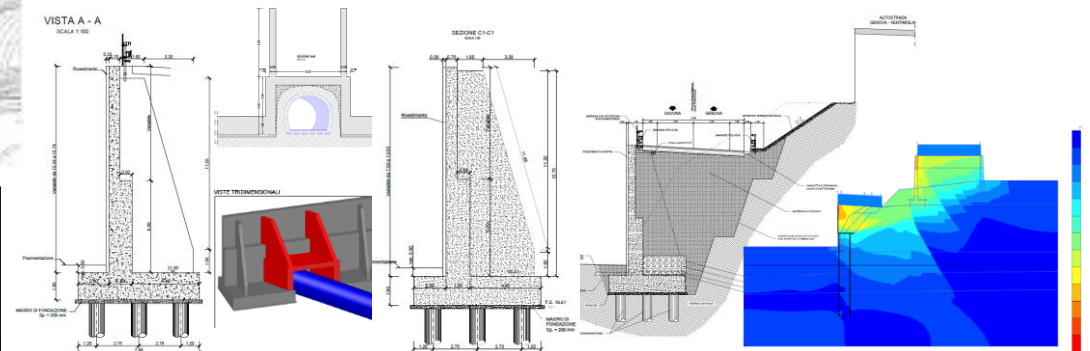
## Analysis and resolution of excavation problems



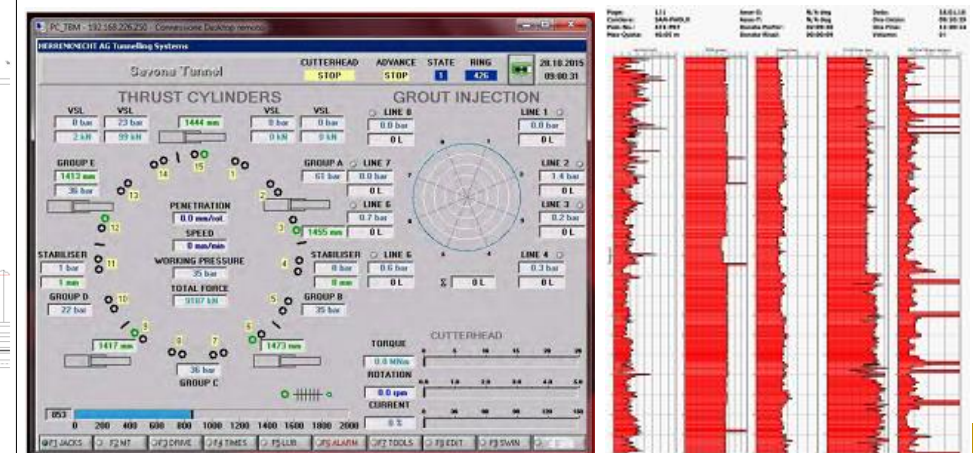
## Building interference analysis and resolution



## Verifications and modeling of supporting works - Schiantapetto Wall



## Mechanized excavation - TBM progress checking



GEOTECHNICAL AND SPECIAL FOUNDATIONS

