

CITY TUNNEL CROSSING

Monitoring of structural movement for buildings located along the line of the tunnel routes

Designed and built to alleviate traffic congestion in the coastal town of Toulon, where the A50 and A57 motorways converge. The Toulon tunnel project had several major obstacles to contend with from the start:

A highly variable ground strata and a high water table on a project located close to the Mediterranean coast, was further complicated by consultants who defined maximum movement limit values for the buildings along the path of the tunnel drive.

Over 180 buildings were likely to be influenced by the 14m diameter tunnel running through the old city center.

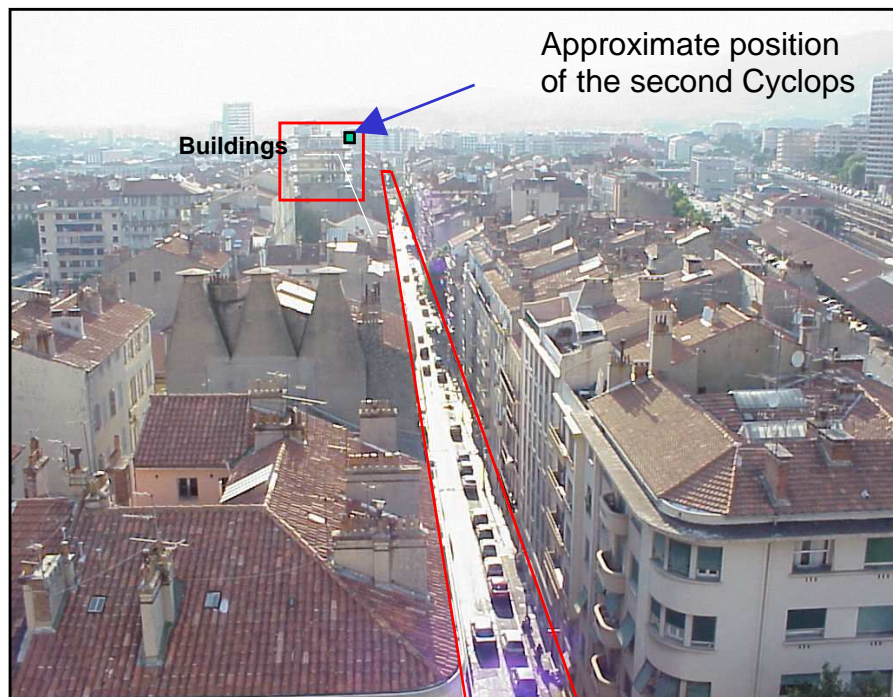
SolData was appointed to design and install a complete monitoring system for the project.

• **The instrumentation**

The installed network of instruments includes two Cyclops theodolites, which continuously monitor the buildings located above the tunnel alignment for movement.

Other instruments included electrolevels installed in the basements of the buildings where the Cyclops were installed to confirm any self-movement detected by the Cyclops units themselves.

There were also inclinometers and automatic crack gauges installed to some of the structures that showed progressive movements.



The city centre under real-time monitoring (picture taken from the first CYCLOPS location)

OWNER :	REGIONAL AUTHORITY
CONSULTANT :	VERITAS
PROJECT DURATION :	1999 - 2003
SCOPE OF WORKS:	
<ul style="list-style-type: none"> • Surface 3-D monitoring using CYCLOPS with radio communication. • Electrolevels, inclinometers and crack gauges. • Real-time monitoring over 30 months. • Pager and e-mail alert on movement breaches (Early Warning System). • Alarms and reporting. 	

- **The monitoring**

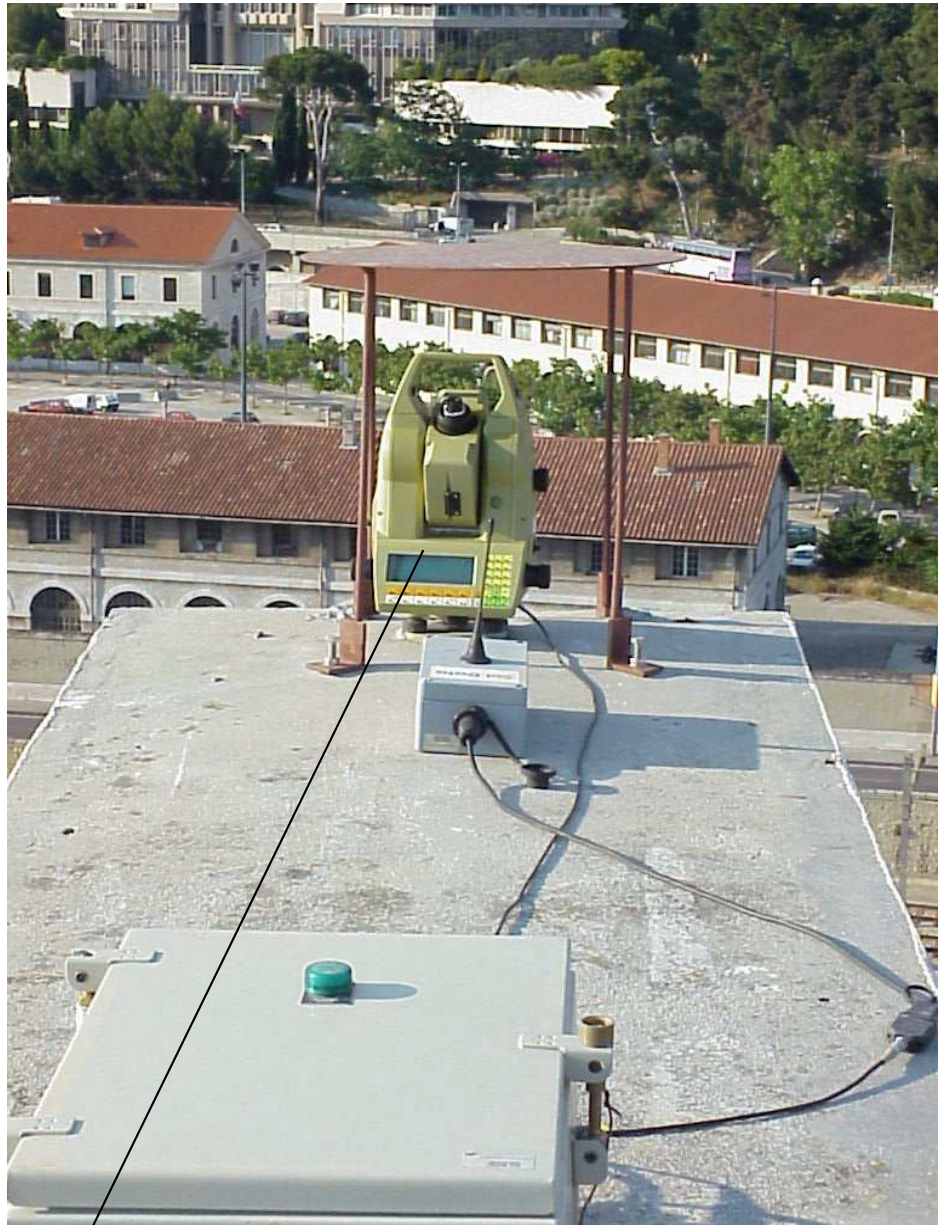
All of the instruments were networked back to the logging computers via GSM radio modems to reduce the amount of wiring required and accelerate installation program.

Three GEOSCOPE computers were located in the monitoring office.

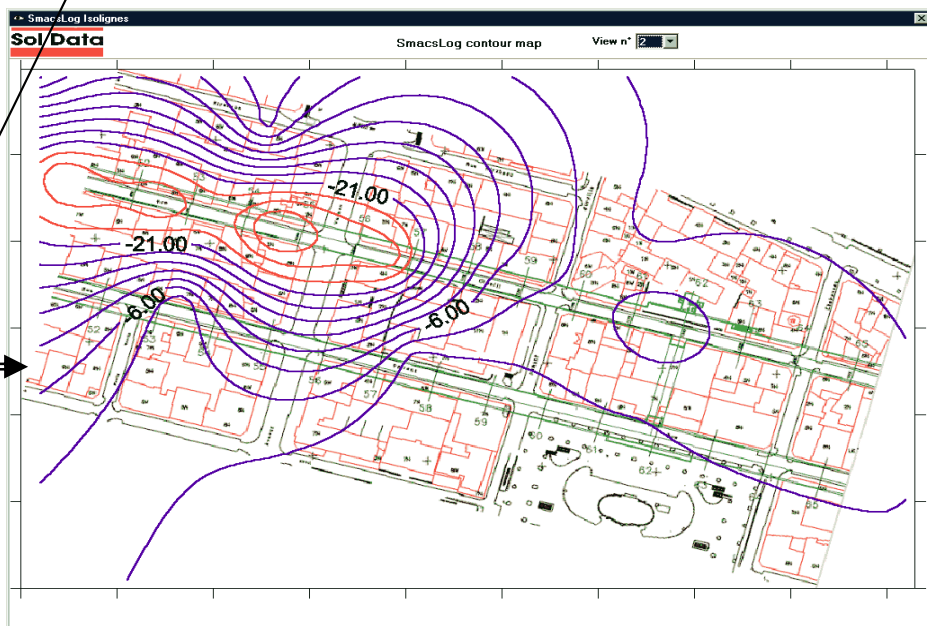
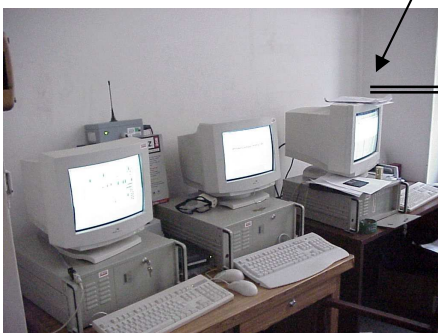
Two of the computers were installed to manage the acquisition of the data from the installed instrumentation. These PC's were configured for remote access, which allowed the consultant, contractor and client to connect onto the site and observe the monitored data from their offices.

The remaining computer was linked to the two computers that controlled the instruments onsite and was used for the archiving of the data, the formatting of the graphical reports and was used to generate reports for presentation to the various parties involved in the project.

This allowed the project team to continuously monitor existing structures for movement, and be able to take rapid action in case of unforeseen events. This was absolutely necessary as the tunnelling was temporarily suspended in 1995 partly due to lack of any monitoring.



CYCLOPS system on the roof of a building



Real-time settlement curves displayed on the GEOSCOPE screen