

Leica Geosystems **TruStory**

Connecting Continents - Leica Nova MS50 scanning for the 3rd Bosphorus Bridge



■ Company/Institution

ICA Construction
www.ica-construction.com

■ Challenge

- To check the deviations in the horizontal sections of the pylons during the construction of the 3rd Bosphorus Bridge (as-built against design)
- Working in cold wind, haze and humidity and under pressure of time

■ Objective

Develop a robust method to accurately measure the concrete surface.

■ Location

The Bosphorus Strait, Istanbul



■ Key Tasks

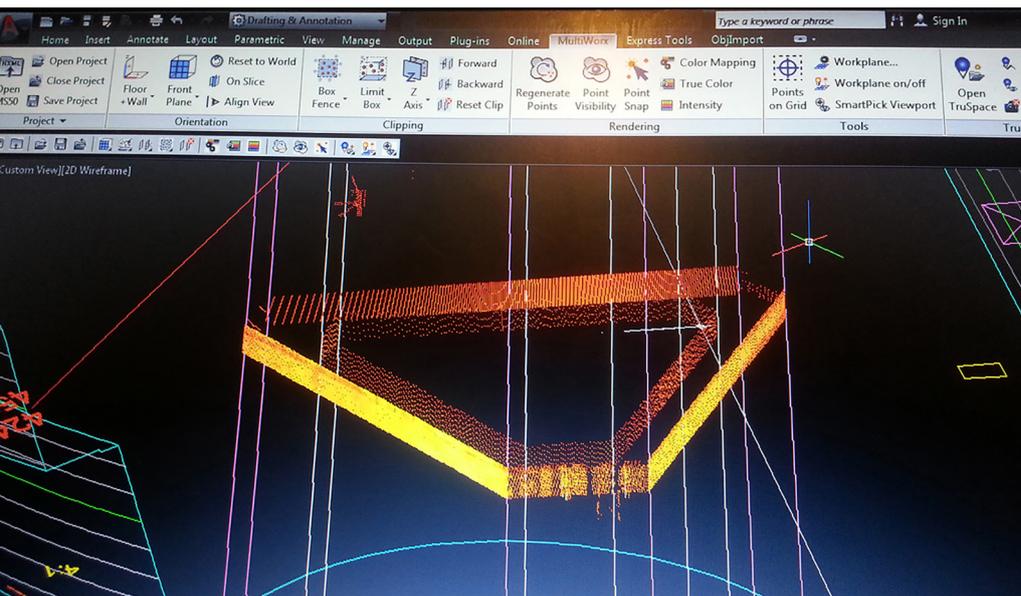
- Establish control points using static GNSS observations
- Set up the Leica MS50 over the control points to scan the pylon surface
- Process the data to confirm whether any deviation is within tolerance

The construction of a third suspension bridge over the Bosphorus Strait relied on the Leica Nova MS50's unique capability to deliver data using a multitude of accurate surveying methods. The impressive new bridge, designed to ease Istanbul's traffic congestion, is a gigantic feat of modern engineering supporting Istanbul's commercial and financial growth. Built by ICA Construction, the Yavuz Sultan Selim Bridge, provides the transcontinental city with additional rail and road transit capacity across the waters that connect Europe with Asia.

The Leica Nova MS50 MultiStation, together with ICA's existing Leica Viva GS15 GNSS receivers, was used

during construction for establishing control, deformation monitoring and checking the as-built against design.

Key to the construction were four enormous pylons, the highest of any suspension bridge in the world, measuring up to 309m in height. Productivity was at a rate of 2.5m per day vertically and the structural design required a relative decrease in width between each pylon by decimetres. One of the critical demands from the engineers was for the surveying team to check the deviations on the concrete surface of the pylons. Due to production imperatives there was a very small window of time available for this procedure but it was critical since



■ Hardware and Software

- Leica Viva GS15
- Leica Nova MS50
- Leica TS30
- Leica Geo Office
- Leica Cyclone 8.0
- Leica Infinity
- Leica Multiworx for AutoCAD

■ Benefits / Values

- Accurate scanning capability over long range
- Fully operational in adverse weather conditions
- Using one instrument for a multitude of surveying tasks, increases efficiency and saves time

The scan data of the pylons were checked against design with Leica MultiWorx for AutoCAD.

any tolerances out of specification could adversely affect the next level of pylon construction.

The laser scanning function and long range measurement of the Leica Nova MS50 was used to determine the concrete surface deviations against the design and processed through Leica Cyclone point cloud software. To achieve the highest accuracy of the scanned data, the MS50 was set up over control points established using Leica Viva GS15 GNSS static observations, processed in Leica GeoOffice.

A further challenge was the harsh environment in which this work was carried out. The Bosphorus Strait connects the Black Sea to the Marmara Sea and workers have to contend with a cold north wind, together with haze and humidity which can even persist through the winter months. All Leica equipment used for this project can easily cope with these challenging conditions. The Leica Nova MS50 has a -20°C to +50°C workable temperature range and IP65 dust and water protection.

Measuring the quality. Most of the work was carried out from three ground control points. They give a clear line of sight to the pylons and construction site and the control was monitored weekly to check for any movement.

In addition vertical alignments of the pylons were checked using several Leica TS30 total stations. Measurements were taken during construction from different positions in order to verify the accuracy for real time as-built comparison.

The Nova MS50 was set up over the control points, a scan window defined and a point cloud measured with a density of 1cm every 100m over a distance of 150m. After collecting scan data from all sides of the pylons, vertical slices, created in Leica MultiWorx were checked against the design (CAD) data.

Surveying manager Mr. Yasar Hacieyupoglu commented, "We had complete confidence in the Leica Nova MS50 and Leica Viva GS15 GNSS receivers to deliver the accurate

long range measurement required on this project. The Nova MS50 is the only instrument which can scan accurately and at speed over the range required."

"Leica Geosystems has been a collaborative partner on this project - the construction company ICA, the main contractor, HYUNDAI Eng. and the surveying team, ENDEM Cons all use Leica Geosystems' products and know they can count on the support, training and service they receive from the manufacturer and market leader."

You can check the latest news about 3rd Bridge and visit the company website below: <http://www.3kopru.com>



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