

Monitoring Shanghai's busiest bridge

With a span of 620m, Yang-Pu bridge is not only one of the longest suspension bridges in the world, but also one of the busiest. Stability and reliability of such a bridge is very important, and regular checks are necessary to provide the highest security. Surveying technology has evolved during the last few years to introduce new systems to improve the accuracy of measurements and greatly reduce the time needed to perform such tasks. By using automated Leica total stations, able to find the targets automatically, combined with deformation measurement software, results can be viewed directly on site.

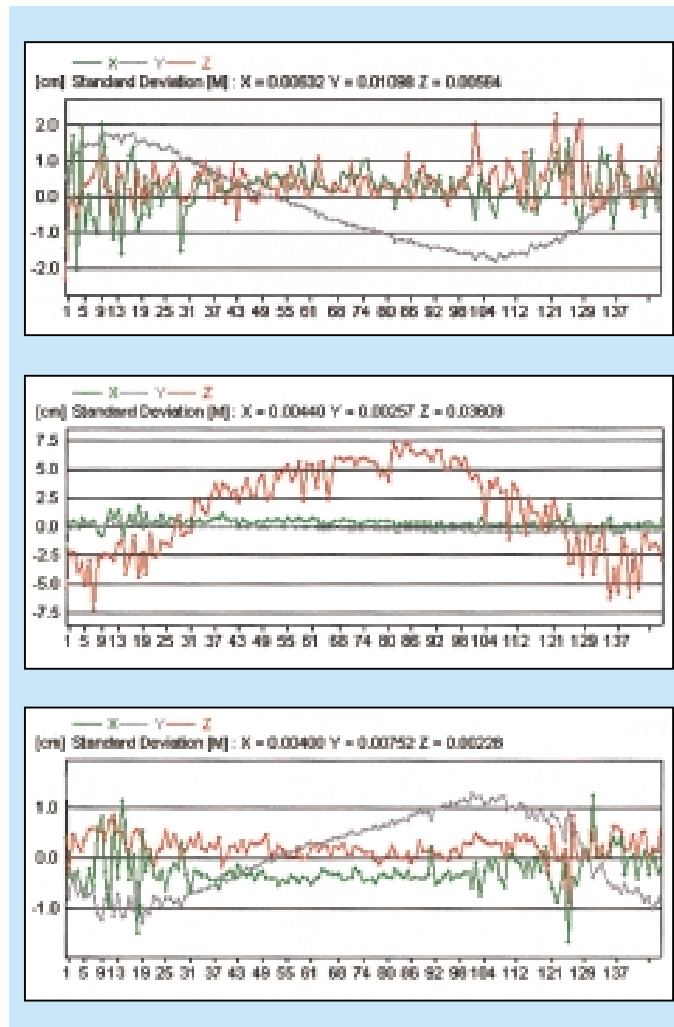
Simply the best!



At its first Leica Day in Beijing the "Leica Chengcai Award" has been awarded to the best students by Leica Geosystems Hans Hess (President), George Kiu (VP Leica China), and John Wood (VP Leica Asia).

East of Shanghai the 1172m long Yang-Pu Bridge has a span of 620m across the Huang-Pu River. Being the busiest bridge in Shanghai, its traffic rate outnumbers 5000 vehicles per hour in the rush hours.

Since it opened to public in 1993, leveling as well as geo-technical equipments (e.g. stress sensor) have been applied in checking the various aspects of the bridge. However, these did not give a complete picture of the bridge deformation. The Shanghai Huang-Pu River Tunnel and Bridges Development Co., Ltd., who is in charge of the management of the bridge, had decided to adapt a new methodology. They co-operated with Leica China and came up with a scheme in which a monitoring system consisting of two sets of automated total stations Leica TCA2003, each of them controlled by a PC with APSWin software installed, and of 24 prisms. 22 circular prisms were distributed evenly across the bridge and 2 circular prisms installed in the beam of the bridge as reference points.



The first survey took part on 5 August 1999 at 2:00 p.m. and ended at next day 2:30 pm. Totally, 148 cycles of measurements were recorded. The 67th and 68th cycles, recorded at midnight when the bridge was

without loading and under homogeneous atmospheric conditions, were taken as reference. Interpretation of the measurements shows that during day-time under sun-radiation, the bridge deforms in such a way that



it deflects upwards 10 centimetres (z direction) in the middle, and elongates by 6 centimetres.

The result was confirmed by the Yang-Pu Bridge Authority to be valid and consistent with results from other systems. It was the successful implementation of the first automatic bridge monitoring system in China

and it delivered the proof that large engineering constructions can be checked with such systems more accurately and faster.

With a span of 620 m across Huang-Pu river, the 1172 metres long Yang-Pu bridge is the busiest in Shanghai. For the automated check 24 surveying prisms have been installed on the structure.

Two Leica TCA2003 high-precision total stations recognized the surveying prisms on the Yang-Pu bridge automatically and transferred the measurement values of angles and distances directly to the PC with Leica's APSWin monitoring software. On the screen deflections in all directions were shown directly to the engineers of Shanghai Huang-Pu River Tunnel and Bridges Development Co. Ltd.

