The Deformation Study of High Building Using RTK-GPS: A First Experience in Malaysia

WAN AZIZ W.A, ZULKARNAINI M.A. and SHU K. K., Malaysia

Key words: RTK, Deformation, High Rise Building, Structural Monitoring.

SUMMARY

Deformation of large engineering structures is often measured in order to ensure that the structures are exhibiting safe deformation behaviour. Nowadays, there are much more high buildings than in the past. From the structural point of view, the dynamic behaviour of high building under loads is apparently the most important aspect at the designing stage. The design of buildings should follow the structural requirements under primary loading and for this reason they are designed according to standards. For many years, deformation monitoring of this engineering structure relies on geodetic surveys (e.g. theodolite-EDM, Close Range Photogrammetry) and geotechnical measurements (e.g. accelerometer). However, for the past few years, the use of GPS for deformation studies has evolved rapidly since the onset of processing and instrumentation improvement of the technology. There are two system architectures for structural monitoring using GPS, one based on a fixed network of sensors and the other based on mobile sensors. In both system, the GPS technology can measure directly the position's coordinates and relative displacements of the structure at rates of 10Hz or higher (rapid assessments). Here, a Real Time Kinematic (RTK) technique represents a smart solution to the problem of obtaining high productivity without sacrificing much in terms of accuracy and reliability. This technique has been considered as a cost-effective tool to monitor safety and performance of engineering structures, including high buildings. The RTK-GPS is a carrier phase observation, processed (corrected) in real-time to give the position's coordinates whereas the kinematic parameters of deformation can be computed in order to predict failure events. Therefore, this paper highlights the concept and methodology of the RTK-GPS and its potential application for high building monitoring surveys. The understandings and experiences gained from the test are proven to be invaluable in choosing a right GPS measurement and processing strategy for a building monitoring. The data collected through these preliminary tests will serve as a benchmark for the future implementation.