

Success story from our customers

CORS STATION IN KUWAIT FOR HIGH RISE CONSTRUCTION



■ CHALLENGE

- To provide a very precise control network to assist with the surveying operations during the construction.
- Continuously check the positions of the self-climbing formwork to ensure the proper position of the core walls.
- Working in very obstructed areas (cranes, steel bars)

■ CUSTOMER

CGEOS Creative Geosensing Belgium

<http://www.cgeos.com/>

■ DATE

July 2015

■ LOCATION

Kuwait





CORS station located nearby the construction site

■ PROJECT SUMMARY

○ Instruments:

SinoGNSS M300 Pro GNSS receiver and **AT300 GNSS** geodetic antenna

Leica TPS and prisms

○ Fieldwork:

The GNSS AT300 antenna mounted on the top of a nearby building, which

Designed by Foster + Partners, 300m-high headquarters tower for the National Bank of Kuwait have distinctive characteristics among the high-rise buildings of Sharq, the Kuwait's growing financial district. To shield the offices from the extremes of Kuwait's climate, its design combines structural innovation with steel, glazing and glass-reinforced concrete in a shellfish shape, which is also shaded by a series of concrete fins, extending the full height of the tower to provide structural support.

The SinoGNSS M300 Pro GNSS Receiver together with Leica Automatic and Reflectorless Total Station (TPS) were used during construction for establishing control and deformation monitoring.

The main problem with high-rise building construction was vertical deviation due to wind, cranes, raft settlement, concrete shortening and various loads. To drive the NBK tower in the vertical direction with millimeter accuracy, only

was connected to the M300 Pro GNSS receiver in the building.

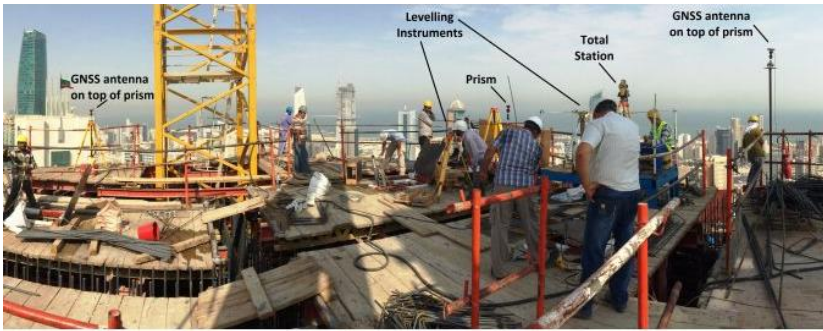
○ Office:

Through the M300 Pro's Webserver, Surveyors were able to directly check and download observation data in RINEX format from GNSS reference station, easy for post-processing the measurements of the GNSS receivers placed on top of the building.

■ BENEFITS

- 24hr uninterrupted operation with fully remote control through its Webserver
- Better performance in urban areas thanks to its tracking Beidou signals
- 8GB internal storage with extensible memory
- Integrated battery serves as a primary power or an Uninterrupted Power Supply (UPS) backup
- Cost savings

relying on traditional optical instruments is impossible because of long distance from ground control points to the top of building; therefore, the core wall control survey (CWCS) method^[1] was adopted. Major measuring instruments in CWCS consists of minimum of three GNSS antennas / receivers along with the prisms, one total station instrument (TPS) at the top level of the formwork, as well as GNSS reference stations on the ground.



Various surveying instruments arranged on top of the construction site

The TPS instrument was used to measure angles and distances to the prisms when GNSS receivers recording in static mode. Along with data from GNSS reference stations, all data were outputted to post-processing center to calculate coordinates of survey instrumentation and marks in the site project coordinates.

The SinoGNSS M300 Pro GNSS receiver was set up as local GNSS reference stations, considering its multiple functions and high performance. With a large internal memory and expendable memory card for long-term big data storage, the integrated battery serves as either the primary power source or the stand-by uninterrupted power supply (UPS) backup. The built-in web user interface gives access to information on receiver status, configuration and firmware update and RINEX data download. All these features ensure stable and long-term measurements.

A further challenge was the barrier environment around which this work was carried out. These surrounding buildings impacted reliability of GNSS reference stations that need a line of sight to satellites. However, the SinoGNSS M300 Pro GNSS receiver has strong capability to track multi-constellations especially BeiDou signals over three frequencies (B1, B2 and B3). It increases the number of GNSS signals that can be tracked that is beneficial on a site where obstructions frequently block GNSS signals.

Furthermore, it is worth mentioning that this M300 Pro GNSS Receiver is the very first CORS station tracking BeiDou satellites signals deployed in the Middle East region, showing up to 11 satellites visible in the sky above Kuwait. In the near future, worldwide customers will get benefits with progress of BeiDou navigation system global service.

Designer of CWCS method, Mr. Joël VAN CRANENBROECK, commented, " we compared performance of the SinoGNSS M300 Pro GNSS Receiver with the Leica GRX1200 receiver used preciously for the Al Hamra tower through a zero baseline test, which shows less than one millimeter difference in 3D coordinates. Therefore, we had complete confidence in the SinoGNSS M300 Pro GNSS Receiver to deliver the high accurate measurement required on this project."



[1] Invented by JOËL VAN CRANENBROECK, the CEO of CGEOS Creative Geosensing Belgium, core wall control survey (CWCS) method has been successfully applied in Burj Khalifa in Dubai and Al Hamra tower in Kuwait.

ComNav Technology Ltd.

Building 2, No.618, Chengliu Middle Rd.

Shanghai, 201801, China

Tel: +86-21-64056796

www.comnavtech.com