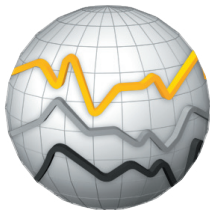




TRIMBLE MONITORING SOLUTIONS: BUILDINGS



KEY FEATURES

- Automated, real-time monitoring system
- Structural health monitoring
- Seismic response monitoring
- Construction response monitoring
- Post disaster structural integrity monitoring

Solutions for Safe Structures

THE ROLE OF MONITORING

Monitoring installations are crucial for buildings which are subject to vibration, ground movement, extreme weather conditions and construction activities.

It is important to detect movements, vibrations, structural changes and responses of buildings to these local conditions in order to identify potential failure modes.

Monitoring provides the information needed to support a safe living and working environment by continuously verifying the ability of buildings to perform their intended function.

The growth in the number of tall buildings and MRT projects requiring the construction of tunnels beneath buildings results in an increased demand for building monitoring.

THE FOCUS OF MONITORING

The performance of buildings subject to seismic and micro seismic activity and the influence of adjacent or underground construction can be monitored by the system.

The integrity and stability of a building after a significant seismic event may be rapidly determined using the data captured by the monitoring system.

Lateral movement, inclination, fracturing, heaving, settlement and fatigue resulting from activities such as tunneling, excavation, piling and drilling may be tracked.

TRIMBLE 4D CONTROL

Trimble® 4D Control™ software is the key element of the Trimble Monitoring system. The modular design facilitates an industry specific solution capturing data from GNSS, optical, geotechnical, seismic and metrological sensors.

The data is processed using advanced, state-of-the-art algorithms and presented in a powerful, yet user friendly Web Interface. It provides a variety of visualization and analysis tools to identify potential failure scenarios.

A fully featured computation parser can be used to create customized observables presenting information of specific interest to the analyst.

Events or information of interest which may affect the behavior of the building can be logged and displayed on the charts.

Boolean comparators are used to integrate data from GNSS, optical, geotechnical, seismic and atmospheric sensors to create complex alarm conditions.

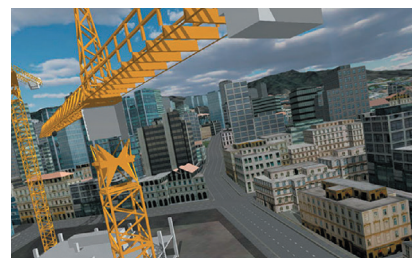
Alarm notifications are issued by email and SMS to selected recipients and the system may also activate audible and visual alarms.

DESIGNED FOR DEMANDING ENVIRONMENTS

The Trimble Building Monitoring Solution is designed specifically for the seismic, structural, modal and survey monitoring analyst.

It complies with the building code requirements of cities in seismically active areas in the United States such as Los Angeles, San Francisco.

Intricate data from multiple sensor types is converted into meaningful information from which informed decisions can be made with confidence.



TRIMBLE NETR9® TI-M GNSS RECEIVER

A full-feature, top-of-the-line receiver with an industry-leading 440 channels for unrivaled GNSS multiple constellations tracking performance intended for monitoring applications.

TRIMBLE 4D CONTROL MONITORING SOFTWARE

A powerful monitoring software that integrates GNSS, optical and geotechnical sensors to collect and manage data, provide computation and analysis, visualization and mapping and alerts and alarms.

TRIMBLE REF TEK 130 SMA

A strong motion 24-Bit Strong Motion Accelerograph that combines the third generation broadband seismic recorder and an advanced low-noise, force-feedback accelerometer.

TRIMBLE S8 TOTAL STATION

An advanced total station that combines Trimble FineLock™ technology with long-range, distance measurement to provide fast and precise monitoring measurements.

TRIMBLE REF TEK® STRONG MOTION ACCELEROMETERS

Powerful devices that measure the acceleration of motion of structures as well as subsurface monitoring of the ground.

TRIMBLE DiNi® DIGITAL LEVEL

A digital height measurement sensor for any job site where fast and accurate height determination is required.

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KEY FEATURES

- Integrated total station/GNSS coordinate adjustment
- Automated tilt correction
- Automated data synchronisation between the Trimble 4D Control and Trimble Access software
- High-precision stake out for high rise construction
- Permanent real-time monitoring of reference coordinates



Trimble High Rise App

The Trimble® High Rise App is intended to monitor high rise structures during construction using GNSS and inclination sensors. Integrated processing of GNSS, total station and inclination data delivers precise and reliable coordinates on demand. This is essential for stake-out jobs on structures subject to tilt such as towers, port and naval infrastructure and high rise structures.

THE ROLE OF MONITORING

Monitoring installations are crucial for structures which are subject to vibration, ground movement, extreme weather conditions and construction activities in order to identify potential failure modes.

The growth in the number of tall structures and MRT projects requiring the construction of tunnels beneath structures results in an increased demand for structural health deformation monitoring. Lateral movement, inclination, fracturing, heaving, settlement and fatigue resulting from activities such as tunneling, excavation, piling and drilling may be tracked by the monitoring system.

Traditionally, surveying on a high rise structure is done with a total station. The total station periodically references to fixed reference points with known coordinates on the structure to record measurements and features of the structure.

CHALLENGES

The precision of the survey depends on the precision of your reference points. Therefore points on ground-level are selected for which absolute consistency of the position can be guaranteed.

Difficulties using fixed ground-level reference points include:

- Densely built-up surroundings
- Visibility problems because distance to ground-level reference points increases continuously

During construction, structures lose their exact vertical alignment due to various factors that might include:

- Crane loads
- Wind loads
- Solar effects
- Concrete shrinkage

TRIMBLE HIGH RISE APP

A stake out of design point coordinates requires the consideration of factors affecting the dynamics of a high rise structure.

To set up a total station on top of a high rise structure, the precise coordinates of combined GNSS and prism targets delivered by the High Rise App are used as fixed reference points. The reference coordinates are monitored in real-time by sophisticated GNSS engines built within the Trimble 4D Control™ monitoring software.

Furthermore, information of inclinometer sensors is used to automatically apply dynamic effects during the Total Station setup.

The automatic tilt offset correction and an integrated adjustment of GNSS and terrestrial observations guarantee high-precision stake outs.

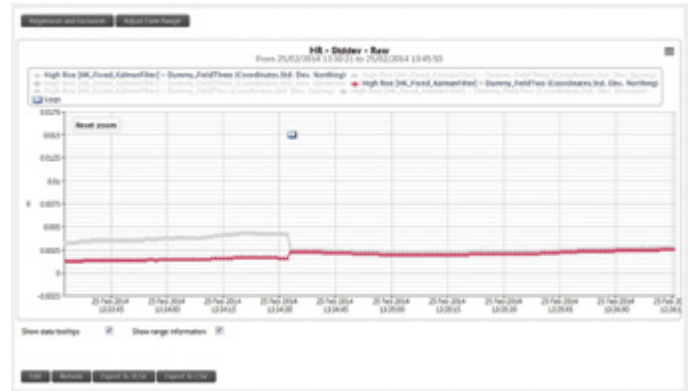
WORKFLOW

The High Rise App uploads current coordinates from the Trimble 4D Control server and makes them directly available on site using the Trimble Access™ software, running on a Trimble field controller.

This automatic workflow is also supported by the online data management system Trimble Connected Community.

TRIMBLE 4D CONTROL WEB

Within the Trimble 4D Control Web module, the High Rise application provides advanced charts and analysis and comes with an integrated alarming functionality of coordinates, displacements and results from external inclination sensors.



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