



AMTS at a project site in NYC

Precise optical monitoring requires total stations, prisms, and software. The total stations measure angles and distances to the prisms, which are fixed to critical points on the structure. The software applies statistically-weighted adjustments to the measurements and outputs spatial coordinates for each prism.

Changes in coordinates indicate that movement has occurred. The magnitude and direction of movement is found by comparing current and initial coordinates.

Precise optical monitoring used to be slow and expensive. That has changed with the development of automated total stations (AMTS).

About AMTS

AMTS (Automated Motorized Total Stations) are advanced optical monitoring systems built around high-precision robotic total stations.

AMTS operate autonomously, provide frequent measurements, and can achieve accuracy approaching that of standard geotechnical instruments.

AMTS systems from GEO-Instruments include:

- Controllers for unattended 24/7 operation.
- Wireless communications for data transfers.
- Automated least-squares processing, control point evaluation, and data quality checks using GEO's Monstar and STAR*NET software.
- Web-based reporting to provide alarms, plots, and integration with data from standard geotechnical instrumentation.

Deploying AMTS

Deployment involves positioning monitoring prisms at specified measurement points, control prisms at stable locations outside the zone of influence, and AMTS at locations that have clear line-of-sight to the prisms. Site-specific variations include special prisms, mounting brackets and towers, and solutions for power and communications.

GEO achieves superior results by installing redundant control prisms and configuring each network to include prisms from other networks. In addition, every controller is programmed to record three observations of each prism for each measurement cycle. These extra steps enhance accuracy, create strong geometric networks, provide the flexibility to accommodate changes at the site.

Advantages of AMTS

- **Automated:** Unattended operation improves safety, lowers costs, and provides data and alarms 24/7.
- **Accurate:** Redundant control prisms, multiple observations, and rigorous least-squares processing produce statistically robust data.
- **Reliable:** Prisms have no electronics to fail and no cables that can be cut. Total stations monitor remotely, so they can be installed in secure locations, safe from accidental damage.
- **Compatible:** GEO's MonStar software can output data as specified by the customer, suitable to combine with other geotechnical instrumentation and CAD-generated plan views and as-builts.



Transbay Transit Center

GEO monitored the SEO system with a strong geometric network of 6 AMTS, 250 target prisms, and 30 control prisms.



I-5 Undercrossing

GEO monitored two massive retaining walls with 2 AMTS and a laser scanner while twin tunnels were bored through their foundations.



Green Line Metro

GEO monitored 2.5 miles of the Green Line with a network of 15 AMTS and hundreds of prisms during construction of a test track.



Kennedy Center Expansion

GEO monitored the Kennedy Center expansion project with 3 AMTS and 80 prisms along with conventional geotechnical instruments.



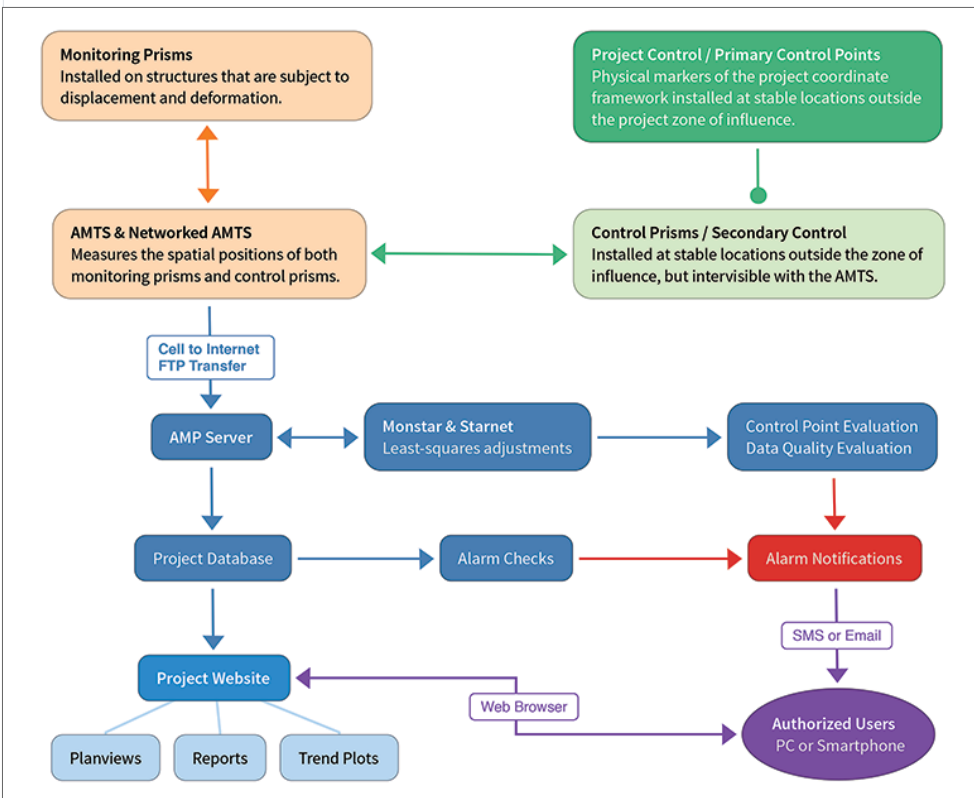
Rosslyn Metro Station

GEO monitored the underground station vault with 4 AMTS while demolition and excavation took place overhead.



Hernando de Soto Bridge

GEO monitored bridge piers with 4 AMTS after unexpected settlements occurred during a seismic retrofit project.



AMTS Diagram

Monitoring Prisms are installed on structures that may be affected by construction activity. Changes in the spatial positions of monitoring prisms indicate movement of the structure.

Control Prisms are installed at stable locations and are referenced to the project coordinate framework. Measurements of control prisms are used to adjust for possible changes in the spatial position of the AMTS.

AMTS monitor the spatial position of the prisms. Networked AMTS share multiple monitoring prisms and control prisms.

AMP (GEO's Automated Monitoring Platform) directs incoming measurements to Monstar and STAR*NET for least-squares processing, and then to the project database.

Project Database runs alarm checks and notifications and stores the measurements.

Project Website makes planviews, trend plots, and reports available to authorized users via their web browsers.