

GKM's integrated approach to monitoring tracks and deep excavations, Toronto, Canada.



Gravity base installation



Building monitoring prism



Road prism



AMTS on auto-levelling tribrach

GKM Consultants has been selected to oversee the implementation of an automatic monitoring system designed to monitor the properties owned by Metrolinx, located adjacent to a major excavation site designated for the construction of three new condominium towers in the urban environment of Toronto. This expansive project necessitates the excavation of foundations near both a crucial service lane and a busy railway station. To ensure precise management, the project demands daily monitoring of 21 prisms strategically placed along the service lane and an additional 6 prisms at the railway station. To meet the client's high standards for precision and reliability in a constantly changing construction environment, it was decided to deploy a state-of-the-art monitoring system that utilizes automated motorized total stations (AMTS). This advanced technology is designed to provide deformation measurements at regular hourly intervals, boasting a repeatability threshold of approximately 0.2mm. Data collected by these instruments are integrated into a sophisticated online visualization platform, which allows secure and immediate access to authorized personnel.

An initial observation phase, lasting about one week and conducted in the absence of construction activities, provided critical insights into the natural variations or "noise" influenced by environmental factors. Notable among these observations was the impact of daily solar dynamics, which were found to induce horizontal displacements of up to 1mm. These critical insights were communicated to the

client, enabling them to define clear thresholds for movements that exceed those caused by natural phenomena. In anticipation of potential deviations from established baseline parameters, GKM proactively configured real-time alerts for each prism and measurement axis. This approach ensures that project stakeholders receive prompt notifications, facilitating immediate corrective actions in response to any deviations that may arise from the ongoing excavation work.

The total stations, essential for the monitoring process, are installed on specially designed towers that offer an unobstructed view, crucial for unimpeded data collection. With a commitment to maintaining the highest standards of safety and operational integrity, the design addresses the need to minimize maintenance efforts, significantly reducing the associated risks. Additionally, the prisms installed require minimal maintenance, with cleaning primarily necessary during severe weather conditions such as heavy rain or snow.

The comprehensive planning and execution of these monitoring solutions have culminated in the rapid and seamless deployment of GKM Consultants' monitoring system. Within a mere span of ten days, which included a dedicated five-day period for establishing accurate reference benchmarks through careful readings, GKM has successfully established a robust monitoring framework.