



Key achievements

- **Accurate, high-frequency, long-term automated instrumentation system.**
- **Highly successful monitoring scheme led to significant project time and cost savings and award-winning technical paper.**

The Project

Part of the Crossrail project, the western ticket hall of the Tottenham Court Road Elizabeth Line station required a large excavation very close to neighbouring buildings and existing tunnels and infrastructure. The excavation needed to be 40 metres across and 30 metres depth.

The Challenge

The size and depth of the excavation meant it needed significant numbers of temporary props at multiple levels to support the excavation walls. Additionally, due to the proximity of many sensitive assets, ground movement had to be minimised.

For these reasons, detailed monitoring was required to satisfy the requirements of asset protection, design validation and construction safety.

The Solution

A composite monitoring scheme was designed to monitor the diaphragm walls during the excavation. The scheme included various types of manual and automated geotechnical instrumentation, but a key focus of the design was monitoring the deflection of the retaining walls using 9no ShapeArrays installed in each section of the retaining wall prior to the start of excavation works. Prop loads were also monitored using Vibrating Wire Strain Gauges. ShapeArrays (SAA) offered multiple advantages including easy installation and short segment length, leading to a more accurate profile of deformation. SAAs provide high frequency 24-hour data with no need for intervention on-site. When paired with capable monitoring software, alerts and reporting can also be fully automated.

The accuracy and reliability of the sensors and methodology used allowed for one of the five levels of temporary props to be removed from the construction program as part of a value engineering proposal, resulting in considerable time and cost savings to the project.

Application

High frequency structural monitoring

Technique

Automated monitoring
Data visualisation software

Market

Buildings
Infrastructure

Client

Crossrail

Project Duration

2+ Years

Instrumentation

ShapeArray

Keller companies

GEO-Instruments