

Case Study

Customer:

Sir Robert McAlpine

Project:

Albert Hall excavation

Solution:

Trimble S8 Total Station and T4D monitoring software



Monitoring the Albert Hall with the Trimble S8

A single Trimble monitoring system is all that's required for a challenging site thanks to intelligent planning and a full understanding of the project's challenges.

As the Albert Hall approaches its 150th birthday in 2021, the building is being prepared to tackle the next 150 years with a good clean-up and the installation of a two-storey, double height basement on the south-west quadrant of the building.

Termed 'The Grand Excavation', these works will open up around 1000m² of back-of-house space for the creation of facilities such as a new café area for visitors and a new multi-purpose space for artists, schools and community groups.

Undertaking the works, which include the upgrade of all internal services and the construction of the new basement area and carpark, is Sir Robert McAlpine and responsible for all monitoring connected to the site, including the implementation and management of the system over a 3.5 year period, is Senior Geospatial Engineer, Vince Bridle.

Challenging Site

The site presented Vince with a number of monitoring challenges that were evident from the outset:

- Large basement dig in a small area, zero piled against existing foundations

and with little room for the cherry picker required for prism installation.

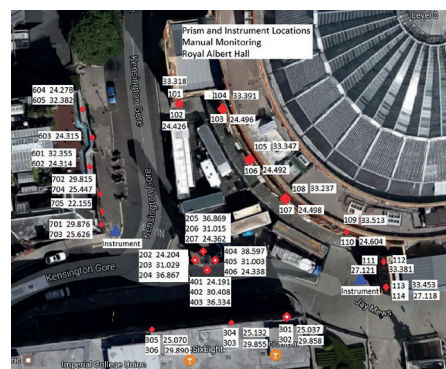
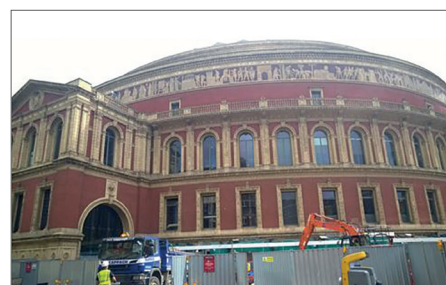
- Requirement for an excellent relationship with all stakeholders responsible for other close and notable buildings in the area, each with their own restrictions as to what could be fixed to them. Obligations included the presentation of data in a way that was accessible and easily understandable by all involved.
- Noise levels – vital that nothing could be heard from a monitoring system within the hall during performances or rehearsals.
- Monitoring of both an adjacent 45m Victorian chimney which had historically shown signs of distress and the domed Hall itself.
- Accommodation of two very different sets of monitoring requirements – those necessary during daytime excavation work would be very different to those at night.

Vince knew that careful planning would be key to the success of a reliable monitoring operation and one that would have the

confidence of all stakeholders so his first step was to undertake regular 'normal circumstance' manual monitoring to establish exactly what would be needed during the project. Over a period of one year the site was therefore monitored eighteen times using a Trimble S8 Total Station to measure to pre-set points in preparation for the excavation.

Selecting and implementing a monitoring system

Familiar with Trimble technology from previous projects, Vince was convinced that a single KOREC supplied Trimble S8 Total Station used in conjunction with Trimble's T4D monitoring software would deliver on all the requirements of this challenging site. With its proven track record, the S8 would provide exactly the accuracy, reliability and robustness that would be vital for an instrument left open to the elements over a prolonged period. Additionally, the S8's MagDrive™ Servo Technology would kill two birds with one stone. It's smooth performance would reduce friction on any moving parts (vital for an instrument that would, in one case, be in almost perpetual motion over a nine month period) and would also render the instrument totally silent whilst undertaking its measurement rounds, discounting any possibility of it being heard within the hall.



▲ Prism and instrument locations

In order to have line-of-sight to all the planned prisms, the S8 was mounted on a 4m steel column fixed to a concrete block for stability. The instrument would be uncovered to avoid impeding the line-of-sight when tilting.

In preparation for the work, a cherry picker was used to enable Vince to attach prisms where required. This included the two faces of the Victorian Chimney and across the Hall itself but only into easily reparable concrete rather than brick work. On the nearby Royal College Of Organists building no intrusive fixings were allowed so the SRM team developed a bracket for attaching onto the ornate grills around the windows.

Planning key to monitoring success

An additional challenge was that monitoring during the daytime needed to be far more intensive than that at night time. Vince wished to retain the simplicity and cost-effectiveness of a one instrument system and decided that two frequencies of measurement would work best. He was able to set this up in Trimble's T4D software so that during the day, the S8 would take readings from one third of the 'primary point' prisms every five minutes over an eleven month period; during the night, the measurement round would include all prisms but at hourly intervals. Not only did this mean that the site required just one instrument for monitoring, but also that Vince could change the measurement pattern during the day if he was required to provide more detailed information for the stakeholders. This could be done without affecting the night time set up. T4D was also used to set up the alarm tolerances for alerts.



▲ Special brackets were made for mounting the prisms on the Royal College of Organists building

For Vince, one of the key aspects of any monitoring project is to develop a good working relationship with all stakeholders

and he reports that reliable, accurate and understandable information is vital if this relationship is to succeed. Because Trimble T4D uses a web-based interface, all permitted parties can view the information coming from the system live on a range of convenient devices from computers to mobile phones. This gives an excellent range of 'at a glance' graphical information for the stakeholders and enables them to manipulate and extract exactly what they needed for both their own reporting and in order to ask relevant questions.

Additionally, once a week reports are autogenerated with further graphics and data and these reports are emailed to all stakeholders. The quality of the reporting has proved useful to Vince for ensuring that all involved trust the accuracy of the information they are being provided with. So much so that following a request from a concerned party wall surveyor for the installation of tilt beams in a basement, Vince was able to provide the surveyor with sufficient information to reassure him that just a couple of tilt beams would be sufficient rather than an additional full building monitoring system. In previous cases this had not been an accepted proposal, but in this case, the surveyor was sufficiently reassured by the data that Trimble T4D provided.

Thoughts for the future

The simplicity of the system that Vince installed meant that one SRM site engineer, picked to be the 'eyes and ears' on site, was able to check the system each day and although initially unfamiliar with it, was astounded by its simplicity. Throughout the project, the S8 delivered accurate, reliable data, in all weather conditions without the need for any maintenance.

The project has also been a useful learning curve for future monitoring jobs. When work began, the Settop M1 communications hub had not been released. This small, robust blue box is connected to a Trimble Total Station and totally takes care of the communication between the instrument and T4D. It can power cycle the instrument remotely, send measurement data via several communication methods including internal cell phone SIM card, measure air temperature and store measurement data onboard if there are any communication issues, particularly at busy network times during the days. This greatly simplifies the setup and maintenance of a real-time monitoring total station.

In future projects, Vince will also look at using an S8 or S9 with Trimble VISION

technology. The Albert Hall project created a lot of interest and VISION technology would have allowed him to provide images for both the stakeholders and other project engineers in SRM.

Finally, the need to incorporate information from other sensors into T4D, in this case, from the tilt beam sensors has resulted in the SRM team automating this process for future projects.



▲ The Trimble S8



▲ The Victorian chimney needed careful monitoring

Contact us:

Please do get in touch for further information on any of the products or services mentioned in this case study, a demonstration, support or just a chat about your requirements.

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