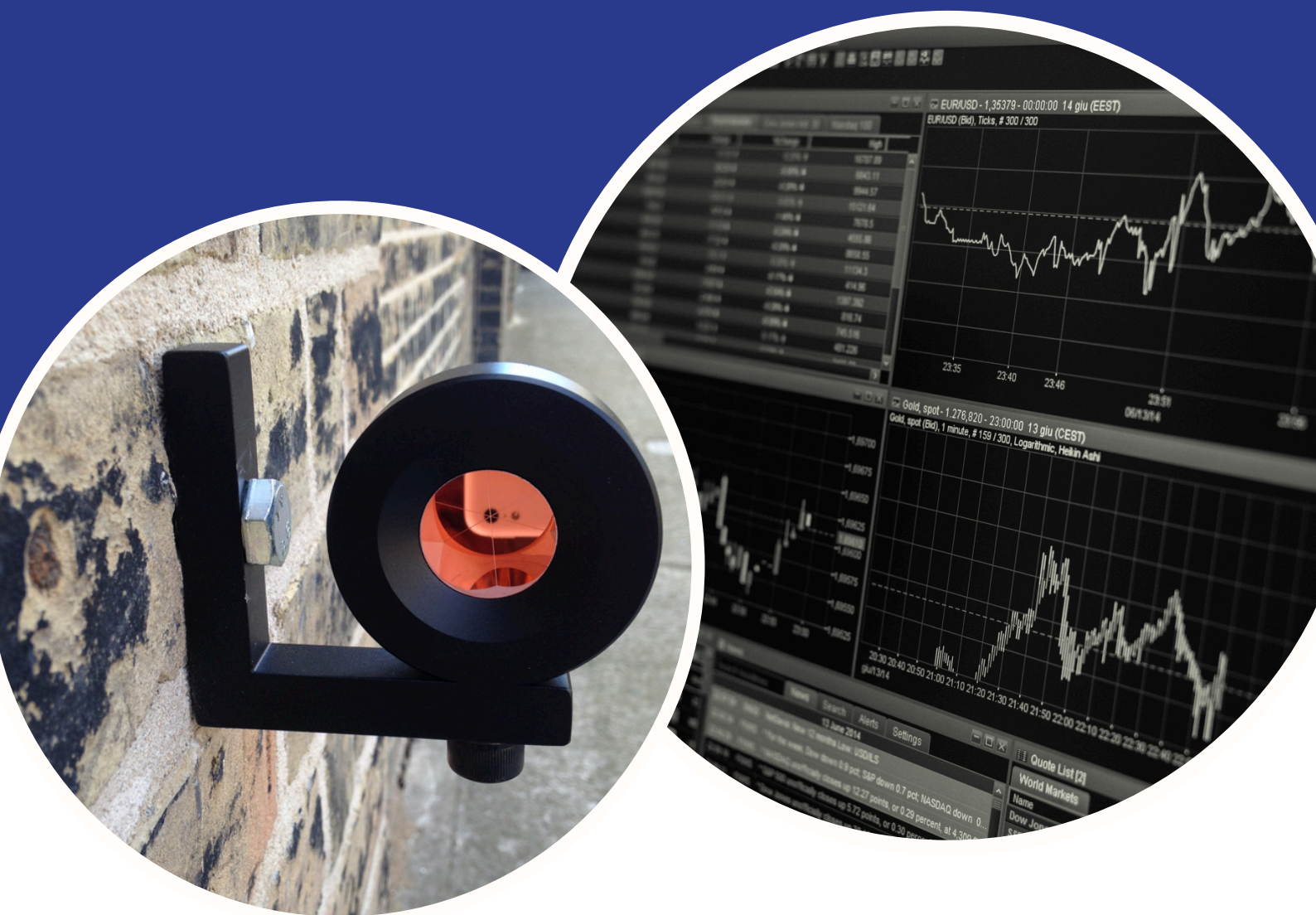




# MONITORING DURING CONSTRUCTION ACTIVITIES

Things to consider when defining  
a monitoring scheme.



## CAPTURING THE IMPORTANCE OF MONITORING

The key to determining what monitoring is required and what equipment is to be used is to first identify the question you are trying to answer. It is not uncommon to see specific monitoring approaches or equipment included in specifications that will not provide results to validate the parameter in question. This can lead to misunderstandings when interpreting the results and, in extreme cases, compromised decision making. Always start with the problem and work backwards.



# HOW DO I KNOW IF MY PROJECT REQUIRES A MONITORING SCHEME?

It is not always straightforward to identify whether monitoring is required when undertaking construction works. However, here are a few questions to consider which may make the decision process more straightforward:

- 1** Is the project taking place adjacent to or above assets such as railway lines, tunnels, heritage buildings, utility services or other sensitive property?
- 2** Does the activity involve the excavation of a basement?
- 3** Do I need to comply with certain environmental legislation during the works, such as Section 61?
- 4** Could the work cause ground movement which may impact the stability of surrounding structures?
- 5** If making changes to an existing building, is structural integrity likely to be compromised?
- 6** Is the activity likely to have a significant impact on ground water and would it be useful to understand conditions as the work progresses?

This list is not exhaustive and a positive answer to a question does not always indicate that monitoring is definitely required. It is certainly a good place to start, however, in order to understand whether further discussion with a specialist monitoring contractor is necessary.



## WHEN IS THE RIGHT TIME TO START MONITORING?

This is a question commonly asked and the natural response is always to suggest it should commence as early in the project programme as possible. Ideally, it is always preferable to understand how structures or ground conditions naturally change through seasonal variations, and then use this information to define a baseline for future comparison.

However, obtaining a baseline over the course of a year or more is rare and often unfeasible due to both programme and cost constraints.

The key is to ensure that monitoring is established well in advance of any works that might have an influence, to ensure that stable data is obtained. It is also important to liaise with any key project stakeholders, such as London Underground or Network Rail, to understand their requirements for baseline monitoring.

Collecting good quality baseline data is vital if observations and trends are to be understood during the works.



## DO I NEED CONTINUOUS AUTOMATED MONITORING OR IS A PERIODIC MANUAL REGIME SUFFICIENT?

Typically there is no 'one-size-fits-all' approach and each monitoring scheme should be considered on a case by case basis. However, here are a few questions you can ask yourself to establish which approach may be best suited:

### **How much risk is involved with the works and what assets are located nearby?**

A good example would be piling within the exclusion zone next to a live London Underground tunnel. This operation carries a very real risk on impacting the safety of critical infrastructure and therefore an automated, near real-time system would likely be required. Conversely, piling several meters away using appropriate methodology may carry minimal risk and LU may therefore be happy with monitoring taking place manually on a periodic basis.

### **How long will the monitoring be required for and how often is the data needed?**

For shorter schemes of a few weeks or months manual monitoring, where a survey team regularly attends site, might be a cheaper option. However, on larger schemes where the monitoring could last for years, it is likely to be more cost-effective to automate the monitoring, eliminating the need for costly site visits. This is also the case when more frequent data is needed to support activities that carry a higher level of risk. Increasing survey frequencies can dramatically increase the cost of a scheme over quite a short space of time, so again, an automated approach may be preferable.

### **What are the constraints in carrying out the monitoring?**

Whilst site activities may not pose a significant threat to surrounding infrastructure, and a manual monitoring regime would typically be sufficient, access restrictions may not make this practical. A good example is when carrying out monitoring of live railways. Access to this sort of asset is typically only available during engineering hours and/or possessions and therefore the window for collecting data can be limited. There can also be significant costs involved in obtaining possessions which can greatly increase the total cost of a monitoring scheme.

Plowman Craven regularly works with clients who are considering either manual and/or automatic monitoring techniques and we are always happy to talk through the benefits of each approach. We also frequently provide unbiased cost comparisons so that the appropriate informed decisions can be made.

# ARE THERE ANY SOURCES OF INFORMATION THAT WOULD HELP ME DEFINE A MONITORING SCHEME?

Over the last few years, a number of excellent resources have been created which help to both define and specify monitoring schemes. Whilst they should always be backed up by expert advice, these are a great place to start when trying to understand best practice and how monitoring can benefit a project.

A couple of our favourite examples can be found via the following links:

1. [The Survey Association - Guide to Instrumentation & Monitoring](#)
2. [BSI BS EN ISO 18674 Series](#)



## WHAT INFORMATION CAN A MONITORING SYSTEM PROVIDE?

Ultimately, the main reason monitoring is required is to determine whether certain parameters are deviating away from their normal state. This might be the rotational movement of a retaining wall, an increase in pore water pressure or an increase in noise and vibration levels in comparison to ambient conditions. This in turn provides assurance to stakeholders, informs engineering decision making and ensures compliance with relevant obligations.

Therefore, the key to determining what monitoring is required and what equipment is to be used is to first identify the question you are trying to answer. It is not uncommon to see specific monitoring approaches or equipment included in specifications that will not provide results to validate the parameter in question. This can lead to misunderstandings when interpreting the results and, in extreme cases, compromised decision making. Always start with the problem and work backwards.

Another thing to consider is that the type of data that can be provided through monitoring regimes continuously changes.

Over the past few years a number of extremely innovative businesses have begun offering new monitoring products to the industry and they continue to develop them at a fast-moving pace. New advances allow parameters to be measured in ways that were not possible previously, providing more meaningful data in a greater range of situations.

Added to this are the benefits that improved data interpretation and analysis capabilities bring. It is becoming more and more common for monitoring data to be augmented and post-processed in a way which provides additional insights to clients, therefore speeding up the decision-making process. Design assumptions can now be validated at an almost real-time pace, increasing safety and opening up the potential for constant optioneering throughout the construction process.

At Plowman Craven we are passionate about the possibilities new technical approaches can bring and we are always happy to share our thoughts with others!



# ABOUT US

**Consult. Trust. Innovate.**

Combining technical expertise with the latest equipment, Plowman Craven is one of the largest surveying companies in the UK, serving a broad client base that includes developers, architects, contractors, engineers, project managers, commercial agents, estate management, investors and government bodies. Our access to skilled and specialist resource allows us to respond effectively, no matter the size of the project or how challenging.

Plowman Craven's broader surveying and measurement services is at the forefront of many major tunnelling and construction developments in the UK, working with clients to advise on and manage all structural, monitoring and engineering services requirements through a project lifecycle.

## Plowman Craven



“

Ultimately, the main reason monitoring is required is to determine whether certain parameters are deviating away from their normal state. This might be the rotational movement of a retaining wall, an increase in pore water pressure or an increase in noise and vibration levels in comparison to ambient conditions. This in turn provides assurance to stakeholders, informs engineering decision making and ensures compliance with relevant obligations.

”



## Contact our expert today!

FOR QUESTIONS, QUOTATIONS, AND MORE

### Phone Number

+44 (0)1582 765566

### Email Address

WebEnquiry@plowmancraven.co.uk

### Website

[www.plowmancraven.co.uk](http://www.plowmancraven.co.uk)

**Plowman** | **Craven**