home safe and well

CASE STUDY AECOM | 1.1b) January – March 2024

A63 Castle St – Underpass Excavation Monitoring & XWatch GPS Software

Introduction

A63 Castle Street scheme is currently at PCF Stage 6 construction phase. The AECOM team work on site full time, and have a requirement to ensure that all the works constructed on site are in line with the works information, specification for highways works and safe for use once released to the public. The improved A63 includes a new grade separated junction, including large 800m long underpass that has a maximum finish depth of 8m, with 4 running lanes that are constructed between two Diaphragm walls and on top of 366 Tension piles and a concrete base slab.

Overview

AECOMs role involves reviewing and commenting on Inspection & Test Plans (ITPs) and Risk Assessment Method Statement (RAMS) for new high risk acitivites on site, which includes the recent excavation of the main underpass. The excavation is taking place between two reinforced concrete diaphram walls (D-Walls), which are being temporarily held in positions by large props.

To ensure the excavation is a success in both in terms of construction progress and safety, the ground and D-walls are constantly monitored for movement during the dig. Trigger levels have been set for the movement tolerances and AECOM are directly involved with these alerts, to ensure they are assessed correctly and appropirate action is taken.

Additionally, proximity tolerances have been established for the excavators working within the excavation, to ensure that the temporary props, completed construction work (D-walls & tension piles) and the monitoring equipment installed in the ground are not impacted. To monitor proximity of the excavator and its surroundings, new GPS XWatch technology has been installed on the plant, which automatically stops the plant from getting close or hitting anything.

During the first week of excavation work both of these control systems encountered technical issues. AECOM have been directly involved in resolving the technical issues, ensuring they operate correctly again before excavation restarts. See Figure 3 for potential issue.

Challenges

- Ensuring all parties involved understood the potential safety hazard to the operatives working within the underpass if the temporary props were moved/hit.
- Ensuring all parties involved understood the potential safety hazard to the general public driving adjacent to the underpass if the temporary props were moved/hit.
- Ensuring excavation works is only undertaken when the control systems were in place and operational (proximity restrictions & XWatch GPS System).
- Ensuring that the alert systems were opertional and movememnt tolerances are adhered with.

Action Taken

- One monitoring node in an inclinometer reported a red alert, identifying D-Wall movements of exceeding 500mm. Excavation work was imediatley paused. AECOM joined alert meetings and contributed in the assessment and decision to conclude this was an equipment failure and this was a flase movement alert.
- Following this, the node was replaced with a new one. No further false alerts have occured.
- The XWatch GPS system was installed on all plant used for the excavation. However, the initial installation it did not work as intended, whereby plant was still able to physically get within 500mm of the props, exceeding the proimity thresold.
- Due to the possible safety implications of a prop being hit, all excavation works were put on hold until the software could be fixed and operate as required.
- The software was unable to be fixed on the large 50T excavator. As alternetive control mreasure a slew restriction has been applied to the 50T excavator to restiction movement to stop the bucket and arm colliding with the props (see photo below). The XWatch GPS conitunes to operate on the other smaller plant within the main excavation area itself.
- AECOM ensured that the XWatch GPS syetem & slew restriction on the 50T excavator were documented in both the ITPs & RAMS and implemented prior to the excavation works starting.

Results

Following the above actions, the Contractor ensured that all the nodes in the monitoring equipment system were replaced if faulty. All parties (Contractor, Client, Designer & AECOM) were added onto the alert email system and will continue to receive alert emails from any monitoring systems that breach the defined thresholds. This provided the scheme and the public with the assurances that any movements exceeding the permitted tolerances would be alerted and acted on appropriately.

The Contractor put a hold on all excavation works until the XWatch GPS system was fixed on the smaller plant and a slew restriction was implemented onto the 50T machine. Both these control measures ensured that the temporary props and movement monitoring kit would not be damaged during the dig, keeping everyone with the dig safe and the public driving adjacent to the dig safe.

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Images

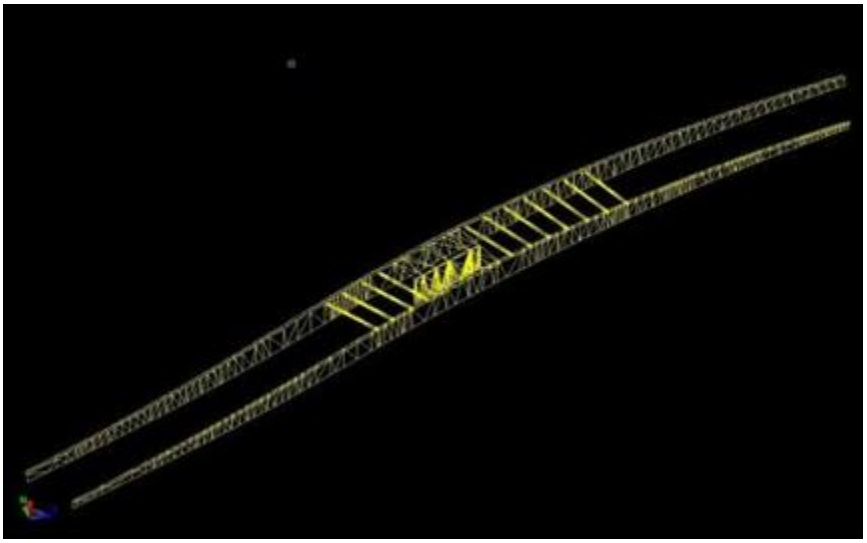

Figure 1 – XWatch Model installed on the GPS System

Figure 2 – Excavation on going, with mark up of slew restrictions on 50T machine.

Observation ID: 1462288
Project: Transport, Energy, Power & Major Projects > Highways > RIP > MHC01005 | A63 Castle Street, Hull - Phase 2 Construction (Highways SBU)
Click here to view the observation online.

Date	Time	Source
2024-02-12	11:46	Mobile
Anonymous?	Reported By	Reporter e-Mail
No	Casey Amer	casey.amer@balfourbeatty.com
Request Feedback?	Resolved at Submission?	Location
No	No	53.74101, -0.33760
What Did You See, What Could Have Happened?		What Did You Do?
Prop hit by machine.		Stopped work and raised with Foreman

Figure 3 – Observation raised by the Contractor for a prop being hit (Almost Hit)