How to Inspect Precast Concrete Elements with Minimal Drilling

Assess the grouting of the joints in precast concrete buildings

Precast concrete elements offer numerous advantages in construction, including speed, efficiency, and quality control. However, the potential for hidden defects within the joints of these elements significantly highlight the need for thorough inspection.

Non-Destructive Testing (NDT) can be used to assess the joints, grouting and condition of precast elements without compromising their integrity. This application note describes efficient non-destructive inspection of precast elements to minimize the need for costly drilling.

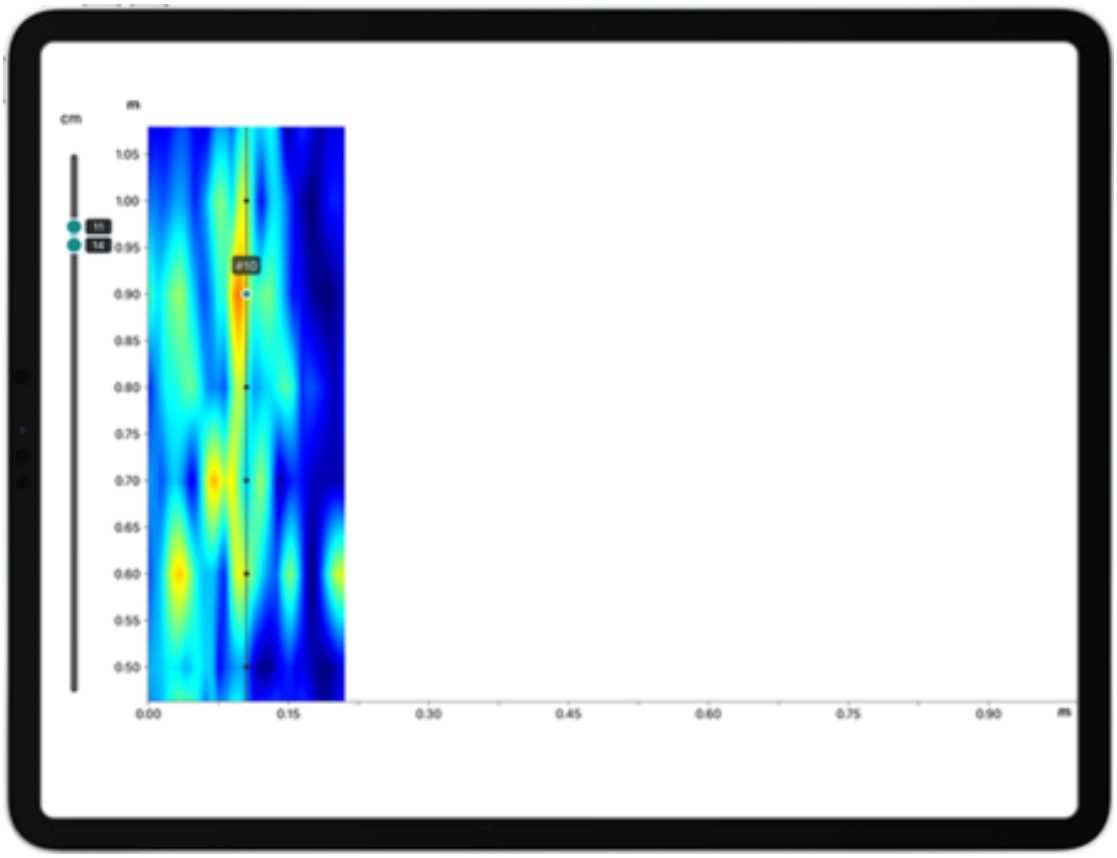
Challenge

Precast structures are built using big panels of concrete made in a factory. They are stood up, fitted together, and filled with mortar at the joints. Sometimes the joints do not fill properly with grout. You cannot always see where you are pouring it, sometimes it clumps together, and it can be difficult to know if the location has been filled correctly.

Currently, it is typical to drill in at random locations to check if the joints are filled correctly. But this means spending time filling up the joints, then drilling them back open to verify, then filling them back up to repair. This is both a costly and time-consuming process. This is where NDT methods step in as a more efficient way to guarantee to the client that the joints are correctly filled.

Solution

Ultrasonic Pulse Echo (UPE) technology is a non-destructive testing method that works very well for checking the grouting on precast concrete elements. The Pundit PD8050 is an intelligent ultrasonic imaging system ideal for this application. It uses UPE to check the grouting non-destructively, whilst giving you real-time visualization of the results. The lightweight, wireless design and powerful software make the PD8050 an ideal choice for this type of inspection where the scanning areas vary, and the results are needed immediately.



Void detected inside mortar joint slightly to left. The black centre line above indicates the location of the joint. The joint was broken out (below) to check for voiding.



Voiding found over a 30cm length (they didn’t break out the entire length of the void. Total length of voided joint section was estimated at 45cm)

How it works

Once you have marked out the spacing of your 3D scan on the concrete using chalk, or have attached the silver AI marking tape, simply scan up your joint and the PD8050 will assemble the scans into a 3D model.

In this case, five different locations and several different types of joints were scanned on one floor of the building to prove that the method worked.



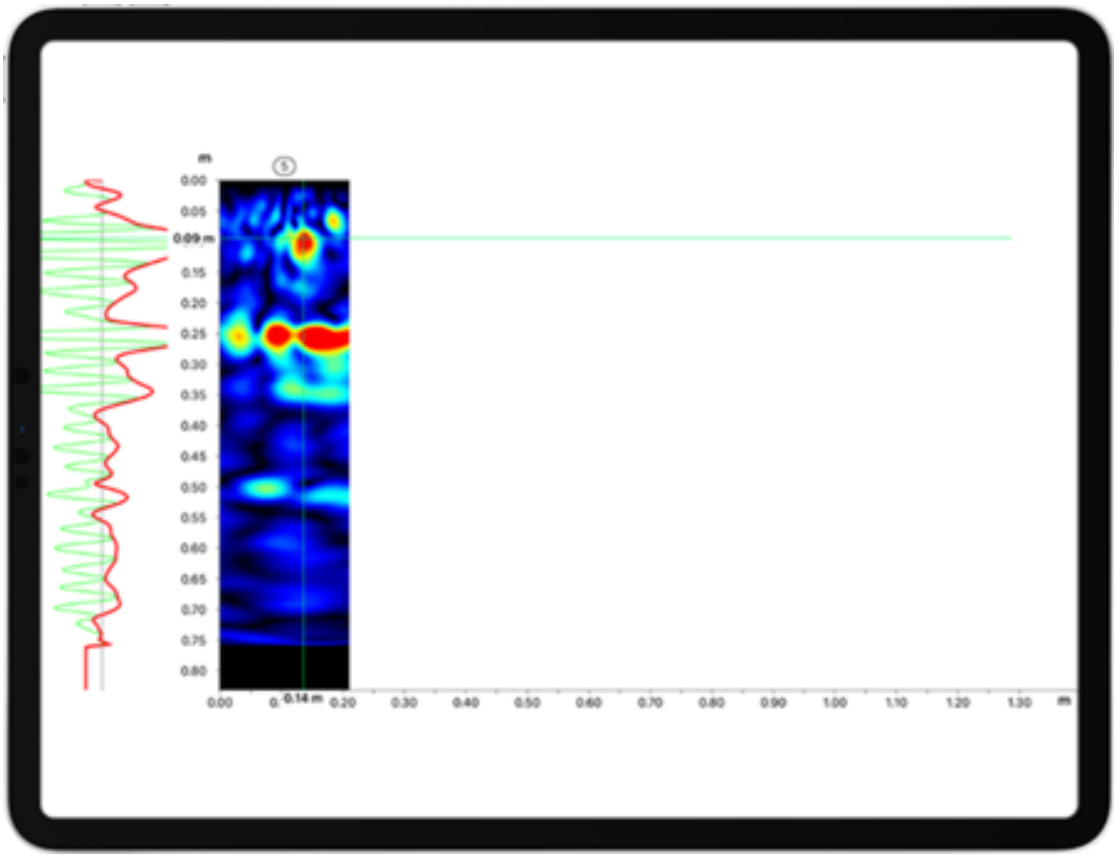
First scan location was voided in joint where red arrows are



Second scan location was voided at the top of the scan

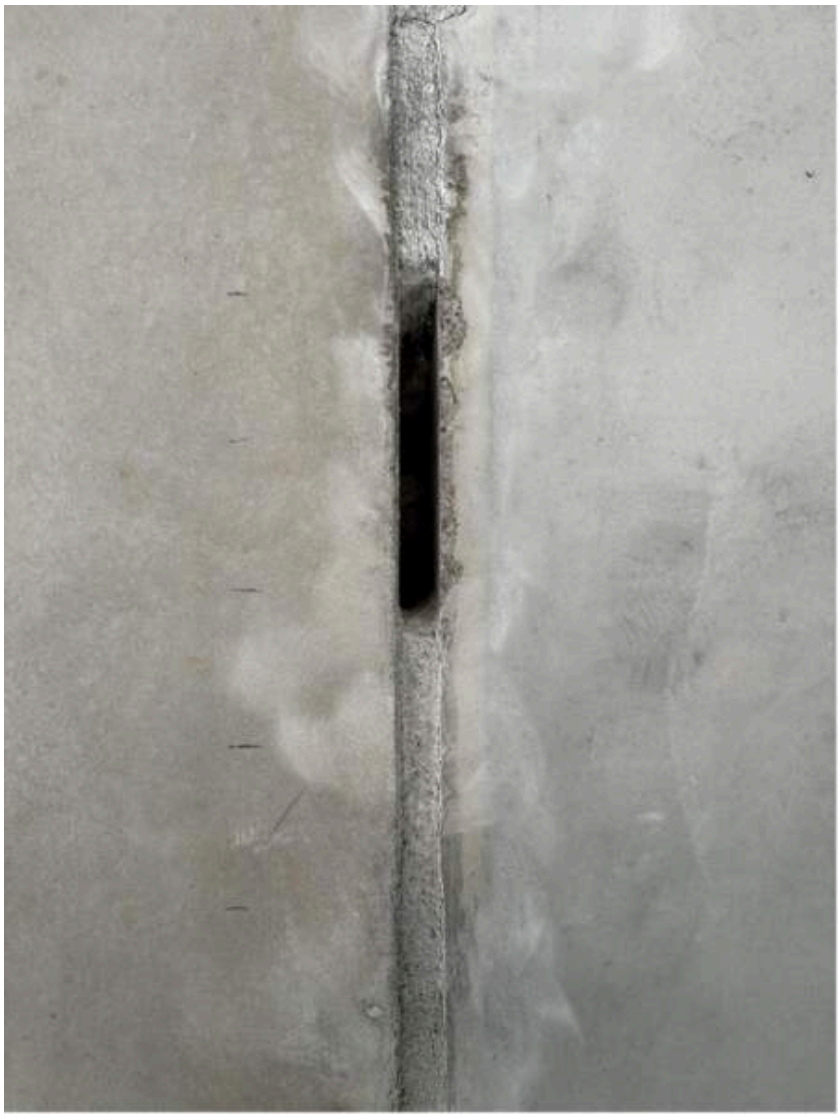


Breakout of potential void done by site engineer on the second scanning site with AR overlay of estimated voided area. Red area of scan indicates voiding in the joint.

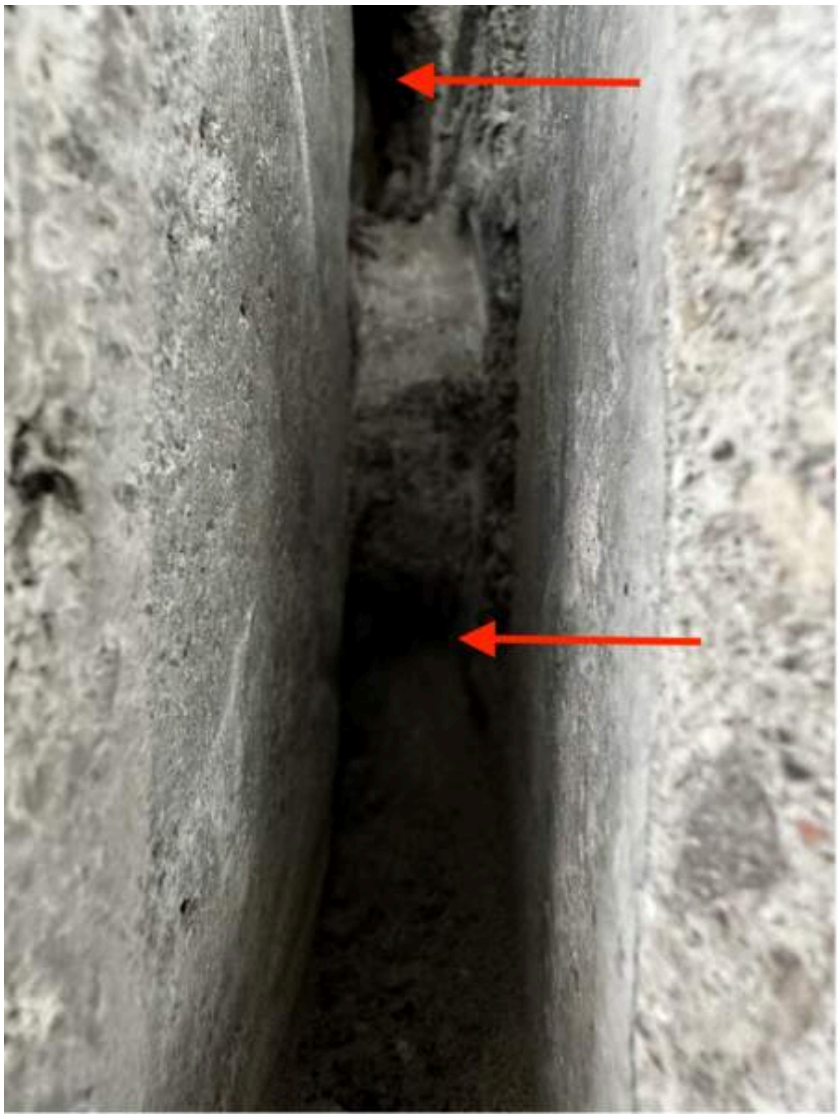


Voided where green crosshairs are.

In the AR overlay above, the estimated area of voiding is indicated in red and this was confirmed after the engineer broke out this area of the joint (below).



This joint was voided where red arrows are (below)

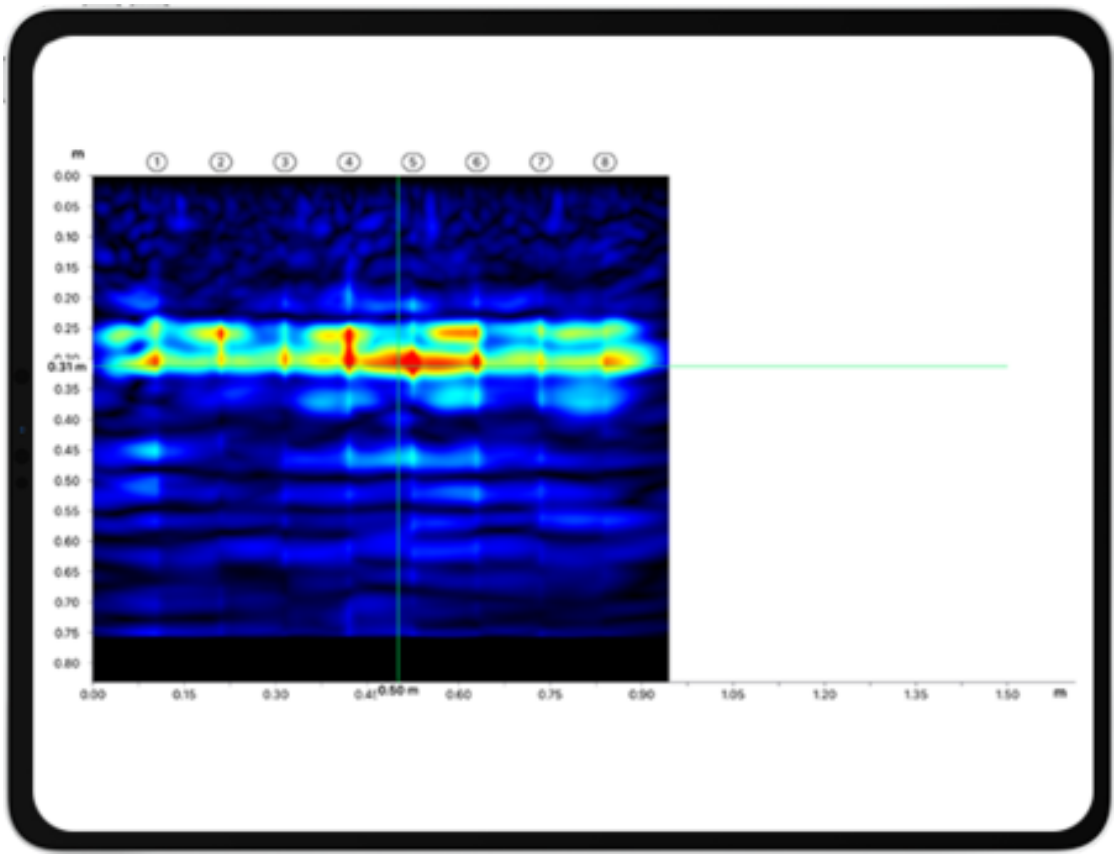


located voids in the joint

A line scan was performed with the PD8050 on the corner joints at the window to inspect the grouting.



The black arrow shows the direction of the scan along the window reveal.



Line scan data from the corner scan. The data points to a possible void or poor bond at the crosshairs location.

Breakouts were performed on three areas in total to verify the results, proving that ultrasound pulse echo is an accurate non-destructive method for inspecting precast elements, delivering a clear view of any grouting defects.

This equates to time and costs saved on site, as well as better quality reports to the client. Trust in Pundit for effective structural inspection that minimizes invasive drilling.

Intrigued to see how the Pundit PD8050 ultrasonic imaging system can work for your precast concrete projects? Contact our team for a free demo.

This application note was created with thanks to Axioma Measurement Systems.

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