Post-earthquake Assessments with Non-destructive Testing

The world shook with the news of the 7.8 Mw magnitude earthquake that happened on the 6th of February 2023 in Turkey and Syria. More than 55.000 deaths have been reported and a loss of $84 million in infrastructure is the first estimate. Over 85.000 buildings of all different kinds either collapsed or were damaged after the quake, leaving many questions about what can be done to prevent such catastrophes from ever happening again.

Seismology is an inherent part of the structural design in some earthquake-prone regions where seismic events are a constant threat to structural longevity. Special design and construction are required to minimize this risk and ensure safety; however, more must be done.

A part of the problem lies in the fact that retrofitting of buildings is not common in this region and the level of enforcement for standards of new buildings remains questionable, especially in this case where some of the collapsed buildings were less than 5 years old. Seismic retrofitting is not only a good preventive method that potentially saves lives, but it is also far less costly (and better for the environment) than building new ones after the damage has already been done.

Non-destructive testing (NDT) plays a very important role in assessing the integrity of buildings and infrastructure after an earthquake - even a low-level one - because it can identify potential hidden damage or defects without causing further damage. This allows engineers to evaluate the safety of the structure and determine if repairs or retrofitting are needed to ensure the structure can withstand future seismic events.

Furthermore, post-earthquake assessments with NDT help to drive seismic retrofits and contribute to building a historical digital health record for any structure. NDT techniques commonly used for post-earthquake assessments include ultrasound, ground-penetrating radar (GPR), and rebound technology.

The first step would be to conduct a visual inspection of the site, typically using an iPad with intelligent inspection software to create a full-scale 3D scan and 360-degree photos of the building and surroundings. Visual cracks are identified and segmented with AI defect analysis for further study.

Next is the detection of hidden cracks or delamination in the concrete using NDT technologies such as impact echo and ultrasound pulse echo. Ultrasound pulse velocity is used to analyze the cracks further and estimate their depth.

To gain more understanding of the structural failure, or the potential, it's critical to conduct imaging of the reinforcement layout and rebar diameters. This is often done with GPR for concrete imaging and Eddy-current for visualizing the rebar cover and diameter. Estimating the compressive strength and comparing structural elements with rebound technology also gives a clearer understanding of structural failure. Drones and other technologies are also often used in post-earthquake assessments.

Through intelligent inspection software, all data from the non-destructive testing is gathered in one place for efficient analysis, reporting and tracking.

As with any structural inspection, it is crucial to take a multi-technology approach to ensure nothing is missed and so that informed decision-making can happen. Without several data sources, it is impossible to ensure the safety or longevity of the structure.

In the wake of devastation in Turkey and Syria, it has never been more important for every building in seismic zones to have post-earthquake assessments with NDT and inspection technologies.

Thankfully, it has also never been easier for this to happen since NDT and inspection technologies are now democratized, accessible, and more user-friendly than ever. Having reliable data from technologies that have been trusted for decades is always the best place to start. Get in touch to find out more about our reliable, trusted, and customized solutions.