Efficient Concrete Assessments in Complex Operating Environments

A collaboration of researchers at the University of Seville, Spain and University of Lisbon, Portugal have used Screening Eagle Technologies' Proceq GP8800 to investigate concrete structures in complex operating environments.

One study was on a building located close to the sea and therefore exposed to many environmental stressors, and the other study was on a radiotherapy bunker. In both cases a thorough investigation of the concrete was required and Proceq GP8800 was used to determine the rebar layout and to identify other important details such as voids and layers, all done on-site, non-destructively and in real-time.

Study 1 - Multi-storey building

The subject of the first study [1] was a multi-storey building constructed in 1996, at a distance of 50-100m from the marine coast in Spain. The building is suffering from concrete cladding detachment and reinforcement corrosion. The purpose was to characterise in detail the state of the materials comprising the exposed concrete façade.

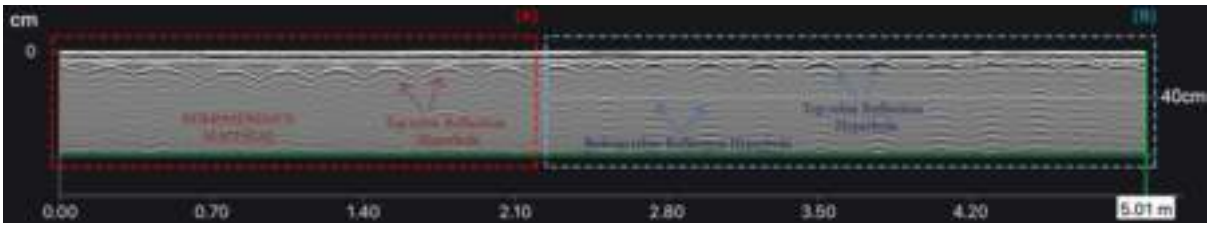
The researchers used Proceq GP8800 to determine the rebar layout and, together with a covermeter, determine the concrete cover. They found that there were areas with no rebar and areas where the concrete cover was less than recommended by national standards at the time of construction. They were also able to identify defects (voids) in the radargrams; these were present on the façade that is most exposed to marine spray and these areas presented an imminent risk of detachment. The researchers concluded that it was not only the marine environment that was contributing to the poor state of the building but also poor placement of the rebars. The recommendation for the building's future is to implement a periodic protective maintenance programme.

Read the full article, Analysis of alterations presented in a white-concrete façade exposed to a marine environment, including the results of other testing methods.

Study 2 - Radiotherapy bunker

The subject of the other study [2] was a radiotherapy bunker constructed in the 1980s and located in a hospital in Spain. It houses equipment for cancer treatment and the concrete performs as insulation, preventing possible radioactivity emissions beyond the shielding of the equipment itself. Concrete used for this purpose must be thick and dense. Insufficient information on the structure was available in documentation. However, a recent adaptation of the bunker to accommodate new equipment allowed investigators to thoroughly test one wall and they found it to be a double wall with layers of conventional concrete and barite concrete. The latter is commonly used in radiotherapy bunkers and it includes barite instead of conventional aggregate because of the additional density that this provides.

The purpose of the study was to investigate the construction and structural characteristics of the rest of the bunker, to characterise the concrete with which it was built to determine its current state. The researchers used Proceq GP8800 to determine the rebar layout and to check for any ‘double walls’. They found that the reinforcement was in good condition and that some of the walls did indeed appear to have two layers – conventional concrete and barite concrete. They inferred this because two layers of rebar were detected approximately 40 cm apart; however this can only be confirmed with destructive testing which is not permitted on these walls. They concluded that GPR could confirm the reinforcement of radiation protection without carrying out destructive tests on the wall.



Read the full article, Characterization and radioactive evaluation of the concrete from a radiotherapy bunker, including the results of other testing methods.

Both studies demonstrate the usefulness of GPR as an on-site testing method that complements more involved and expensive scientific methods. They also clearly demonstrate the high quality of the data obtained from the GP8800 antenna and the flexibility of the GP app software for non-standard investigations.

We look forward to sharing more research work which Screening Eagle software and sensors have contributed to.

1. V. Flores-Alés, F.J. Alejandre, F.J. Blasco-López, M. Torres-González, J.M. Alducin-Ochoa. Analysis of alterations presented in a white-concrete façade exposed to a marine environment——A case study in Cádiz (Spain)[J]. AIMS Materials Science, 2022, 9(2): 255-269. https://doi.org/10.3934/matersci.2022015

2. Torres-González, M, Mantero, J, Hurtado, S, Flores-Alés, V, Alejandre, FJ, Alducín-Ochoa, JM. Characterization and radioactive evaluation of the concrete from a radiotherapy bunker. Structural Concrete. 2022; 23: 3102– 3113. https://doi.org/10.1002/suco.202100379

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