Efficient Detection of Corrosion in the Concrete floors of a Parking Garage

Nebest investigates large parking garage for corrosion using advanced half-cell potential technology

Overview

- Nebest was required to investigate the nature and extent of damage to a concrete parking garage in Rotterdam
- The Profometer PM8500 Corrosion sensor was used to carry out potential measurements (half-cell measurements)
- The team were able to achieve over 30,000 measurements in just one day with a clear view of locations with active corrosion.

Nebest is an independent engineering/consulting firm, specializing in inspection, in-depth technical research and advice but also project management in construction, infrastructure, industry and hydraulic engineering.

Challenge

The floors of a parking garage under a former office building in the center of Rotterdam showed some local damage with compressed concrete. The building had been purchased by a property developer, who wanted to repurpose it as a high-end apartment complex.

Prior to the large-scale renovation of the complex, a good insight into the condition of the parking garage, investigation was needed in order to determine the nature and extent of the necessary maintenance measures.

Solution

In addition to the usual investigations into the causes of the damage already observed (coverage measurements, carbonatation, chloride levels in the floors), potential measurements were also carried out using the Profometer PM8500. Potential measurements, also called half-cell measurements, are used to detect corrosion activity of the reinforcement, even before it has actually led to concrete damage.

With the PM8500 half-cell potential meter, a lot of insight can be gained into the corrosion activity in a construction in a relatively short period of time. This technique is based on measuring the stress differences (potential differences) that occur during active corrosion. In places where a low potential (more negative potential) is measured, there may be a corrosion hot spot.

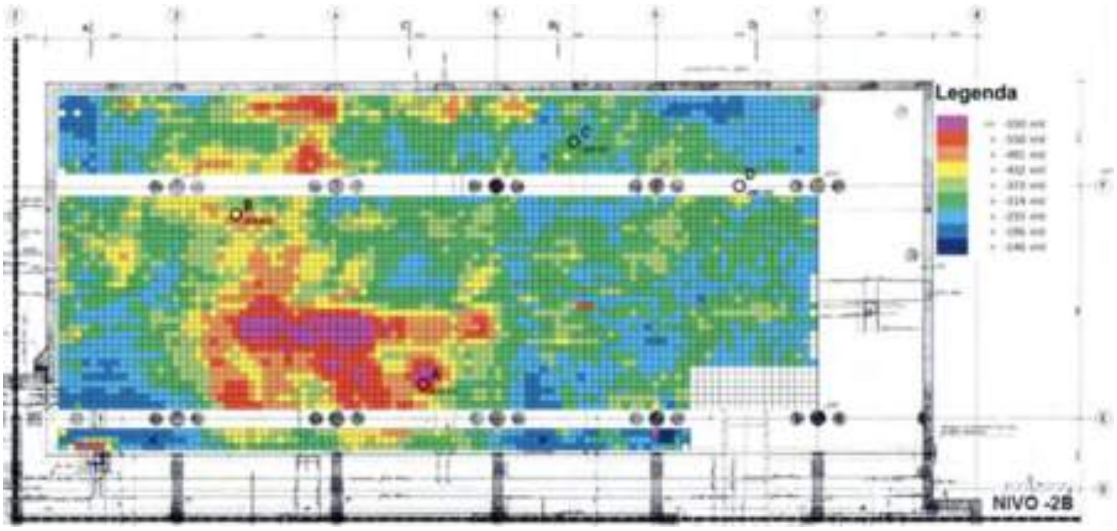
Performing half-cell potential measurements on the concrete floor with the Profometer PM8500 corrosion sensor

Because of the presence of some damages in the floors and the knowledge that the floors had been exposed to thaw salts driven in by cars for about 40 years, it was suspected that the corrosion problem in the floors was possibly much more serious than it appeared. Potential measurements in such a situation can provide relatively quick answers about the presence of reinforcement corrosion in the entire floor area (over 1400 m2, spread over three split-level parking levels).

Result

Within one day, the parking floors were fully measured in a 200 x 200 mm2 grid. The measurements were performed with the PM8500's wheel electrode, where the measuring electrode is included in the measuring wheel. This wheel electrode is rolled over the surface to be examined and automatically measures the potential value for each preset measuring distance; in this case, one measurement every 200 mm. So a total of almost 30,000 measurements in one day!

Using the data log function in the equipment, a color map was generated from the measurement results and then plotted in a drawing of the investigated floor area. With this, it is clear at a glance where the zones with corrosion activity are located (in this case at measurement values < -375 mV, these are in the plot the yellow, orange, red and purple areas).



In this situation, the potential measurements quickly clarified the extent of reinforcement corrosion in the floor. This was certainly more extensive than just the corrosion at the few damages visible in the floor, but it also became clear that it was certainly not a generic problem. This proved to be important information for determining the most economical and technically correct repair and maintenance measures.

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