infrasolute
smart infrastructure monitoring

Intelligent measure for underground car park renovation

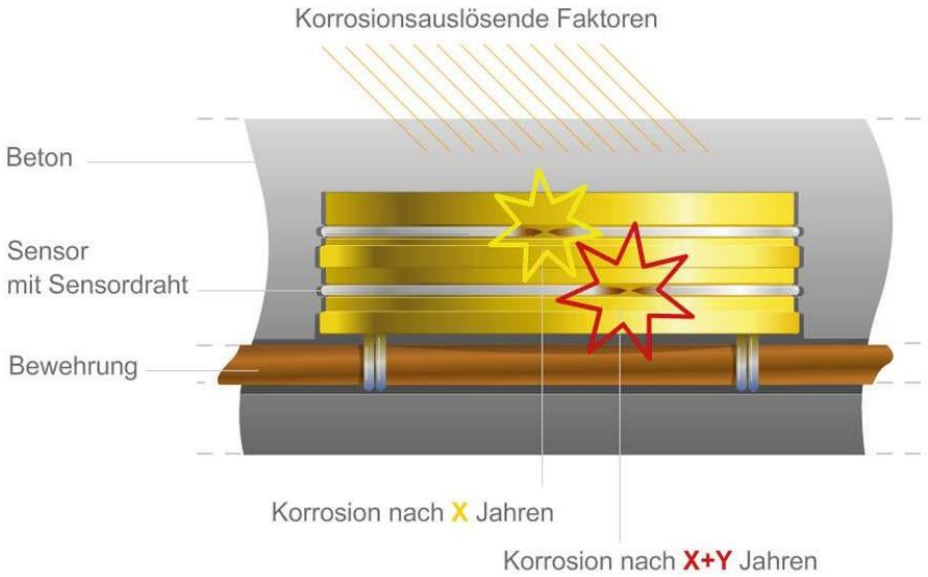
Published in DDIVaktuell, a trade magazine for property managers, issue 03/17

As diverse and widespread as the possibilities of building automation have become in the meantime, one economically enormously important aspect has hardly been taken into account so far: the actual service life of building components. However, this will now change - with the introduction of a new maintenance guideline for underground car parks planned for mid-2017, whereby this term here stands for all types of parking structures.

New measures

For the first time, the directive stipulates that the scope of maintenance measures on such garages is to be measured according to the remaining useful life. In the run-up to such a measure, the so-called wear and tear reserve will therefore have to be determined in the future. It results from the current actual condition in relation to the desired remaining service life, which is determined jointly by a competent planner and the client. The planning of the maintenance measure is based on this, which will be all the more intensive with the increasing length of the upcoming period of use. This was not previously provided for in the current directive from 2001.

What sounds reasonable, on the one hand, also harbours great dangers: If one disregards the fact that the recording of the actual condition in advance will be many times more time-consuming than before, the question of proving the statements made about the remaining useful life will also arise at some point. In this context, it should also be mentioned that the application of the new technical building regulation (TB according to BO) alone requires enormous knowledge about and relevant experience in the renovation of underground garages, which is why the requirements for expert planners have significantly increased.



This is how the CorroDec®2G works: direct connection to the top reinforcement layer with corrosion sensors in two levels.

Not visible from the outside: The wireless and energy-less sensor technology is read annually.

Sensors offer safety

Therefore, it seems sensible and logical from a professional point of view to install systems that can provide proof of the remaining useful life to secure warranty claims on the one hand and reliably inform clients about the actual condition on the other. In this way, necessary renovation measures can also be planned and saved for in the long term.

In fact, there are already very easy-to-use solutions for this: sustainability monitoring using wireless and energy-less sensors. They make it possible, for example, to
B. to quantify the risk of corrosion of the top reinforcement layer over the next decades after a cost-intensive full renovation. The new

Maintenance guideline includes nomograms for estimating the remaining service life as a function of exposure class (e.g., XD3), chloride diffusion coefficient, and age exponent. Since the material parameters, in particular, contain certain uncertainties, the sensor provides a more reliable statement about the current corrosion risk. Furthermore, the system realistically records all influences from moisture and chlorides in the component so that when the sensors strike (= rusting through of the wire), the sometimes controversial discussions of the experts about the corrosion-triggering chloride content of 0.2 to 1.0 M. - % related to the cement content are unnecessary.

The sensor directly connected to the top reinforcement layer has two depth-staggered sensor wire levels. If one of them corrodes, this is detected when the measurement is read out via induction/1/4 Anz high RFID. If the lowest wire is affected, the upper reinforcement layer will also start to corrode in the foreseeable future. According to the manufacturer, the service life of the sensors is 50 years.

The decisive factor for the accuracy of the sensors is that the embedding concrete has the same diffusion coefficient as the surrounding concrete when it is subsequently installed. Ideally, they are installed at the same time as the renovation. However, if, for example, there are concerns with large ceilings that the thin sensor wires could be damaged, an alternative installation method can also be chosen. In any case, a few days after installation, the concrete is blasted locally at the sensor with ultra-high pressure water jets up to 3 000 bar; the corrosion sensors are fixed to the upper reinforcement layer and filled with the same concrete on the date of the next concreting section. Finally, approved specialists carry out the annual reading of the sensors.

Outlook

Currently, the maintenance guideline of the DAfStb (2001) is still valid. However, according to current reports, the new maintenance guideline is to be introduced at the end of 2017. After the yellow print has been published, installing sustainability monitoring systems with wire- and energy-free sensors is already advisable due to the liability issue mentioned above. This is the only way to read out the current actual condition of relevant components in underground garages in terms of corrosion or moisture non-destructively and reliably on an annual basis. This provides security for all parties involved and makes maintenance plannable for owners in the long term for the first time.

Lecture on the topic

Rainer Eger will discuss monitoring for maintenance in depth in a presentation at the 25th German Managers' Day: 7/8 September 2017, ESTREL Berlin.

The author

Dipl.-Ing. Rainer Eger
The graduate engineer has been planning and supporting concrete and building restoration measures for around 30 years. The practical planning of concrete restoration is his personal concern. Find out more at www.eger-ing.de