

MINI SEMINAR ON SERVICE LIFE OF CONCRETE STRUCTURES INCLUDING THE PROPAGATION PERIOD



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ABSTRACT

The background for the seminar was the currently widespread interest in the propagation period in a service life estimation. The knowledge about the mechanisms that decide the propagation period in the corrosion process has enhanced. This knowledge justifies a discussion about using the propagation period in the service life models of concrete structures. The aim of this mini seminar was to gather researchers actively engaged in the field, contractors and owners for a discussion.

Consensus was reached that the idea was a very interesting approach for estimating service life. The results presented support the concept, but show that more research is needed for making safer service life estimates.

Key words: Service Life, corrosion, chloride

1 INTRODUCTION

Corrosion is the most common durability problem for concrete structures. Results from the corrosion research indicate that the fundamental service life for a concrete structure will not have come to an end when the initiation period is finished. If we know more about the propagation period, this will result in more safe models for estimating the total service life. This will result in a more optimised construction which also results in a lower cost and a higher competitiveness for the concrete structures.

This Nordic mini seminar was organised by the Swedish National Road Administration and the Swedish Cement and Concrete Institute, CBI. The seminar called "Service Life of Concrete Structures Including The Propagation Period" was held the 10 of December 1996 at CBI.

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2 PRESENTATIONS

There were 20 invited speakers, 15 of them presented papers that are listed below.

Definition on life time *Now and Yesterday*. Karin Pettersson, CBI discussed the different ways to decide the service life of a concrete structure. Today we are quite modulate when estimating the service life of a concrete structure. There are different criteria for different details in the structure. Cracks in concrete are not so dangerous as we thought a few years ago. Today we know quite a lot of the ongoing corrosion (corrosion rate) why we think it could be included in the service life estimation.

Test arrangement for determination of time for initiating corrosion of reinforcement in concrete. Ernst de Place Hansen, DTU presented an ongoing project about measuring the initiation period with the polarisation resistance method. He also presented a project concerning the combined mechanical and durability loading in fibre reinforced concrete. The fibres were both steel and polymer.

Corrosion monitoring of concrete pillars in marine environment. Øystein Vennesland described a test at a bridge in Norway where a dense epoxy coating was applied to the concrete surface. The bridge was contaminated with chlorides. The main objective of the test was to study the effect of the dense coating on central corrosion parameters, especially the oxygen content.

Research needs regarding the influence of macro cracks on salt penetration and reinforcement corrosion in concrete. Paul Sandberg gave an account of the necessary research about cracks in reinforced concrete. A systematic mapping of cracks in concrete structures in deicing salt environment is needed. Cracks in the marine environment are occasionally investigated, but these results can't be used in the deicing salt environment.

Resistivity as a repressive corrosion factor. Magne Maage presented the definition on service life on concrete structures in the ISO and CEN standards. When the propagation period is about 10 years it is not of interest. If and when we can control the factors that decides the propagation period then it will be very interesting. The resistivity is one controlling factor for the corrosion rate. Reducing the water binder ratio, w/b and/or add additives in the concrete results in an increased resistivity.

The durability, repair technology and the economical service life for concrete structures. Håkan Sundkvist gave an account of the research section on the Royal Institute of Technology Department of Structural engineering. The material and construction researchers ought to collaborate more to get optimal construction solutions. This will strengthen the use of concrete structures on the market.

Definition of the service life. Bo Eriksson discussed the opinion from the Swedish National Road Administration about service life on concrete structures. The opinion is that the service life is finished when the initiation period is finished. This because the SNRA has to guarantee the traffic safety. More research and data about the mechanisms that control the propagation period is needed before it can be included in the propagation period in the service life estimation .

Definition of the service life. Håkan Kellner presented the opinion from the Swedish National Rail Administration about service life in concrete structures. SNRA does not think that corrosion caused by deicing salt is a problem for their structures. There are a lot of questions that have to be clarified before the propagation period is taken into account in the service life estimation. Even though it is a good idea to use the propagation period during the design stage.

Service life estimation of concrete construction in Finland. Erkki Vesikari presented a new project at VTT "Life time estimation on construction materials and products". The purpose with the project is to develop a life time methodical for construction materials and products adapted to the Finnish climate. Collecting data from structures on site will give a better insight in the service life understanding.

Durability in concrete structures. Stefan Jakobsen presented a research program in Norway concerning "Durability in concrete structures". The project started in 1996 and will end at 1998. The purpose with the project is to build permanent concrete structures with a minimal life cost. The author meant that the service life should include both the initiation period and the propagation period.

3 CONCLUSIONS

There is a consensus that the propagation period ought to be included in the service life estimation. However, more research and data are needed about the rate of the deterioration before the propagation period with certainty can be used in a service life model. The criterion for life time has to be decided by the owner. Life time will vary for different structures and different environment. The Swedish National Road Administration can assist with information about the criteria for the ultimate strength for different existing concrete structures, taking into consideration the accepted degree of corrosion for a specific concrete structure.