SIMPLE CONCRETE LIFE EXTENSION

Alexis Borderon
Specialist, Stainless steel reinforcements
Valbruna Spa , Viale della Scienza, 25 - 36100 Vicenza Italy
alexis.borderon@valbruna.it

Alexis Borderon, born 1967, received his structural engineering & architect degree from Grenoble school of architecture, France . His main area of expertise is related to concrete durability

1 Introduction

Service life of concrete constructions has been increasing since the economical crisis started, due to obvious financial issues as maintenance is costly and difficult to predict. The demand from the builders has been either monitoring of the structure in order to be able to plan and finance in time maintenance or repair, or specify the project with a longer durability from the start, as the savings in time exceed by far the design and construction costs.
This paper examines the different options to access durability and their benefits, and the technical solutions to provide it.

2 Concrete deterioration

Most of the deteriorating concrete in infrastructures is due to the corrosion of the carbon steel rebar. The cost is recognized to be 1% of the project price per year. For the public administration or the private builder, it means build 1 and pay for 2 for the expected 100 years lifetime.
If costs are important, structural integrity is crucial. Still, concrete decay may lead to collapse, and 70 % of structural failures happen unloaded, due to only 5 % of the reinforcement been corroded. (i.e. [1])

3 Concrete cover

High performance concrete (HPC) is nowadays preferably used in civil engineering projects, to protect reinforcement, to resist deterioration and to provide adequately high strength to fulfil the structural requirements. As it strength usually remains within the range of 50 - 80 MPa or higher, microcracking and cracking is inevitable due to the high filler content of the concrete.
This leads to the dilemma of the designer, as higher concrete cover would cause larger cracks, and low concrete cover would not protect the rebar from corrosion in time, as the highest chloride content is 25-30 mm in the concrete.
Corrosion of reinforcing steel and concrete cover are therefore closely related, in a exponential relation
According to the Dura Crete probabilistic design methodology . (i.e. [2]).
As service life is exponentially related to concrete cover, little variation on site means therefore extensive service life reduction.
In this example, the structure´s design life of 100 years is reduced to 15 years, as concrete cover on site had been measured to be just 15 mm lower. See figure 1
Service lifetime is the construction to end service time period, without major repairs.

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