

Exercise 10: Retaining wall on motorway

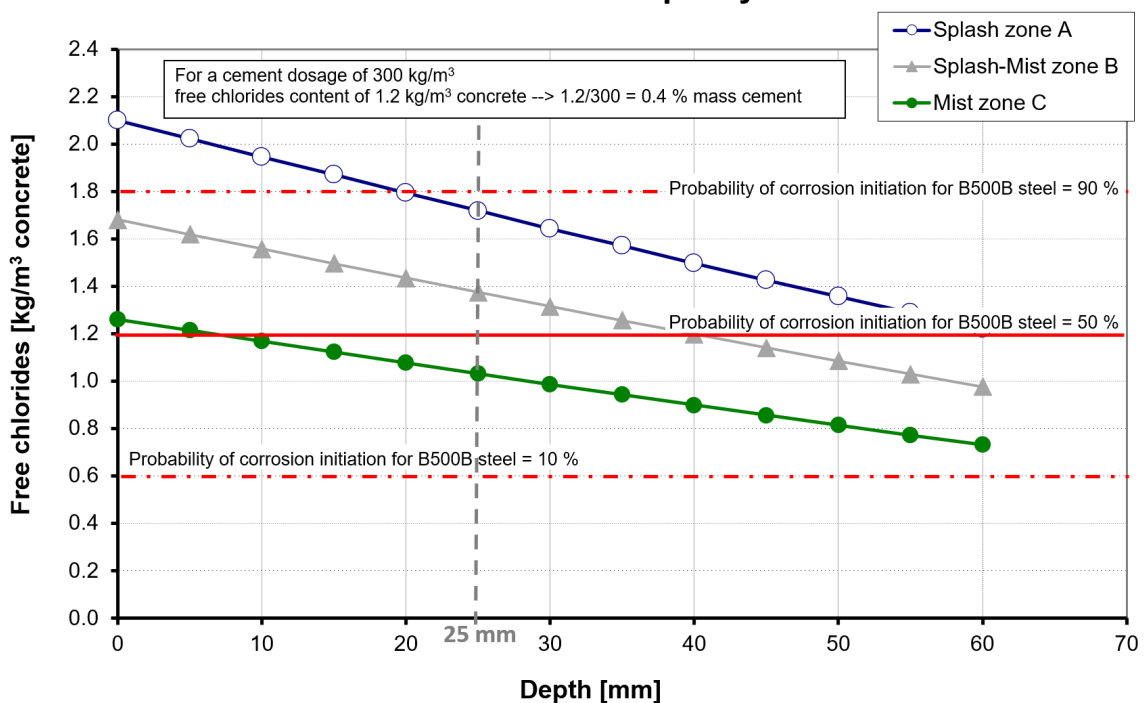
Background and objective

The following image shows a retaining wall built in 1985 along a motorway in Switzerland. The dosage of cement in the concrete is 300 kg/m^3 . This wall is subjected to heavy salt spraying conditions on the road in wintertime.



The chloride profiles were determined for the 3 exposure zones (A, B, C) for a bad quality concrete after 30 years:

**Free chlorides profiles at 30 years
Bad concrete quality**



The concrete cover on the reinforcement bars in the 3 exposure zones is 25 mm. The owner requires an extension of at least 50 years of the service life by means of adapted interventions to restore and protect the reinforced concrete.

The aims of the exercise are (1) to determine the current condition of the reinforcement bars in the three exposure zones (initiation, propagation) in a Tuutti diagram, and (2) to propose possible intervention strategies for the three zones.

Question 1

Determine qualitatively on the basis of the chloride profiles the likely deterioration curves for the 3 exposure zones in a Tuutti diagram, in terms of initiation and propagation.

Question 2

Considering the requirement for a long service life (> 50 years):

Propose interventions to restore and protect the reinforced concrete for the three exposure zones and justify your choices on the basis of the operating principles of the chosen methods.

Question 3

What is the intervention strategy? What is the evolution of the deterioration curves after intervention?

Note: this exercise is adapted from the lecture notes of Prof. Eugen Brühwiler “Structures existantes : Examen et interventions - Bases”, edition 2022, exercises 5 and 7, course CIVIL-436, courtesy of Prof. Brühwiler.