

Outline of the Electrochemical Desalination Method

Electrochemical desalination is a method of discharging chloride ions (Cl^-) from concrete with electrophoresis, in which an external electrode is installed on the surface of the concrete structure via an electrolyte as an anode, and the steel material in the concrete as a cathode, and direct current is applied for a certain period.

In addition, the electrolysis of water produces hydroxide ions (OH^-) around the steel material, which increases the concrete alkalinity and improves the corrosion resistance of steel (re-alkalization).

On the other hand, the electrochemical desalination method cannot be applied to the concrete structures which contains reactive aggregates because the alkali-aggregate reaction can be increased. In addition, after the construction was completed, the surface will be covered, and all construction equipments will be removed. And then, special maintenance will be unnecessary.

There are two types of desalination methods. One is the panel method in which the repair members are immersed in electrolyte solution to obtain desalination effect. (Photo-1) The other is the cellulose fibers method (Photo-2) in which an electrolyte solution is sprayed on the concrete surface and immersed into cellulose fibers to obtain the desalination effect. The figures below show the panel method and the fiber method.

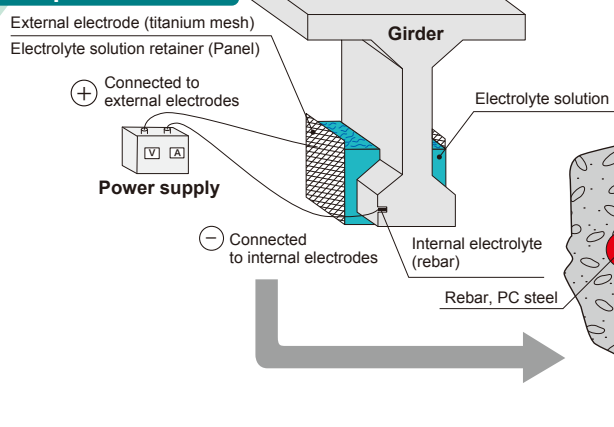


Photo-1 Example of the panel method for desalination.

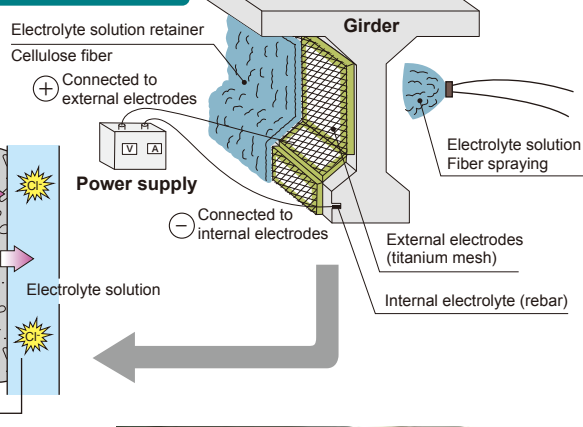


Photo-2 Example of the fiber method for desalination.

The panel method



The fiber method



Summary

We will introduce an example of a post-tensioned T-girder bridge constructed in 1965 (Photo-3) where the electrochemical desalination method was used.

Photo-3 T-girder bridge with the electrochemical desalination ▶



Desalination system assembly



Fiber spraying

Power on



Electrolyte solution spraying

Power on



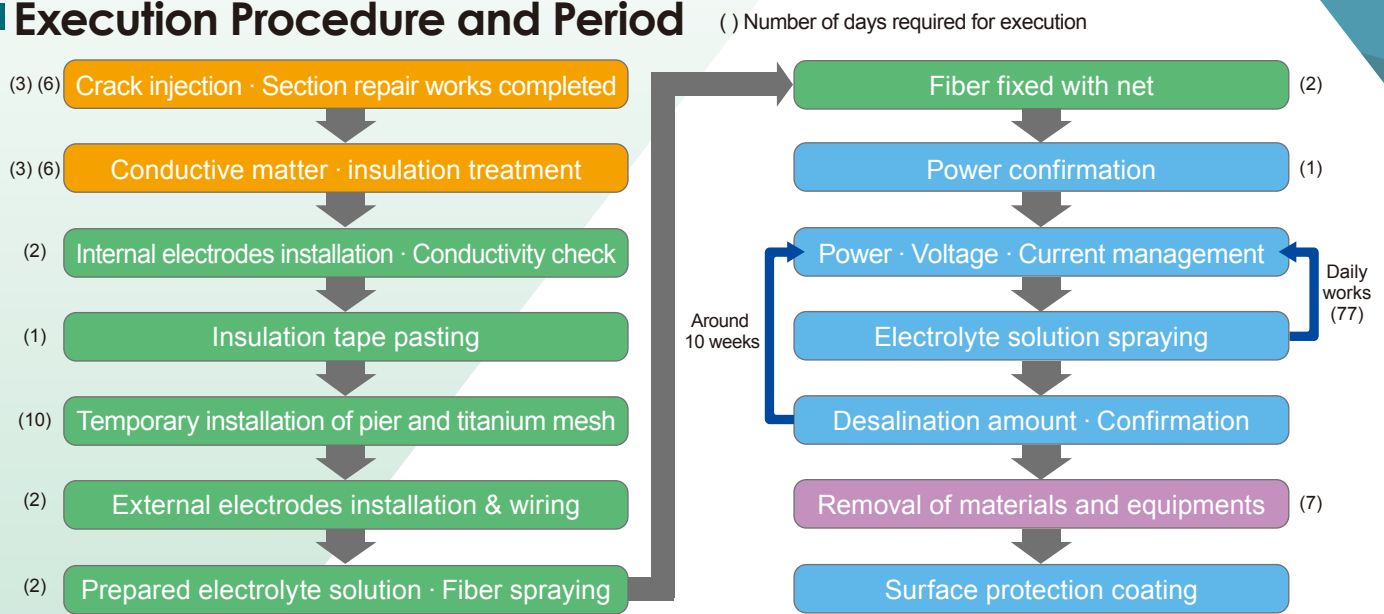
Fiber maintenance

After Desalination



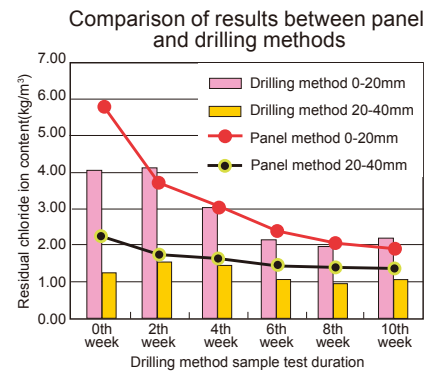
Surface coating

Execution Procedure and Period



Desalination Amount and Verification Method under Construction

- There are three methods for checking the amount of desalination periodically: A) the core extraction method, B) the drilling method, and C) the partial panel method as shown in figure. It can be applied depending on purpose and measuring position.
- A and B are highly reliable because they can measure the salt content in the concrete sample, but they place a burden on the frame. In addition, it can be obtained the simple estimate of the amount of desalting by the partial panel method of C (measuring the salinity of the electrolyte solution in the panel) is numerically equivalent to the measurement result with B. (Right paragraph)

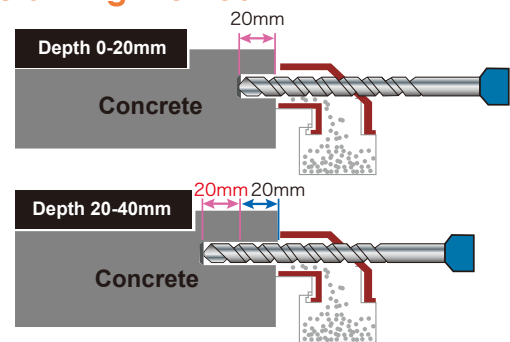


A) The core extraction method



Concrete core extraction by drilling

B) The drilling method



C) The panel method

A panel part is installed in a desalination system using the ambient fiber method, and the electrolyte solution in the panel is measured to estimate the amount of concrete desalination and salt.

