Repair Strategy of Reinforced Concrete Beams Damaged by Chloride-Induced Corrosion

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REPAIR STRATEGY OF REINFORCED CONCRETE BEAMS DAMAGED BY CHLORIDE-INDUCED CORROSION

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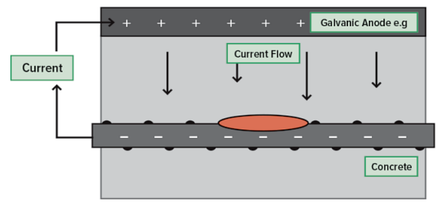
Background

OBJECTIVE : to determine repair strategy of severely damaged RC beam due to chloride-induced corrosion in order to extend the life time until about 70 years

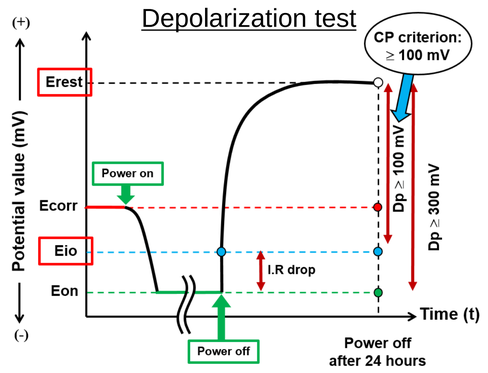


Deterioration by chloride-induced corrosion has been one of the main causes that decreases service life of reinforced concrete (RC) structures in marine environment. Therefore, repair method is compulsory in order to control its deterioration, hence extend its service life.

Application of Sacrificial Anode Cathodic Protection (SACP)

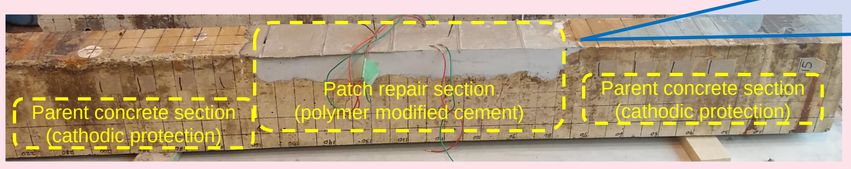


Simple method of protection connects the metal to be protected to a more easily corroded to act as the anode.



Experimental Outline

Specimen design



Patch repair material

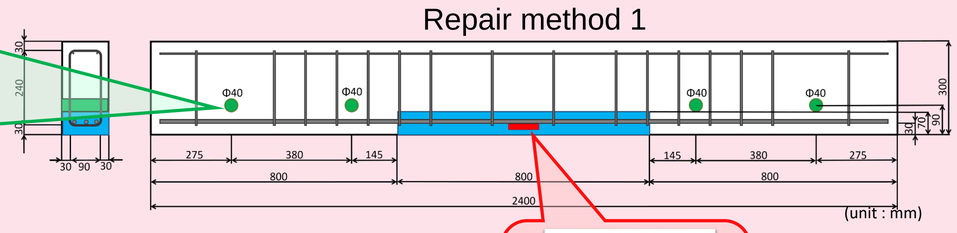

Polymer modified cement for mortar


Coating agent


Cementitious anode coating material mixed with LiOH

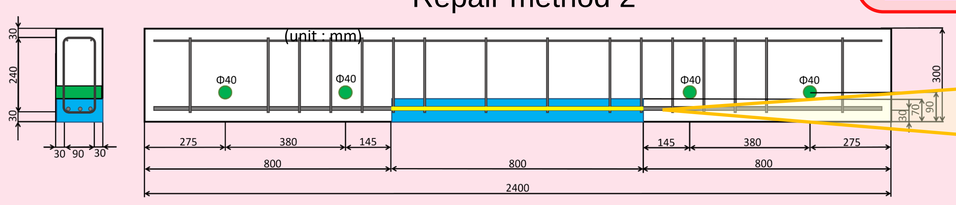

Sacrificial zinc anode

Repair method 1



Sacrificial zinc anode

Repair method 2




Corrosion inhibitor (Modified epoxy paint)

Repair Process


1. Preparation work


2. Preliminary Investigation

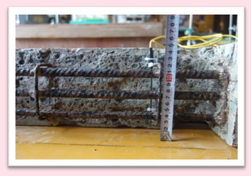

3. Concrete Crush


4. Rebar cleaning


5. Applying Coating Agent


6. Applying Rust Inhibitor


7. Form Work Preparation


8. Wire Sensor Installation


9. Polymer Mortar Casting

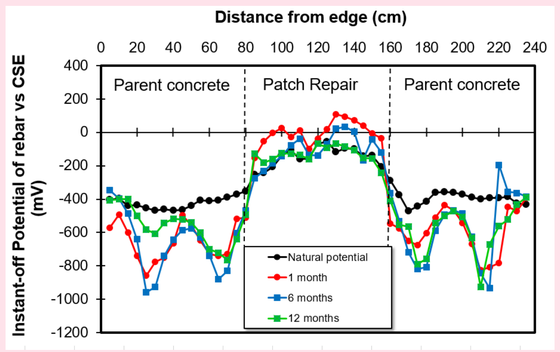

10. Core Drilling Work

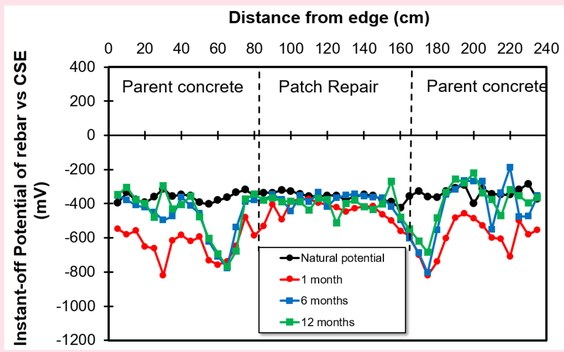

11. Anode Position Setting


12. Cementitious anode coating material mixed with LiOH casting

Result and Discussions

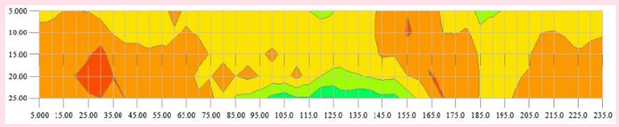
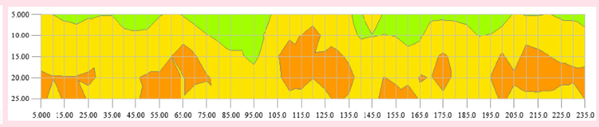
Instant-off Potential (Tensile rebar)



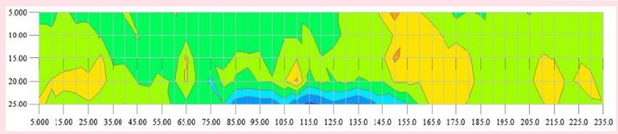
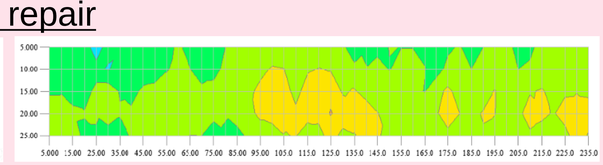


Rest potential

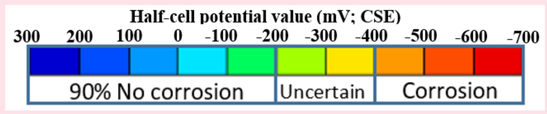
Method 1 — Before repair — Method 2

After repair

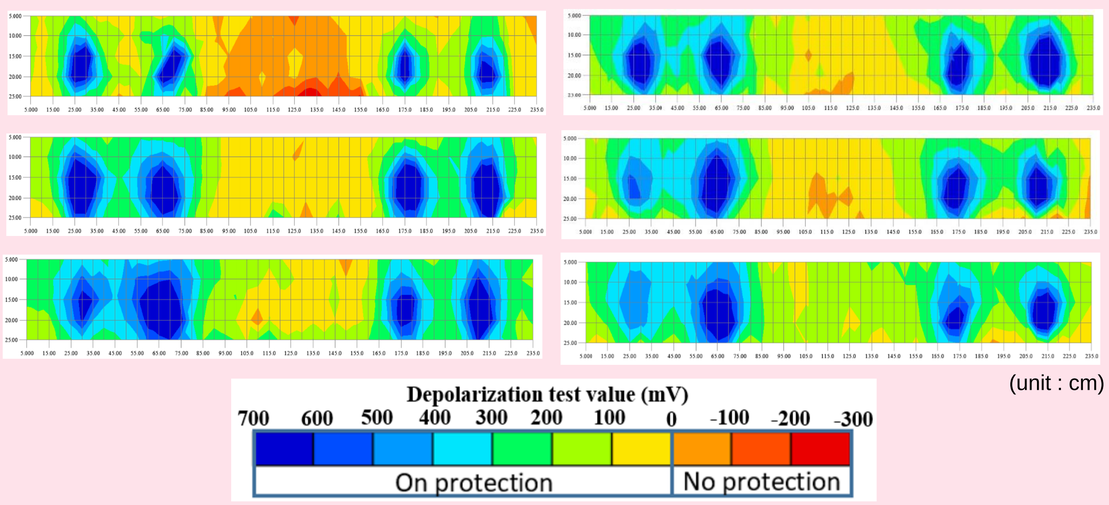
(unit : cm)



Depolarization

Months: 1 → 6 → 12

Method 1 — Method 2



(unit : cm)

Effect of SACP focuses on surrounding of the anodes during early stage, however, it spreads throughout the beam.

- In patch repair section, corrosion inhibitor prevented further corrosion of rebar, while SACP improved the condition of rebar.
- Overall, rebar in both specimens improved after 12-months of application.

Conclusion

- After 12 months of observation, result shows that both repair methods are capable to control corrosion on rebar surface.
- Even for deteriorated structures with such critical condition, its service life is still able to be extended when repair method is applied.

Acknowledgements

I would like to address my gratitude to Port and Airport Research Institute (PARI) for offering deteriorated RC specimens. I would also like to express my appreciation to P.S. Mitsubishi Co. Ltd. and Denka Co. Ltd. for providing sacrificial zinc anodes. Finally, I would like to express my thanks to fellow laboratory members for their support and guidance during preparation of this poster presentation.