

# Durability Study on 150 MPa High Strength Mortar with Micro Fiber and Cracks under Chloride Environment from The Viewpoint of Steel Corrosion

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<https://hdl.handle.net/2324/4481596>

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出版情報 : 2019-11-11

バージョン :

権利関係 :



Kyushu University

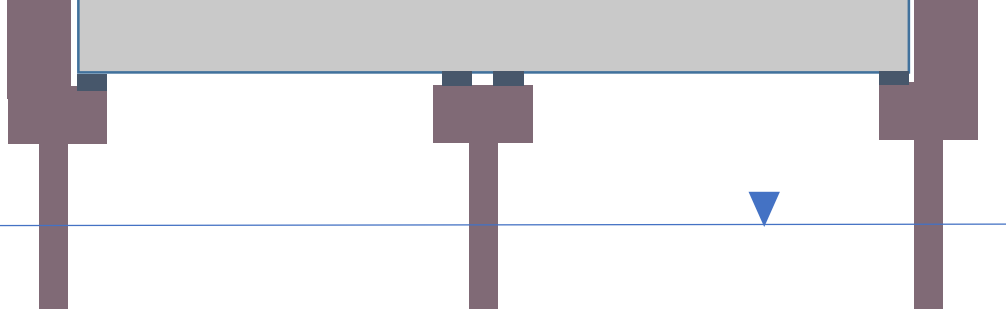
# DURABILITY STUDY ON 150 MPa HIGH STRENGTH MORTAR WITH MICRO FIBER AND CRACKS UNDER CHLORIDE ENVIRONMENT FROM THE VIEWPOINT OF STEEL CORROSION

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## Background

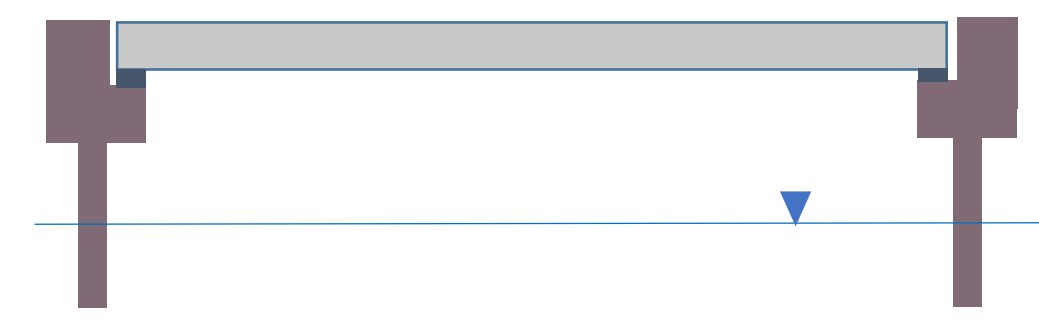
### OPC Bridge



### Advantages

- ✓ High strength and high durability.
- ✓ Reduce clearance height.
- ✓ Increase construction speed.
- ✓ Less maintenance cost.

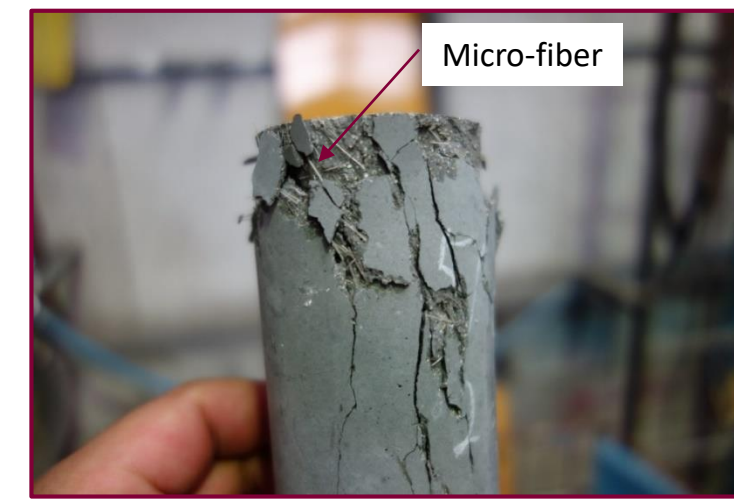
### High Strength Mortar Bridge



What will happen if **cracks happened** on surface of structure?  
Can **cover depth reduce** to 20mm?

## Objectives

- ✓ To study the **trend and effect of corrosion** inside high strength mortar before and after crack repaired.
- ✓ Identify the **minimum allowable crack width** of high strength mortar with cover 20mm.



Micro fiber used in high strength mortar



Both ends coated with epoxy

## Specimens

### Parameters

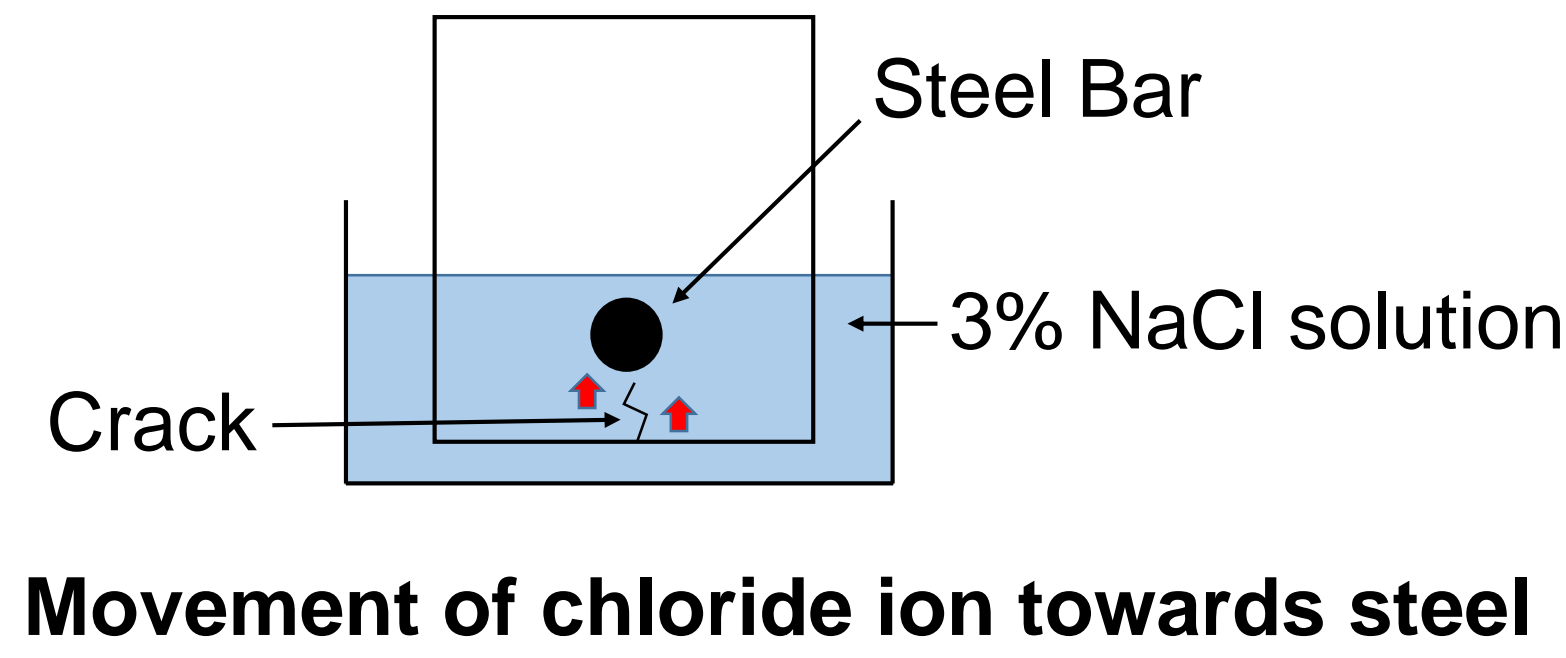
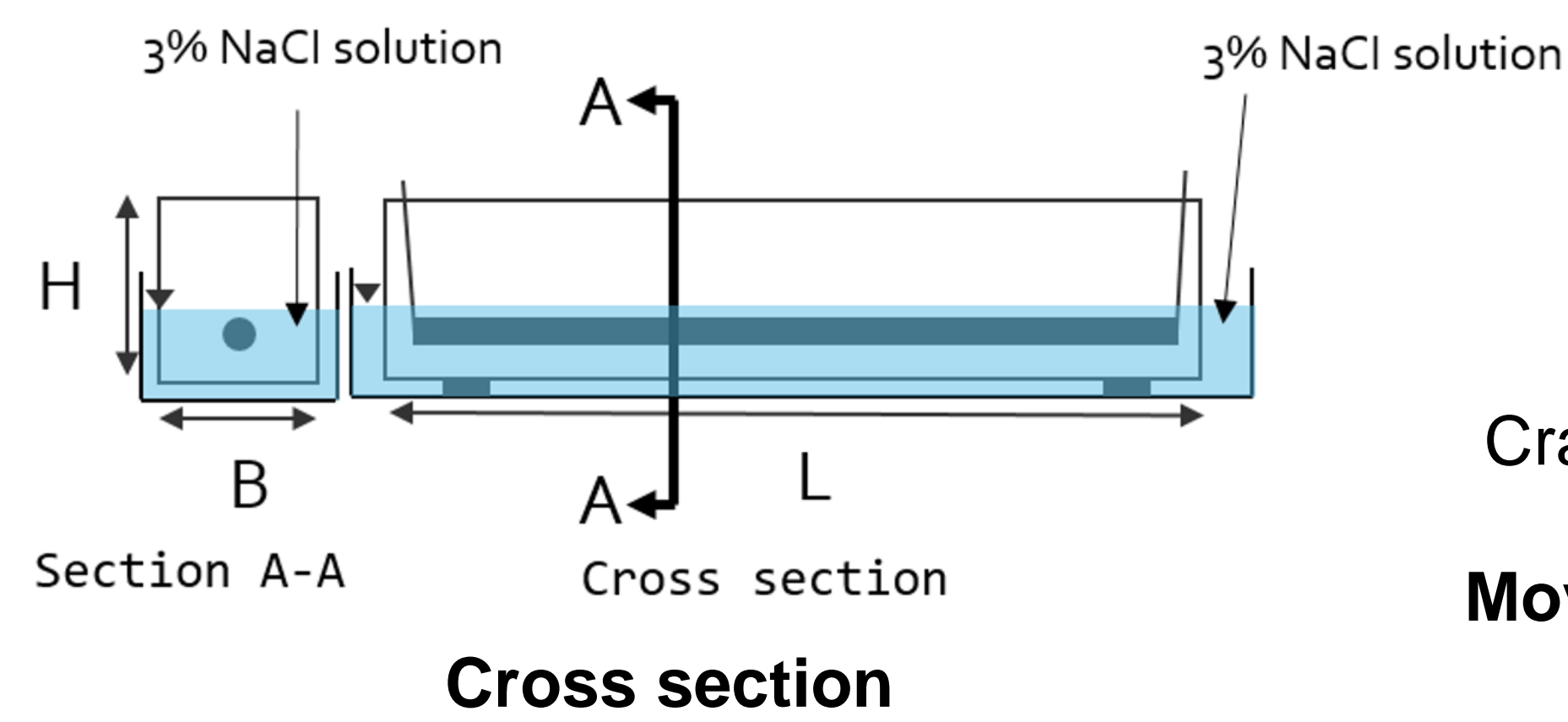
Parameters	150	30 (OPC)
Strength (N/mm <sup>2</sup> )	150	30 (OPC)
Cover Depth (mm)	40 and 20	70 and 40
Crack Width (mm)	0 ~ 0.46	0 ~ 0.26
Bar Size (mm)	16	16
No. of Bar	1	1

Size : 150mm(B) x 150mm(H) x 490mm(L)  
\*150mm(B) x 250mm(H) x 690mm(L)

\*For specimen with cover depth 70mm

### Characteristic of High Strength Mortar

Density (g/cm <sup>3</sup> )	2.45
Strength (N/mm <sup>2</sup> )	150
Bending Stress (N/mm <sup>2</sup> )	20
Tension Stress (N/mm <sup>2</sup> )	7
Cracking Strength (N/mm <sup>2</sup> )	6.8
Elastic Modulus (N/mm <sup>2</sup> )	4.6x10 <sup>4</sup>
Poisson Ratio	0.2
Effective Diffusion coefficient, De (cm <sup>2</sup> /year)	0.00591

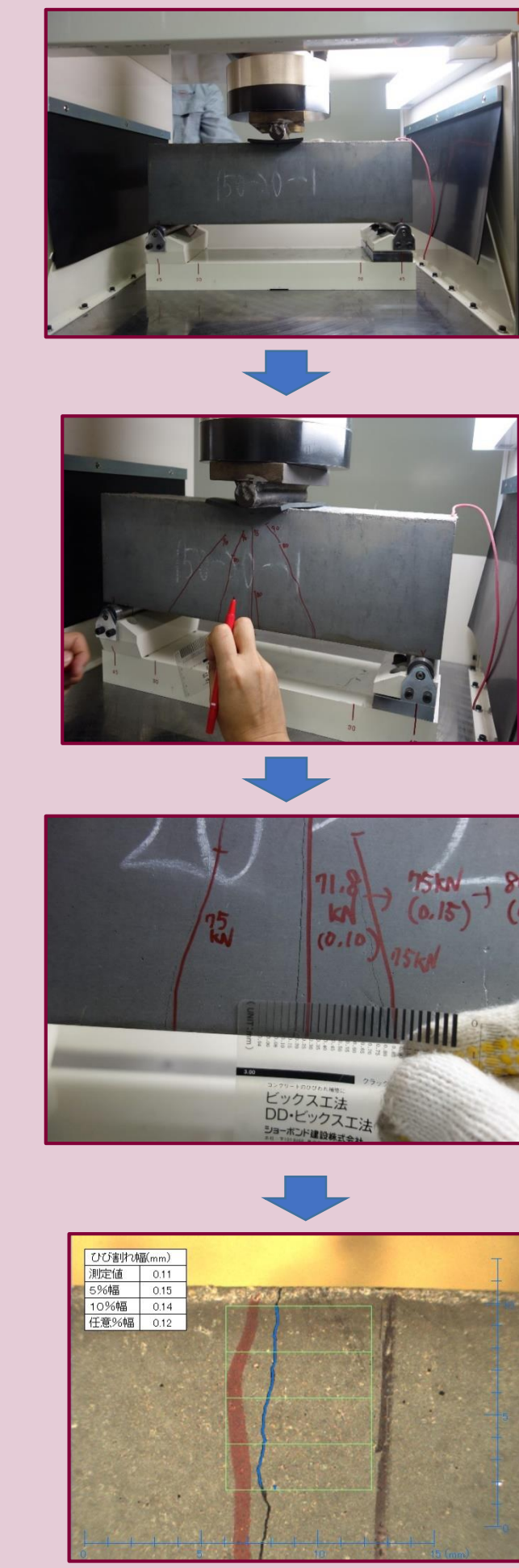


## Methodology

### Casting



### Cracks Making



### Repairing



## Experimental and Results

### Testing Methods

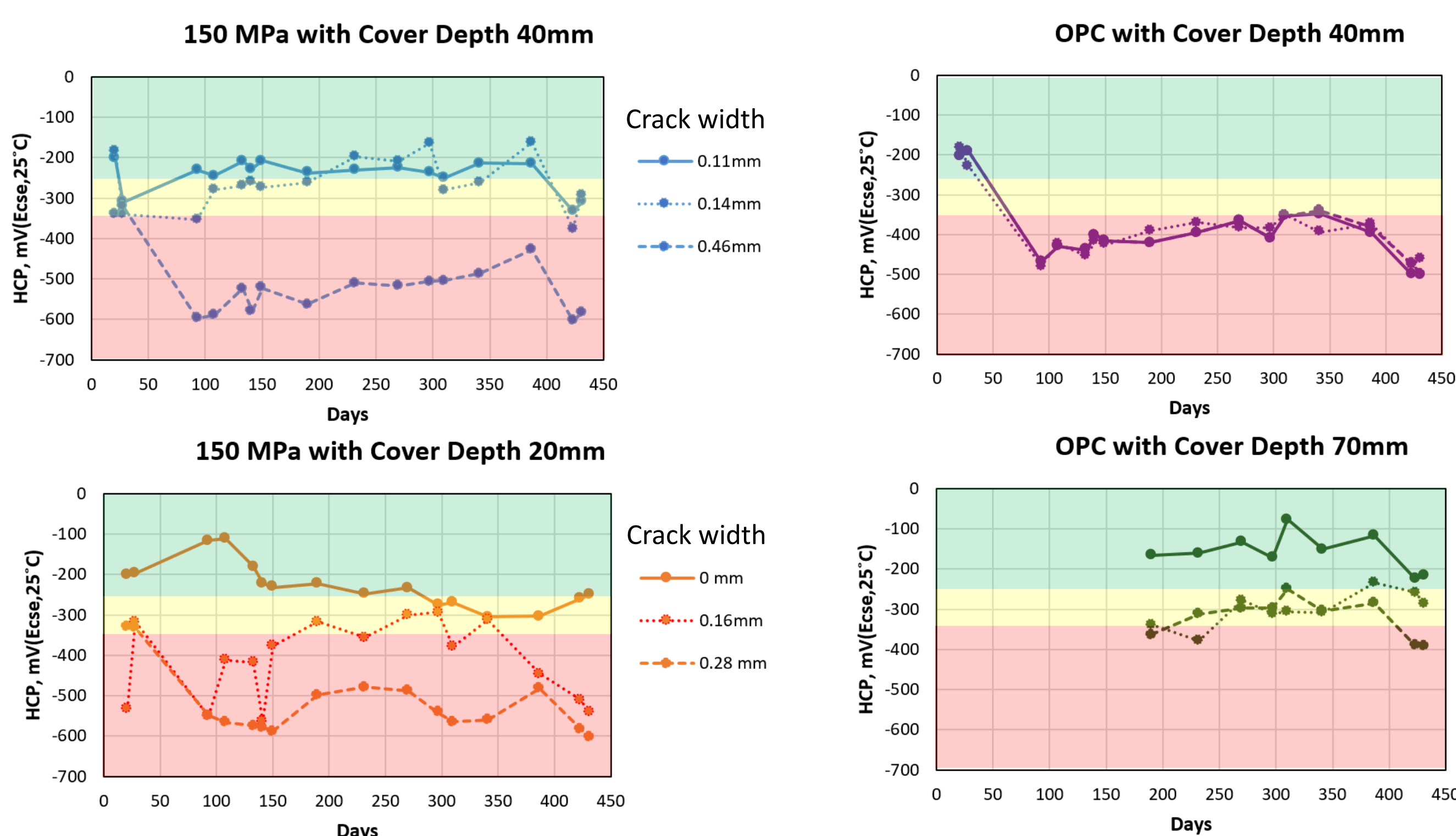
- Half-cell potential measurement : Identify the potential corrosion of steel
- Polarization resistance : Measure rate of corrosion of steel
- Passivity grade : Classify the passivity film of steel

### Purpose

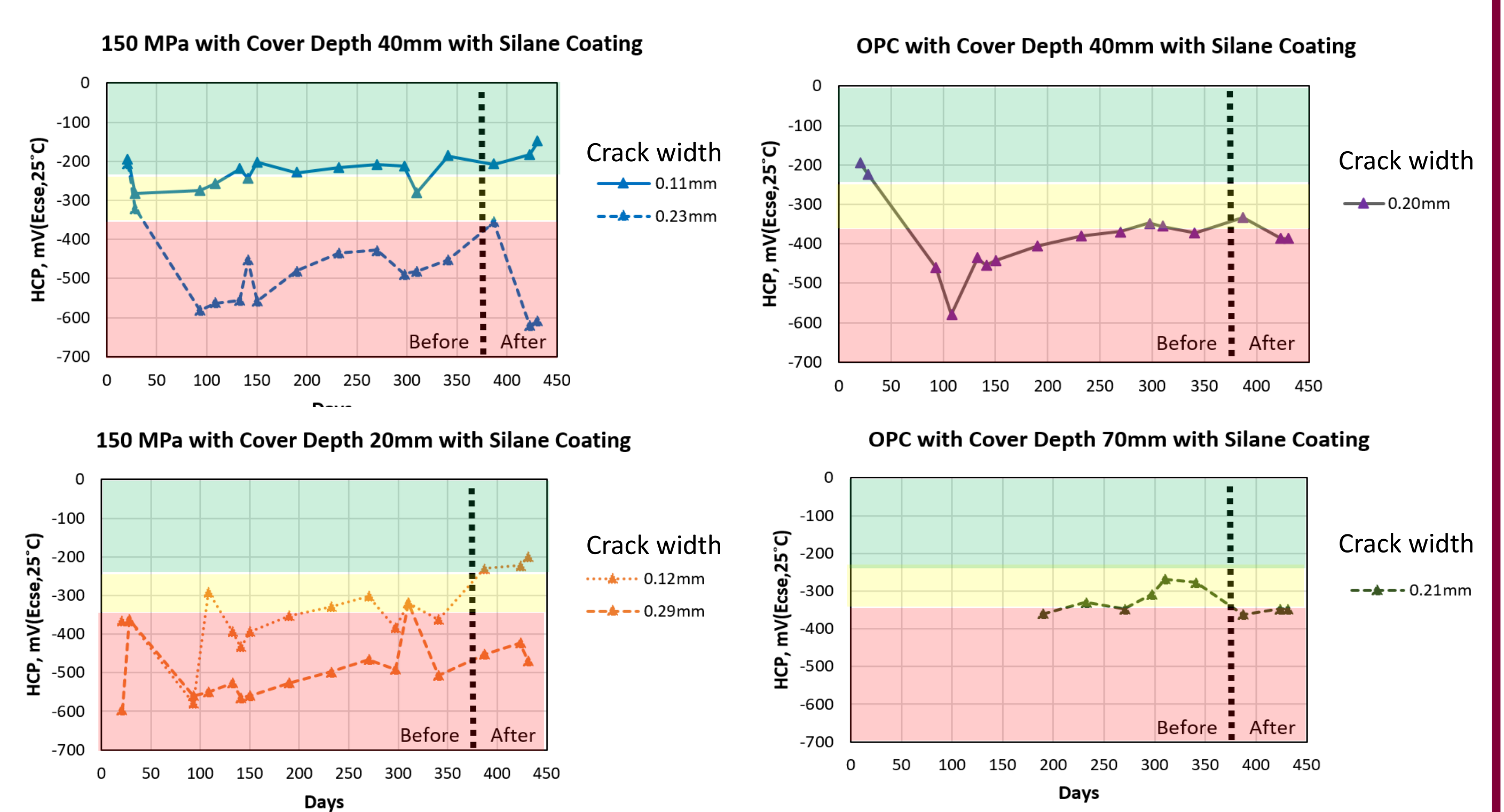
- Identify the potential corrosion of steel
- Measure rate of corrosion of steel
- Classify the passivity film of steel

Measurement up to 431 days  
Applied silane coating on 387 days

### Half-cell Potential (mV)

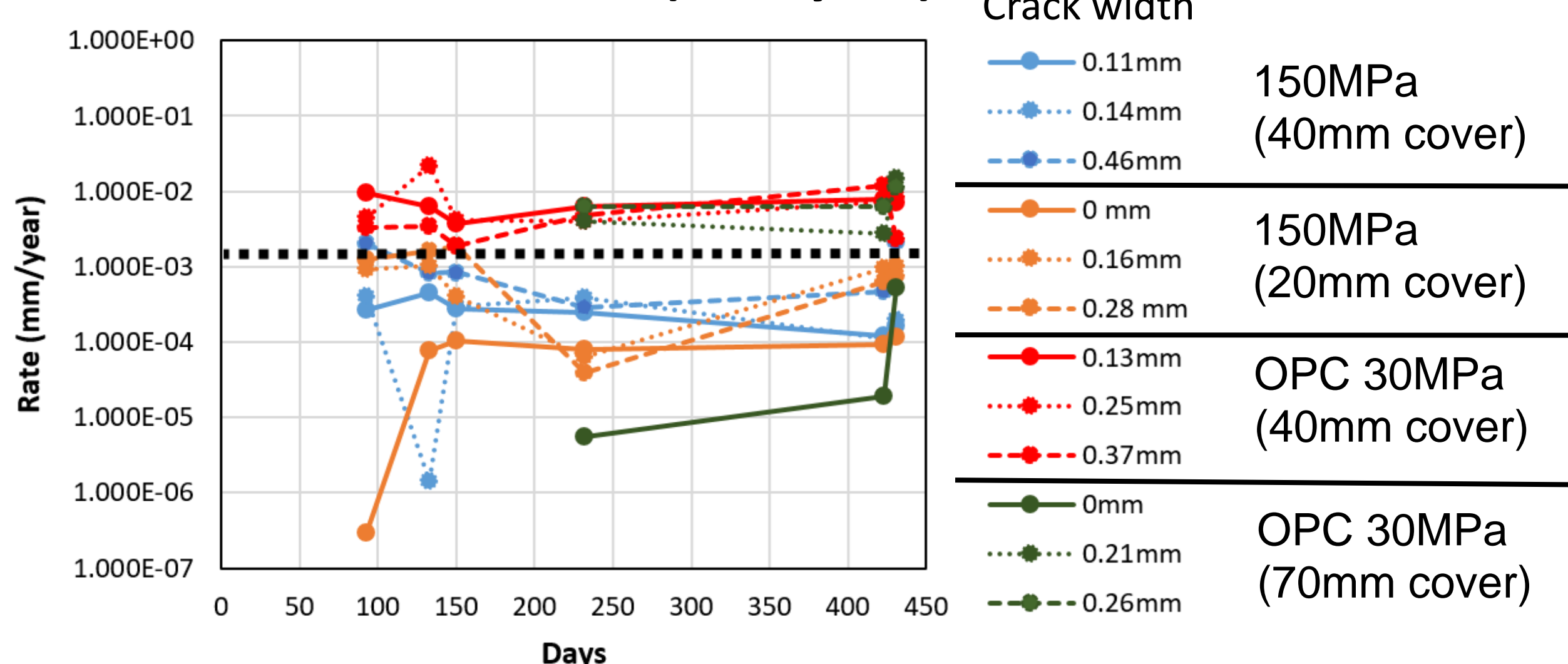


### Half-cell Potential (mV) – with Silane Coating

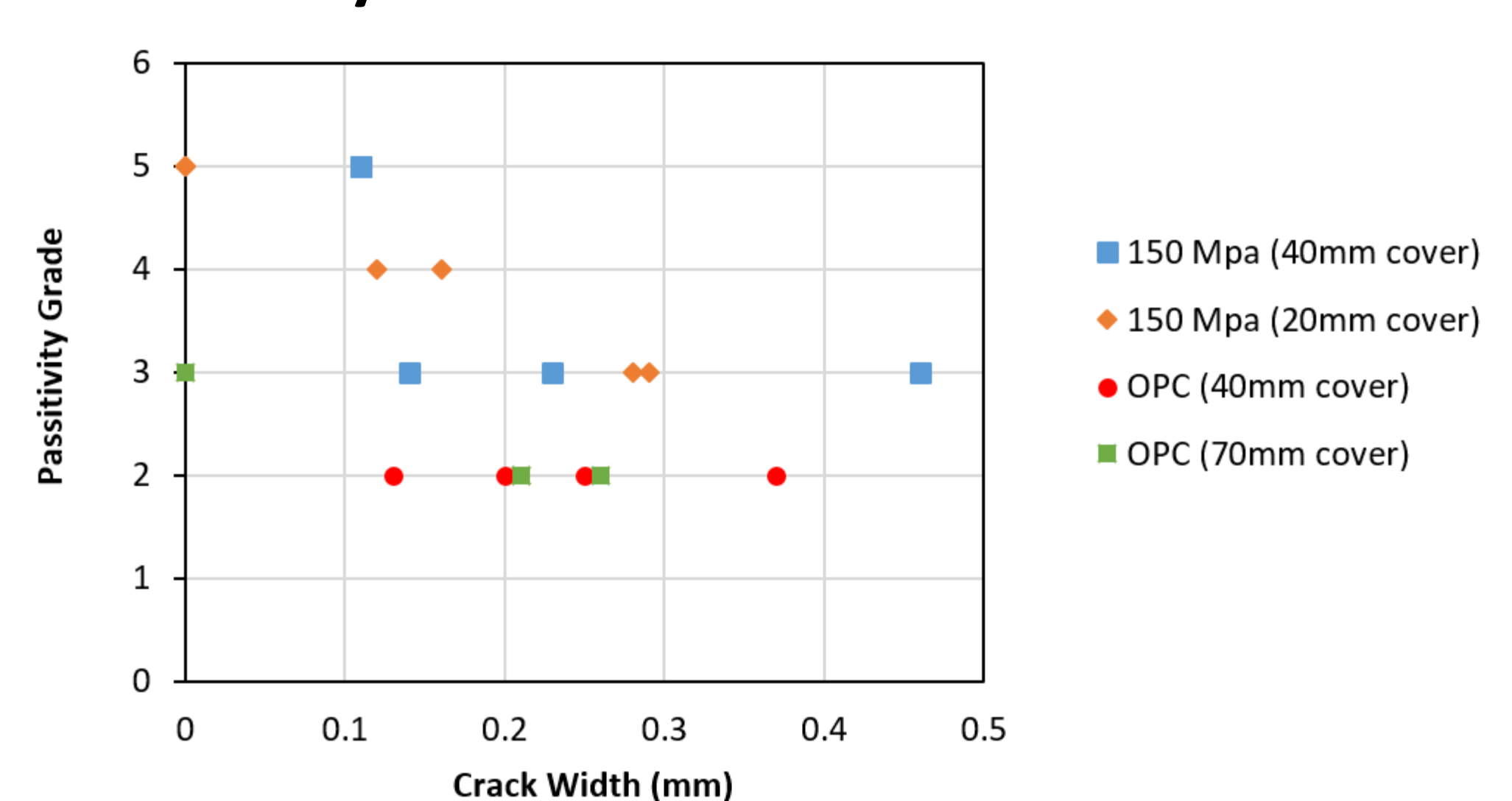


Corrosion ( $E_{cse} < -350mV$ )    Uncertain ( $-350mV \leq E_{cse} < -250mV$ )    No Corrosion ( $-250mV \leq E_{cse}$ ) (ASTM C876-09)

### Rate of Corrosion (mm/year)



### Passivity Grade with Crack Width



## Conclusion

20mm cover depth is acceptable with crack width less than 0.12mm. Repair works is necessary for crack width more than 0.12mm.

## Future Plan

Effectiveness of applied silane coating still can not be judged, therefore more observation is required.

## Acknowledgement

SEC 株式会社 エスイー

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