

Berth 8, Port of Wilmington – Prestressed Concrete Piles



Owner

North Carolina Ports Authority

Client

Moffat & Nichol

Location

Wilmington, North Carolina

Project Components

- Precast prestressed concrete piles
- Durability analysis
- Service life predictions
- Remediation methods
- Life-cycle cost analysis

Services Provided

- Civil Engineering
- Laboratory Testing
- Service Life Modeling

Completion Date

2005

Client Contact

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Port of Wilmington, NC

The installation of a new crane system was planned on Berth 8, but recent observations had shown the presence of vertical cracking of the prestressed piles, attributed to corrosion, and also possibly to delayed ettringite formation and alkali-silica reaction. Actions had to be taken to ensure the structure was able to support the loads of the new crane for a sufficiently long period of time in the future. **The mandate** given to Material Service Life (MSL) was to evaluate the state of degradation of the piles and perform numerical simulations to predict their future service life considering some restoration options. This investigation provided useful information about the degradation extent and the rehabilitation costs of Berth 8, that could be used by the owner to decide whether the structure had to be rebuilt or restored.

MANDATE

- Determine the chloride contamination level for a number of selected piles throughout the structure.
- Evaluate the performance of repair options with respect to expected service life extension of 20 years.
- Help the client to decide if the structure had to be repaired or rebuilt to support the future crane system.

MSL SOLUTION

- Using detailed petrographic analyses, the chemical contamination of the concrete piles was assessed.
- Numerical simulations using STADIUM® allowed MSL to evaluate the service life expectation based on the chloride exposure conditions and on concrete transport properties.
- Using STADIUM®, service life expectations were compared for remediation methods.
- Knowing the cost-performance relationship of simulated repair options, the client was able to compare it to that of a complete rebuilding of the structure.