Durability Engineers: Condition Assessment of an Aging Pool Deck and Basement

Inspecting a 100-year-old swimming pool deck and basement with NDT

Overview

- Durability Engineers were called to conduct a condition assessment of an aging pool deck and basement.
- Several NDT methods were used including the Schmidt rebound hammer and the Profometer PM8000 Pro cover meter.
- The team revealed valuable insights, enabling them to deliver precise recommendations to ensure safety and longevity of the structure.

Durability Engineers provide consulting services before, during, and after the construction of concrete structures. Their backgrounds include civil engineering, chemistry, materials science, and structural engineering.

Challenge

In a U.S. municipality building in Michigan, issues were encountered with the aging infrastructure of the pool deck and surrounding sub-grade basement. Originally constructed in 1926, the pool deck exhibited signs of extensive deterioration, primarily due to water intrusion over the years.



Significant areas of the concrete were compromised, and the steel reinforcement showed signs of corrosion. This deterioration posed risks to safety and operational efficiency, necessitating a thorough condition assessment to determine the appropriate remedial measures.



Solution

Durability Engineers (DE) was engaged to conduct a condition assessment of the pool deck and basement. The evaluation included visual inspections, nondestructive testing, and laboratory analysis to determine the extent of deterioration and identify the necessary repairs. DE implemented the following technical approaches:

- **Visual Assessment and Acoustic Impact Survey:**
    - o Initial Assessment: A visual examination of the concrete elements supporting the pool deck was conducted. Visible deficiencies were documented, and an acoustic impact survey (hammer sounding) was performed to identify shallow delaminations and subsurface voids.
- **Nondestructive Testing (NDT):**
    - o **Cover Meter**: Profometer PM8000 Pro rebar and cover meter was used to assess the as-built conditions of the concrete throughout the basement, determining approximate size, orientation, and depth of steel reinforcement and support the core extraction process.
    - o **Corrosion Testing**: Half-cell potential measurements and concrete resistivity tests were performed to evaluate the potential for ongoing corrosion of the steel reinforcement.
    - o **Rebound Hammer**: Schmidt Rebound hammer testing was performed in general conformance with ASTM C805, “Standard Test Method for Rebound Number of Hardened Concrete.” The rebound hammer was used to provide indications of relative concrete strength on the pool deck and basement concrete. One-foot grids were established to document the variability in the condition of the concrete.
- **Laboratory Analysis:**
    - o **Concrete Core Sampling**: Core samples were extracted from various elements for comprehensive laboratory analysis, including compressive strength testing, petrographic examination, and chemical analysis.
    - o **Petrographic Examination**: Detailed examination of concrete samples was conducted to assess the quality, composition, and extent of carbonation and chloride ingress.



Reinforcement detailing with the Profometer PM8000 Pro cover meter, visualizing the results instantly on the iPad

Results

The assessment revealed significant deterioration in the pool deck and basement, primarily due to historic water intrusion and corrosion of steel reinforcement. Key findings included:

• **Basement**: Active moisture intrusion and efflorescence were identified, causing localized corrosion of steel formwork and deterioration of concrete elements.

• **Pool Deck Slab**: Extensive spalling, poor consolidation, and exposed reinforcing steel were observed, indicating a need for immediate remediation to ensure safety.

• **Pool Walls**: Elevated corrosion potential was detected at crack locations with active moisture ingress. Long-term, comprehensive repairs and moisture mitigation measures were recommended.

The results of the corrosion testing provided insight into the corrosion potential of the steel reinforcement and the Silver Schmidt OS8200 provided relative indication of the variability in the concrete around the pool deck and the basement.

Based on the NDT results, selective core sampling was completed to calibrate the compressive strength of the in-situ concrete and chemical analysis for chloride ingress. From the analysis, DE was able to provide recommendations for further evaluation and repairs to ensure the safety and longevity of the pool deck and basement structures.

See more case studies and application notes for concrete assessment on our Tech Hub.

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