Road Talk

Ontario's Transportation Technology Transfer Digest

Ministry of Transportation

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Ontario

Exploring the Reuse of Pile Foundations: *Assessing the Longevity of Steel*

Ontario's Ministry of Transportation (MTO) is exploring the reuse of steel pile foundations in bridges to improve safety and traffic mobility, lower costs and benefit the environment.

Common Testing Methods

MTO uses direct and indirect testing methods to assess the capacity, durability and service life of existing steel pile foundations. Direct visual observation and inspection is undertaken where possible. Ultrasonic thickness measurements determine the rate of degradation experienced since the foundations were installed. Tensile testing evaluates the structural integrity of the foundations. Finally, a chemical analysis of the soil and groundwater determines the ground's corrosion aggressivity.

MTO has employed various techniques to mitigate corrosion, including coating piles with fibre-reinforced polymer or bitumen and measuring the ground's soil chemistry.

Current Projects

MTO is conducting tests on projects across the province to assess whether existing piles can be reused. Here's a closer look at three projects.

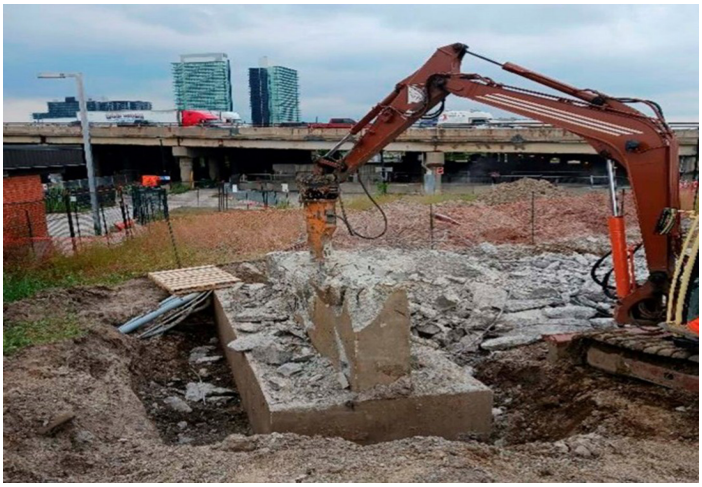

Figure 1: Demolishing an abandoned bridge foundation at the Leslie Street interchange.

Figure 2: Exposed H-piles at the Leslie Street interchange.

Highway 401/Leslie Street Interchange Improvement

In Toronto, the Highway 401/Leslie Street interchange improvement project involved demolishing an old bridge and building a new one. The steel H-piles supporting the old bridge were installed approximately 60 years ago. After removing the pile cap at one of the abutments, MTO found the H-piles exhibited limited corrosion.

The overall thickness loss across the piles was relatively modest, averaging around three per cent. These results confirmed that most of the steel remained in good condition.

Highway 417 Bridge Replacements at Woodroffe Avenue and Richmond Road

In Ottawa, MTO replaced several bridges on Highway 417 that were built between 1960 and 1968 using the rapid bridge replacement technique. At the Woodroffe Avenue and Richmond Road sites, crews installed temporary shoring to excavate the soil surrounding the piles beneath the existing abutments.

Corrosion on the exposed piles was within safe and acceptable limits and MTO concluded they could be reused.

Figure 3: Pre-blast cleaning of pile W3 at Woodroffe Avenue.

Figure 4: Post-blast cleaning of pile W3 at Woodroffe Avenue.

Highway 401 and Hallecks Road Improvement

For this project, the existing four-span bridge at Highway 401 and Hallecks Road in Brockville was replaced with a two-span bridge. MTO extracted and assessed two existing piles from the piers and two from the abutment. Overall, the piles exhibited limited corrosion.

The ministry also used borehole magnetometry and parallel seismic testing to verify pile lengths and confirm they had been driven to bedrock.

Based on the results of the ultrasonic testing and chemical analysis, the Brockville piles would still offer structural resistance for potential reuse.

Environmental and Cost Benefits

By repurposing existing steel pile foundations, MTO can reduce the need for new materials. This minimizes the carbon footprint and cost associated with producing and transporting new materials. It also reduces or eliminates the need for extensive excavation and new foundation construction, further lowering costs and environmental impacts.

Conclusion

MTO continues to rigorously evaluate the potential for reusing piles while developing a database of projects where foundational testing and assessments have been completed. The ministry is also working on a guideline for assessing the reusability of existing piles with safety as a guiding principle for the work.

By reusing existing foundations, MTO is setting a precedent for cost-effective and environmentally friendly infrastructure development. This demonstrates the ministry's commitment to making our roads and bridges safer, more efficient and more sustainable for everyone.

Figure 5: The piles at the Highway 401 and Hallecks Road interchange show minimal corrosion.

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