CRB

CONCRETE REPAIR BULLETIN

September/October 2025 Vol. 38, No. 5

Keep Concrete Weird

UNUSUAL PROJECTS

ICRI
CONCRETE REPAIR
Restore | Repurpose | Renew

Fig. 1: The stage is set for the top-down demolition with rebar retention.

Fig. 2: Two of four pylons wrapped with scaffolding.

Fig. 3: Initial stages of pylon removal.

CONCRETE GHOSTS:

UNBUILDING WHAT WAS NEVER USED

SAM HOUSTON TOLLWAY SHIP CHANNEL BRIDGE PYLON DEMOLITION – HOUSTON, TX

BY BELIN WILLS

Project Description

When four 100-foot (30.5 m) tall bridge pylons — constructed but never used — were deemed incompatible with a revised bridge design, the team was tasked with dismantling them safely, efficiently and without damaging structural elements designated for reuse (Fig. 1). Each structure, with 2-foot-(0.6 m) thick reinforced concrete walls, was hollow and segmented into 25 blocks weighing approximately 40,000 pounds (18,144 kg) each. The demolition approach integrated robotic hydrodemolition, core drilling and wire sawing, with a strong emphasis on preserving embedded reinforcement and minimizing environmental impact (Fig. 2).

Fig. 5: Close-up of concrete being removed from rebar during hydrodemolition.

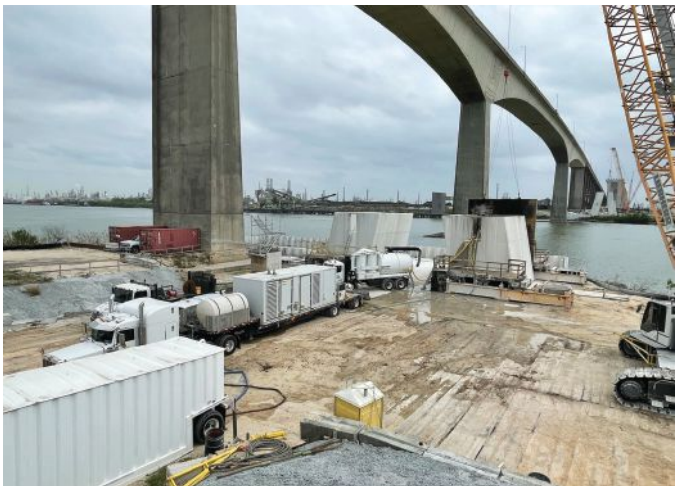

Fig. 6: Staged water supply and recycling equipment during hydrodemolition.

Fig. 7: Hydrodemolition wastewater treatment process.

Fig. 8: Active hydrodemolition on elevation.

Project Summary
Located along the Sam Houston Tollway near the Houston Ship Channel, this project originally aimed to accommodate an increase in daily traffic from 60,000 to more than 150,000 vehicles. After nearly two years of construction, engineers halted progress due to a design flaw. The existing pylons no longer aligned with the new structural concept.[1]

The solution required selective demolition of the four existing pylons without disturbing the underlying foundation or rebar — materials essential for the updated design. Precision removal became the cornerstone of the operation. Each pylon was hollow, reinforced and stood approximately 100 feet (30.5 m) tall. To facilitate removal, each was divided into 25 concrete segments, averaging 40,000 pounds (18,144 kg) per block (Fig. 3).

To guide the effort, engineers developed detailed 3D demolition models specifying saw types, cutting sequences and block dimensions. The methodology allowed for clean, controlled cuts using wire saws and core drills, followed by crane-assisted extraction (Fig. 4). Robotic hydrodemolition was applied at the base to protect steel reinforcement, allowing the future structure to tie directly into the preserved rebar.

The final 5 feet (1.5 m) of each pylon required additional care. These lower sections would become the foundation for new columns once reconstruction began. Hydrodemolition enabled crews to remove concrete without damaging the rebar, ensuring continuity with future work (Fig. 5).

Environmental and Logistical Challenges
Each shift used approximately 40,000 gallons (151,416 L) of water, 70 percent of which was recycled using a mobile on-site treatment system (Figs. 6 and 7). Maintaining a pH below 7 and controlling water discharge were essential to meet environmental compliance standards and navigate stormwater limitations. All concrete removed was 100 percent recycled.

Weather conditions along the Houston Ship Channel presented another set of challenges. High winds and periodic storms occasionally delayed elevated crane operations. Coordination between trades, adaptive scheduling and routine interface meetings ensured progress continued without compromising safety or efficiency.

Crews operated in staggered shifts to align with daylight crane work and to deconflict rigging zones. Careful scheduling allowed overlapping operations to proceed without disruption, while regular meetings between structural engineers, demolition teams and oversight staff helped maintain clarity and alignment throughout the project.

Back to the Bones: Hydrodemolition as Structural Reset
Robotic hydrodemolition played a critical role throughout the project, particularly in areas where preserving the existing reinforcement was essential. This was not standard surface removal — advanced hydrodemolition techniques were used to selectively remove concrete up to 60 inches (1.5 m) thick while leaving the embedded rebar completely intact. High-pressure, oscillating water

Fig. 4: Crane removal of segmented concrete.

> The methodology allowed for clean, controlled cuts using wire saws and core drills, followed by crane-assisted extraction.

jets were operated by specialty robotic hydrodemolition systems, allowing for precision control in confined, elevated and complex geometries (Fig. 8).

Special attention was given to the base of each pylon, where embedded rebar would serve as a tie-in point for the future structure (Fig. 9). These zones demanded precision within millimeters, and the hydrodemolition process ensured that no microcracking or collateral damage occurred to adjacent concrete or structural steel. The process avoided the use of impact tools, which can create vibrations and compromise the integrity of the remaining substrate — an unacceptable risk in a structural reuse scenario.

Each hydrodemolition sequence was integrated into the overall cut plan, using 3D-modeled guidance to ensure optimal sequencing with core drilling and wire sawing. The result was a surgical-level removal process, combining water pressure in excess of 23,000 psi (1586 bar) with computer-guided targeting to meet

PROJECT TEAM

OWNER:
Harris County Toll Road Authority

ENGINEER:
Houston County Toll Road Authority and COWI

CONTRACTOR:
Ship Channel Constructors

HYDRODEMOLITION SPECIALIST:
Aggregate Technologies Inc.

HYDRODEMOLITION MANUFACTURER:
Aquajet

Fig. 9: Completed removal of pylon with exposed rebar.

Fig. 10: Final stages of pylon removal.

engineering tolerances required for nuclear-grade demolition planning, even though the setting was transportation infrastructure. This precision minimized post-demolition prep work and provided a clean, bondable surface for future construction tie-ins.

Project Results
- Approximately 20,000 square feet (1858 m^2) of reinforced concrete was removed.
- All concrete was recycled off-site.
- Water usage was minimized through continuous filtration and reuse.
- No OSHA recordables occurred over the 14-month duration.
- The project was completed on time and on budget.

This demolition effort demonstrated the value of selective removal in modern infrastructure projects, where reuse and sustainability are integral to long-term success (Fig. 10).

Project Details
Location: Houston, Texas
Structure Type: Four 100-ft (30.5 m) tall bridge pylons
Demolition Area: ~20,000 ft^2 (~1858 m^2) reinforced concrete
Completion Date: March 2023
Duration: 14 months

Scope of Work
- Core drilling
- Wire sawing
- Robotic hydrodemolition
- Water recycling and on-site treatment

Sustainability Measures
- 70 percent of water reused daily [~28,000 gallons/day (~105,991 L/day)]
- 100 percent concrete recycling

Unique Attributes
- Removal of newly constructed but no-longer-compatible elements
- Reinforcement preservation for structural reuse
- Precision demolition directed by 3D sequencing
- Mobile water treatment system
- Zero safety incidents

References
[1] Woof, M.J. "Delayed Houston Ship Canal Bridge Nearing First Phase." (2024, February 23) Road Structures. Global Highways. www.globalhighways.com/wh10/news/delayed-houston-ship-canal-bridge-nearing-first-phase.

Belin Wills is the lead educator at Aggregate Technologies, a specialty subcontractor focused on concrete cutting and removal. She holds a degree in education from Louisiana State University and has taught "Basics of Hydrodemolition" to more than 2,000 engineers and contractors across the country, offering professional development hours (PDH) and continuing education (CE) credits. Belin and her team support complex projects that demand a high level of safety, compliance and environmental awareness. Aggregate Technologies along with individuals on its team hold active memberships in industry organizations such as ICRI, ETEBA, AGC, ABC, HCA, PDCA and CSDA.