

CASE STUDY

Trench Cutting Using Hydro Demolition

Project Overview

Application	Trench Cutting — Hydro Demolition
Trench Length	9,000 mm
Trench Width	1,100 mm
Trench Depth	600 mm
Concrete Grade	50 MPa
Key Constraint	Confined space — overhead height restriction beneath stair landing
Rebar Requirement	Zero damage to existing reinforcing steel

Background

The client required a precision trench to be cut through a high-strength 50 MPa reinforced concrete slab. The trench dimensions — 9,000 mm long × 1,100 mm wide × 600 mm deep — demanded exceptional accuracy and depth control, while the location beneath a staircase landing imposed significant height restrictions that ruled out conventional mechanical demolition equipment.

Of critical importance was the preservation of all existing rebar throughout the full depth of the cut. Conventional methods such as jackhammering or saw cutting carry a high risk of damaging or severing reinforcing steel, which would compromise structural integrity and require costly remediation. The client specified that all rebar must remain intact and undamaged upon completion.

Challenges

1. Depth of Cut

Achieving a consistent 600 mm depth through 50 MPa concrete is a significant technical challenge. At this compressive strength the concrete exhibits high resistance to conventional mechanical breaking. Maintaining uniform depth across the full 9,000 mm length without overbreak required precise robotic control and a systematic multi-pass methodology.

2. Confined Space & Height Restriction

The work area beneath the stair landing imposed a restricted vertical envelope. Standard hydro demolition robots and heavy equipment would exceed the available headroom, requiring a compact machine profile. Limited operator access also made remote robotic operation essential for both productivity and safety.

3. Rebar Preservation

Conventional impact demolition methods transmit significant shock energy into the concrete matrix, causing uncontrolled cracking and damaging embedded reinforcement. The client mandate for zero rebar damage required a method capable of selectively removing concrete while leaving steel reinforcement entirely unharmed.

4. High-Strength Concrete (50 MPa)

50 MPa concrete requires substantially higher water pressures and flow rates than standard structural concrete to achieve productive removal rates. Equipment selection and pump configuration were critical to ensuring work could be completed efficiently and on programme.

Equipment & Methodology

Equipment Deployed

Pumps	2 × Jetstream 4200 Series High-Pressure Pumps
Combined Output	20,000 psi (1,380 bar) at 190 lpm combined flow rate
Robot	Aqua Cutter 410V Hydro Demolition Robot
Configuration	Dual-pump combined feed for maximum cutting performance

Why Hydro Demolition?

Hydro demolition uses ultra-high-pressure water jets to erode and break concrete without the impact forces associated with mechanical demolition. Because water has no tensile strength relative to steel, the jetting process naturally terminates at the rebar surface — steel is exposed cleanly with no mechanical damage, notching, or stress introduction.

Key advantages for this scope:

- Selective concrete removal — water erodes the cement matrix while rebar is left pristine
- No micro-cracking or residual stress transmitted to surrounding concrete
- Robotic operation enables safe, productive work in confined, low-headroom spaces
- Consistent, programmable depth control across the full 9,000 mm trench length
- No dust generation — beneficial for enclosed site conditions

Aqua Cutter 410V — Compact Robotic Solution

The Aqua Cutter 410V was selected for its compact, low-profile tracked chassis, which enabled operation within the height restrictions imposed by the stair landing. The self-propelled robot maintained precise positioning along the 9,000 mm trench run, with the hydro demolition head delivering the full combined output of the dual Jetstream 4200 pump configuration directly to the concrete surface.

The robot's programmable oscillation and traverse speed allowed depth to be controlled accurately. Multiple systematic passes were performed to achieve the full 600 mm depth through the dense 50 MPa slab.

Dual Jetstream 4200 Series Pump Configuration

Two Jetstream 4200 Series pumps were operated in a combined feed arrangement, delivering 20,000 psi at 190 litres per minute. This output was essential to generating the hydraulic power necessary to break and remove 50 MPa concrete at commercially productive rates. Running dual pumps also provided operational redundancy — a critical consideration in a confined-site environment where downtime carries a significant cost.

Project Photography

The photographs below document the Aqua Cutter 410V robot operating on site and the condition of the exposed reinforcing steel upon completion of the trench cut.



Figure 1 — Aqua Cutter 410V Hydro Demolition Robot operating on site beneath the stair landing



Figure 2 — Exposed rebar during cutting, demonstrating zero damage to reinforcing steel



Figure 3 — Completed trench section with clean rebar exposure and defined concrete edges

Results & Outcomes

The project was completed successfully within the client's programme and scope requirements. Key outcomes:

- Full trench dimensions achieved: 9,000 mm × 1,100 mm × 600 mm to specification
- Zero damage to reinforcing steel — all rebar exposed, intact and undamaged across the full 600 mm depth
- Work completed within the confined space envelope — the Aqua Cutter 410V operated safely beneath the stair landing without modification to the structure
- High-strength 50 MPa concrete removed efficiently with sustained dual-pump output throughout the works
- No micro-cracking or structural damage to the surrounding slab — adjacent concrete retained full integrity
- Safe working conditions maintained — robotic operation minimised operator exposure in the confined environment

Client Benefit

By deploying hydro demolition, the client avoided costly rebar repairs, eliminated the risk of structural compromise, and achieved a clean, well-defined trench opening ready for the next phase of construction — all within a space that conventional equipment could not access.



About Asia Waterjet Equipment

Asia Waterjet Equipment is a specialist supplier and contractor delivering ultra-high-pressure waterjet and hydro demolition solutions across the Asia-Pacific region. Our capabilities span hydro demolition, concrete cutting, surface preparation, and industrial waterjet applications — backed by a fleet of premium Jetstream pumps, Aqua Cutter robots, and experienced field teams. We partner with civil contractors, structural engineers, and project owners to solve complex concrete removal challenges where conventional methods are inappropriate, unsafe, or unable to meet specification requirements.

