

Technology

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Photo courtesy of Wiss, Janney, Elstner Associates

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Wall-Climbing Robot Makes Bridge Inspections Easier and Safer

The HB3 crawler robot was tested on an inspection of the Chicago Skyway piers

Annemarie Mannion May 15, 2026

A wall-climbing robot powered by technology inspired by Formula One racing is helping engineers inspect hard-to-reach places including bridges, dams, cooling towers and other massive, vertical structures.

Dubbed HB3, the crawler-style robot was developed by UK-based **HausBots**. It is being deployed by national engineering consulting firm **Wiss, Janney, Elstner Associates**, which is headquartered in the Chicago area, to help engineers inspect infrastructure in a more efficient, quick, and safe way than traditional methods involving lifts, scaffolding or rope crews, the firm says.

The 29-in.-wide machine features a PCI camera and is controlled via a joystick. It is able to adhere to concrete and other flat surfaces using a mix of airflow technology and suction. Engineers say it can climb tall structures while carrying inspection equipment that scans for deterioration in concrete, steel and other materials.

For the firm, which handles structural assessment and non-destructive testing, the technology represents a shift in how such inspections are performed.

“It’s an access means for us,” says WJE associate principal and unit manager Mohamed ElBatanouny. “The non-destructive [testing] equipment that goes on it, we are experts on. We understand what the data is and we can interpret the data, but the robot can help our equipment collect data more efficiently and, in some cases, more safely.”

The HB3 can carry up to 25 kg of equipment, traverse rough surfaces and surmount obstacles like wires and bolts, according to Jack Cornes, co-founder and CEO of HausBots. It can also

operate in less-than-perfect weather conditions.

"If wind is above a certain speed, [humans] can't even go up in a lift," ElBatanouny says. "You could have a team already mobilized to a site, but you won't be able to do anything because of high winds. So it's wasted time in a way. You need to tether the robot, of course, but you can make it climb up and down. Conditions that aren't safe for humans are safe for the robot."

ElBatanouny first came across the robot at a bridge preservation conference in 2024 when he saw it climbing the side of a truck and was intrigued.

"I said 'Ok. That looks pretty cool,'" he says.

After graduating from university, Cornes and his colleagues built the first crawler prototype in 2017. Today, the company has 40 to 50 robots operating in the field inspecting hard-to-access places.

Cornes says other manufacturers make robots that use magnetic wheels to climb, but those only work on ferrous metal surfaces. Other systems using vacuum pumps to create suction have been studied and tested, but those require surfaces that are almost perfectly flat for the machines to operate.

"Our system has a fan, so it's using airflow to make downforce so the surface doesn't have to be perfect," he says.

Wiss, Janney, Elstner Associates invited HausBots to demonstrate the crawler in June 2024 in both laboratory and field conditions. The pilot project involved inspecting piers on the Chicago Skyway, a 68-year-old tollway on the city's south side. The challenge was to see if it could carry a range of non-destructive testing tools while climbing vertically on concrete surfaces up to 40 ft tall.

The robot carried equipment for a half-cell potential measurement test, which detects the likelihood of corrosion in the steel reinforcement inside concrete and for a MIRA ultrasonic shear wave tomography test, which uses multiple ultrasonic sensors placed against a surface with pressure. It sends sound waves through the concrete and creates a 3D image of what is inside the structure.

"At first, I did not think a robot could perform this test because the device needs pressure against the surface," ElBatanouny says. "But Jack explained that the robot was designed to handle that, and in the end, it worked successfully."

ElBatanouny says there are still instances where hands-on inspections are needed. "If the data collected by the robot indicates, and we want to go back and look at some specific areas more closely, we can have people do it that way," he says.

A bridge inspection in Louisiana in rainy weather was faster, safer, and more reliable using the robot, he says. "The bridge is over water, so inspectors normally had to use a snooper truck to reach underneath it. They still used the truck for close-up inspections, but they used the robot to continuously scan the bridge and collect data."



The HB3 robot was used to assess a bridge in Louisiana in rainy, slick conditions.

Photo courtesy of Wiss Janney, Elstner

Wiss, Janney, Elstner Associates already has other ideas of equipment its staff want the robot to transport such as an impact echo, or sounding, which involves tapping a structure and using a sensor to measure how it responds.

"We're actually doing in-house research to develop a system like this that can work with the robot," ElBatanouny says. "Jack has been very supportive—he immediately said he could help and that it would be a good idea."

Comes describes the robot, which is patent pending, as a tractor that carries different payloads. HausBot is also working to enable the machine to convey equipment for core sampling on concrete that would require some type of drilling equipment.

"We want to encourage as much diversification of that tractor as we can," he says. "Our intellectual property is the tractor bit —how it sticks to the wall and how it climbs. But then, of course, we need to partner with experts like the [Wiss, Janney, Elstner Associates] team to [look at] how to make this tractor even more useful. We'll support almost any kind of new attachment or adaptation we can."

After piloting the robot, Wiss, Janney, Elstner Associates purchased the technology in late 2025 because, according to ElBatanouny, "it makes us better."



Annemarie Mannion is editor of ENR Midwest, which covers 11 states. She joined ENR in 2022 and reports from Chicago.