

ENR

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Firms wary but hopeful of market rebound (p. 53)

DIGITAL DRIVE

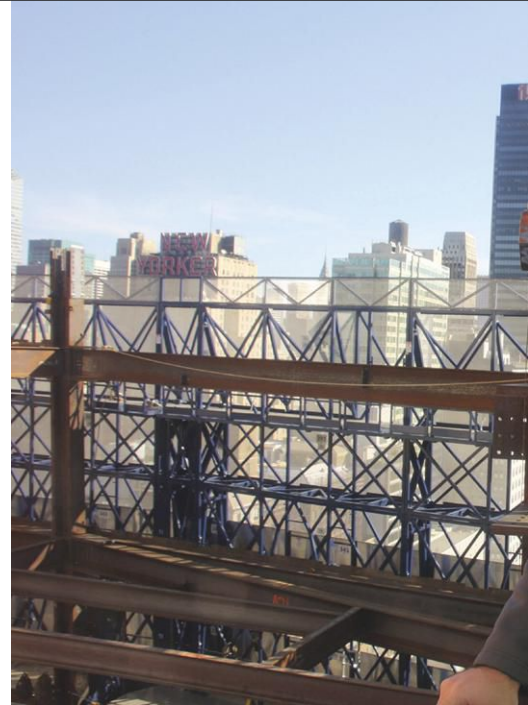
BIM takes front seat in 21-km Stockholm Bypass Tunnel (P. 26)



SAFETY

Building Tall From Within The Cocoon

Hydraulically driven, self-climbing system provides additional layer of protection for steel erector on NYC high-rise project



High above New York City's streets, ironworkers building the 70-story One Manhattan West tower are laboring inside of a six-story, 900-ton steel-mesh cocoon that hydraulically crawls up the sides of the building as they erect structural steel around the tower's concrete core.

Once several floors' worth of steel is in place, the cocoon retracts its walkways, activates its hydraulic cylinders and jacks itself up to the next tiers. Suspended from the building's columns and driven by its own onboard generator, the cocoon can travel between floors without the aid of a crane or even stopping work on the site.

"This is a game changer," says Steve McAward, main superintendent for steel erector Metropolitan Walters LLC, who has been putting in steel while inside the cocoon. "Other cocoons I have dealt with are a nightmare. This one is push a button and go."

The Self-Climbing Kokoon was developed by Italy-based demolition engineering firm Despe S.p.A. In addition to providing a safety cage around the site, it provides a one-meter-wide walkway around the site on all six levels and integrated ladders to move between levels. For power, 96 110V plugs can be found around the perimeter. An air compressor and welder are included, as well.



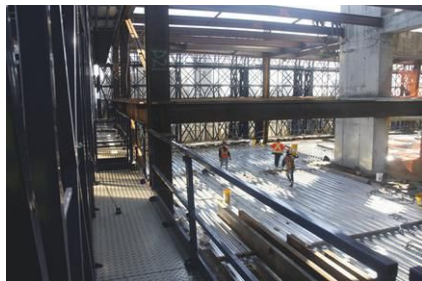
WORKING IN THE CAGE The six-story Despe Kokoon system provides ironworkers with additional walkways and storage space as they erect steel for the One Manhattan West tower in New York City.

The cocoon is run from a control cab that is fastened onto the side, with an internet link back to engineers in Italy to monitor operations. "We have over a thousand sensors on the cocoon monitoring over 220 hydraulic jacks" says Stefano Panseri, Despe CEO and one of the lead engineers who designed the Kokoon.

"Using this system, we're able to perform a double-floor jump in only three and a half hours." During a jump, if the sensors detect any hydraulic jack more than 10 millimeters out of alignment, it halts the process until it is addressed. According to Panseri, a team of three technicians can oversee the entire jacking operation.



GOING UP The six-story steel cocoon system, developed by Stefano Panseri (above left) of Italian engineering firm Despe, can retract its walkways and hydraulically jack itself up the building as steelworkers erect the frame. Sensors in the hydraulics are monitored from a cab attached to the side of the system (top right).



Assembly of the cocoon was performed by the site's ironworkers, who simply had to bolt together the modular segments according to plan.

The Kokoon originally was designed for top-down demolition of high-rise buildings (ENR 7/6/15 p.19). But a meeting with New York City-based steel erector Metropolitan Walters convinced Despe's engineering team that what goes down could also go up.

"I had gotten this job [for One Manhattan West], and the owner said we have got to put a cocoon on it," recalls David Pisacrita, co-owner of Metropolitan Walters. "But I said, 'Let's do something beneficial that isn't going to add to the work we have to do.'"

Pisacrita and his team visited a tower demolition that was using the Despe cocoon

system in Glasgow, Scotland; after a weekend in a construction trailer with Despe engineers sketching out ideas on napkins, they concluded Despe's system might be just what they were looking for.

"I said, 'We need it to withstand 35-mph winds. We need 25 lb per square inch. And we couldn't tie into the corner columns, so we would have to cantilever,'" Pisacrita told ENR. "And we went back and forth. But in that weekend in Glasgow, we came up with something that would work."

The site's cranes were engineered with the cocoon in mind, as well. The top tie-in for the project's tower cranes is located on the lowest level of the cocoon, where a cut-out section allows access for tie-ins. Sequencing has been planned so that, when the cocoon is jacked up, the crane is jumped soon after, so it always has enough clearance to work over the cocoon.

For Panseri, it was an engineering challenge. "We have to personalize the system for each project," he explains. But it was just a matter of customizing the modular design. "It is like Lego: We have special pieces to get around the sloping part of the facade," he says. The entire system was manufactured in Italy in six

months, with one month for delivery.

While the project's developer had asked for a cocoon, he was a bit surprised by the selection. "We always anticipated we would put a cocoon for the steel operation," says Henry Caso, head of construction for Manhattan West developer Brookfield Properties. "But we didn't expect that Metropolitan Walters would literally buy the Ferrari of cocoons."

The issue of price is one part of the Despe system that Metropolitan Walters focused on in picking a supplier. But despite higher up-front costs than competing cocoons, Pisacrita says savings manifested early on in shorter crane time and lower labor costs. "We started doing budgets, and [a competitor's] system would be cheaper to purchase, but it would cost three times as much to reinforce the structure since it would tie into the spandrel beams. And it would need a crane to move up, with a full crew to jump it."

The tower is currently only at about the 20th floor, and the Kokoon was only added at the 12th. While the jump cycles to date have been hardly sufficient to fully quantify any scheduling or efficiency benefits, Pisacrita says he expects the job to go a lot faster than with a traditional cocoon system. "Getting it on added five weeks to the job, but with [other systems] we would be doing eight- or nine-day tiers. Now with this, I think we could do four days and four hours per tier if we pushed it."

"I don't think we've realized the full potential of the cocoon just yet. It's really coming together, and we're going to see those advantages in schedule," says Caso. "The primary focus is for safety, and if it benefits schedule, so much the better."

Caso says Brookfield is considering using Despe's system on other New York City projects, including Two Manhattan West, just across the lot from the current tower. But based on how well it contains the jobsite, he's starting to think big. "I think the next evolution of this system will be multifaceted. It won't only deal with the steel erection," he says. "It will deal with the fireproofing, it'll deal with the curtain wall installation—it'll cover more and more." ■

By Jeff Rubenstone in New York City