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Column caper

Omega Morgan Crane Service, Apex Steel and Lifting Gear Hire teamed up to complete a complex lifting and rigging project in Seattle.

Omega Morgan crane superintendent Eldon Ash and senior engineer Kai Farrar, as well as Apex Steel owner Kevin Koester and engineer Ron Roberts, were tasked with an intriguing and complicated lifting challenge. More than a year of planning, engineering, testing and simulations went into the design of the project known as 2+U, named for its location on 2nd Avenue and University Street in Seattle, WA. The high-rise project is being developed by Skanska USA.

The engineering of structural columns supporting the proposed 38-story office complex provided an intricate challenge in ensuring the Y-shaped columns could distribute the weight of every floor above evenly on the foundation while maintaining a 72-degree angle of installation.

Faced with several issues that could have stalled the project before it even began, Omega Morgan and Apex Steel engineers went over several options to determine the best way to perform the required lifts when available space and increased weights of the columns caused the original lift plan to be scrapped.

“Initially, we were going to use two cranes, and then we were going to use a crane and a tri-lifter, but as the load got heavier and heavier, and as the jobsite got tighter and tighter for access, we had to come up with some more innovative ways to pick and stand these things up, and



The two cranes on the job were a 485-ton capacity Liebherr LTM 1400 AT and a 550-ton Grove GMK 7550.

that’s when I came up with this idea,” said Farrar.

Skip-around schedule

Charged with leveraging their skill and experience to come up with a way to utilize a limited amount space and a strict schedule of road closures to set the foundation for the office tower project, Omega Morgan and Apex had to adapt a skip-around schedule based on which roads would be closed to complete the project while avoiding falling behind schedule.

The engineering of the supports that would be installed at a 72-degree angle – and which start on the second floor and run up through the next five stories – left

no room for error in the construction and placement. Further, engineering the lifts of each section of the columns posed its own problem. With the columns

The engineering of structural columns supporting the 38-story office complex provided an intricate challenge in ensuring the Y-shaped columns could distribute the weight of every floor above evenly on the foundation while maintaining a 72-degree angle of installation.





Rigging gear

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Air Chain Hoist with 35-foot HOL
- 50-ton JDN 50TS
Air Chain Hoist with 35-foot HOL
- 60-ton WLL
Single Sheave Blocks, 24-inch diameter
and 2-inch wire rope



The engineering of the supports started on the second floor and run up through the next five stories.



being assembled in a sort of “Y” shape, the assembled height and weight made it essential to install them in sections. Fully assembled, each column came in with the base, installed separately, weighing in around 50,000 pounds with two arms run at a 72-degree angle that span around 60 to 70 feet tall with a final weight of 165,400 pounds for the heaviest columns. The rigging itself weighed 5,528 pounds. Ensuring all pieces lined up properly to evenly distribute the weight with only enough space for one crane, calculations had to be precise.

Once on-site, further challenges crept up that called for on-the-fly adjustments. The position of the crane had to be modified to avoid swinging the counterweight too close to a tree trunk, which would break branches. The crane was moved five feet away to be able to tie the branches back and assure no contact. This move required the crane be set on a wooden ramp to level it out given the slope of University Avenue.

Once the columns were fabricated

and weighed, the numbers came in significantly heavier than planned. The tight nature of the jobsite inside the building did not allow space for two cranes with the capacity required. It became clear that a rigging scenario in which a single crane could pick and upright the columns would be necessary.

Creative rigging

Because of the tight space on-site, it was not possible to use a boom suspension system to stabilize a longer boom to get enough capacity to make the picks, limiting the boom length to 118 feet with no boom suspension. The short boom and head room required that the single crane rigging setup be as short as possible.

The two cranes on the job were a 485-ton capacity Liebherr LTM 1400 all-terrain crane rigged with a main boom of 118 feet and a maximum radius of 45 feet and a 550-ton Grove GMK 7550 rigged with a main boom of 148 feet and a maximum radius of 70 feet.

Equipping the cranes with a 37.5-ton air chain hoist and a pair of 60-ton sheave blocks, the crew was able to perform the work typically done with the aid of a tailing device while utilizing only one crane and saving on the head room required to perform the lift.

The jobsite constrictions left no room for error in placement of the columns.

“One thing that was unique about this rigging scenario was that using the rolling blocks and the chain lift in this way, as the load goes through its rotation, the head height at the final rotation is minimized compared to other systems that are similar like a tri-block that runs the secondary line down, but the rigging height that you end up with was too much for our project,” said Farrar. “This rolling block/hoist system really minimizes the head room once the columns are upright. Because the site was so tight, we couldn’t use any kind of boom suspension like a mega-wing or guy wires since they stuck out too far and would have interfered

with the building core and a lot of the structural elements, so we had to stick to short-length, main boom only and couldn't have any tall rigging."

Farrar engineered the rolling block setup to create the safest, most efficient pick possible that allowed them to run the lift with one crane and save on the space required compared with other options. Limited on viable options, the use of a tri-block system would no longer work in this application, so the creative use of an air chain hoist paired with rolling blocks saved time and money. Keeping a spare 50-ton air chain hoist on site, which never left its shipping container, ensured there would be minimal risk of unplanned

downtime in the event of a mechanical breakdown.

Omega Morgan and Apex were both contracted by Skanska to assist in the lift and to hook the rigging for the crane operator. Apex's Koester saw this as a personal project and stayed heavily involved, arranging for a test run of lifting the columns days before the lift was planned. Running with a pared down crew of only five guys, each of whom would play pivotal roles during the planned lift, the simulation was performed to assure the best practice for lifting and placing the columns. The initial test runs ran smoothly and, while performing the installation, it was



The rigging plan allowed single crane picks where possible and didn't require the use of a tailing device.

determined that extra support bracing would not be required as previously thought. Koester worked directly with Farrar and Lifting Gear Hire, running through the extensive catalog to hand-pick the gear that would be used on site. He arranged for equipment to arrive the same day as the columns to avoid causing further delays with the road closures.

Productive collaboration

Through the collaboration of all three parties, the job went off without a hitch and the use of the air chain hoist and rolling block rigging solution made the entire project possible given the limitations faced.

"Using single crane picks where possible and not having the use of a tailing device like you normally would, the rigging allowed the single crane to work and allowed the job to even be done," said Koester.

To overcome the inevitable obstacles faced on any job, having the right equipment from a reliable partner is as pivotal as the crew's knowledge and expertise in their craft, according to Koester.

The teams of Omega Morgan and Apex Steel Inc., along with their collaboration with Lifting Gear Hire, were able to easily traverse every hurdle along the way and reached a safe and successful installation of the support columns on the 2+U project.

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