FLYING DUTCHMAN

A modified 25-tonne Hyundai excavator is currently chomping its way down though the last of four high-rise office buildings with a total of 180,000 square metres of floor space, writes Steven Vale.

It is not the first time a hydraulic excavator has been craned to the top of a building for demolition duties, but as far as we are aware no one has ever attempted to use a 25-tonner to take down a 65-metre tower block. The Hyundai excavator belongs to Dutch demolition company Boverhoff and was quickly modified to take down four similar buildings in the northern Dutch city of Groningen. In addition, there are a number of low-rise buildings on site to go, and a 4m-deep air raid shelter. All in all, about 110,000 tonnes of concrete.

This job is a big one, but the largest contract ever undertaken by Boverhoff was a 2.5-year project to remove of all of the buildings and sterilise the ground at a 12-hectare chemical plant at Arnhem. A close second was a three-year job to take down over 200 buildings and structures, including bunkers and F-16 hangars, at the Soest military base, for the Dutch Ministry of Defence.

The Groningen project was awarded to them in the summer of 2011. At the time, the only active high-reach demolition rig in the country that was capable of tackling the four buildings from the ground belonged to a competitor. However, while such a rig could have easily demolished three of the 14-storey buildings, the fourth was perilously close to a newly-built 93m-tall structure, with no space to suspend a protective device between the two buildings.

Therefore a more controlled approach was needed, which was when owner Rijk Boverhoff contemplated the possibility of hoisting a decent-sized excavator to the top, not just to tackle this first building, but also the other three.

Together with chief mechanic Gerrit Nijhof, the two men scribbled down a few ideas, including the need to use a 2.7-tonne Verachtert VT-40 multi-processor and a 1.8-tonne Furukawa F27XP hydraulic breaker. They then approached Ruud Schreijer, the MD of Rusch Special Products, the company that developed a 90m-tall rig and numerous other extreme demolition machines.

This modified 25-tonne Hyundai excavator is believed to be the heaviest excavator in the western world used for top-down demolition.

Above (Two Pictures); The counterweight and hydraulics were beefed-up to enable the Hyundai to use a 2.7-tonne Verachtert VT-40; a 1.8-tonne Furukawa breaker was also in action.

With the details finalised – and the method approved by the client – the search started for a suitable low-houred 21-tonne class base machine. Boverhoff runs larger Hitachis, but the rest of the 20-strong excavator fleet is an all-Volvo affair. This was the brand that was the favoured option for the new rooftop excavator, but the only EC210 they could track down that was immediately available had 8000 hours on the clock. It was the Dutch Hyundai distributor Van der Spek who came to the rescue with a used R210LC-9, which had recorded just 1200 hours.

Speed was of the essence, as they were due on site at the end of the summer holiday, so Rusch had just four weeks to complete the calculations, drawings and modification works, which they did.

SITE VISIT

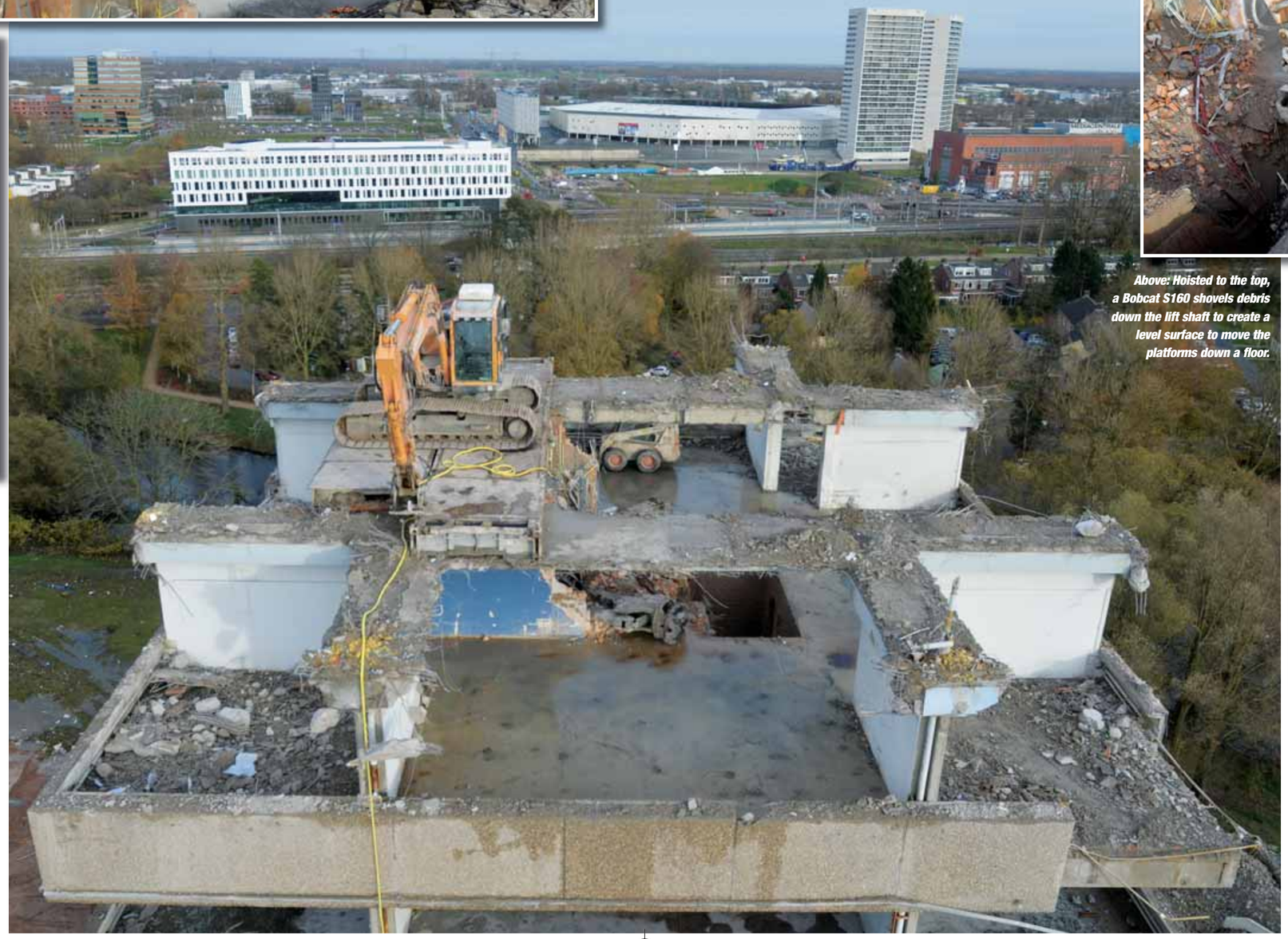
The excavator stands on a platform made of four bases and ends of 40ft flat-rack sea containers. Each base has a carrying capacity of 40 tonnes and is positioned over the central core of the building. From this platform the operator was able to reach out to all four sides of the structure, deftly swapping between the two attachments and letting the debris fall to the ground over the sides.

Externally, with the exception of the additional 1.5 tonnes of rear ballast to counter the weight of the heavy VT-40 attachment, it looks like any other Dash-9 Hyundai R210. This similarity continues inside the cab, but then with one very important difference; a rocker switch to the operator's right hand side. This is a safety device to prevent accidental tracking on this small site 65 metres in the air. Operator Klaas can only move the excavator when he holds down this switch.

Other less visible modifications include a change in the hydraulic oil pressures, which have been boosted to produce the same flow as a Volvo EC290, again to cope with the VT-40.

The initial burning question is how on earth did they get the excavator to the top of the building? After all, the additional ballast and other works boosted the weight of the standard excavator to 24.6 tonnes, far too heavy for the Liebherr LR1130 crane that was supporting the project. A much larger crane, probably something in excess of a 500-tonne class monster, would be needed to lift the complete machine to the top. However, more on this later.

There are three operators on site – excavator operator Klaas Brinkman, Bobcat operator Leon Deen and crane operator Michiel van Gameren.



The site is a disused government office complex. The staff has been transferred to a new building, just a few metres away from the first block to be demolished.

Above: Hoisted to the top, a Bobcat S160 shovels debris down the lift shaft to create a level surface to move the platforms down a floor.

Above: Operator Klaas Brinkman usually works from ground level in the cab of a high-reach demo rig, and says top-down demolition is completely different.

Main Picture: With two of the platforms removed from the 11th floor, the excavator prepares to break through to the next level.

Above (Two Pictures) and Below (Two Pictures): Thanks to a quick-release counterweight and tracks, the upper-structure of the excavator is relatively simple to remove.

While everyone on the project now says it is easy, when Boverhoff was seeking volunteers, Klaas was one of just two of the company's 20 operators that stepped forward. He normally operates a 35m high-reach Volvo EC460C demolition rig and he admits working from the top of a building took a bit of getting used to.

this is one excavator that even the most determined thief will find hard to steal from its site.

Top down demolition needs a completely different mentality to routine demolition works. All fuels and oils have to be craned to the top, while the supply to the water hose is pumped up from the ground.

"Now I feel all the vibrations and on the top floors you can even feel the building move."

"Normally I look up at a building and I am remote from any movements," he said. "Now I feel all the vibrations and on the top floors you can even feel the building move."

However, he quickly grew into his role and enjoys the unbeatable view of working close to the attachments. The only two things that stop them are gale force winds and freezing conditions, when it is deemed too dangerous to work at the top. At least

CHANGING FLOORS

Our visit coincided with the excavator needing to be relocated from the 11th floor of the last building to the 10th floor.

Two of the four platforms were craned off and lowered to the ground. Klaas then demolished a section of the inner core wall on which they had been located, and the debris was left on the 10th floor.

The Bobcat was then hoisted up to clear the debris, some of which was pushed over the sides of the building, while the rest disappeared down the lift shaft. Just as an extra safeguard, Klaas positioned his attachment so there was just enough room for Leon to tip the debris, but not enough room for the Bobcat to start to follow its load.

When Leon had cleared a suitable space, the two platforms were then hoisted back up the building and carefully positioned on the inner core of the 10th floor. By now head mechanic Gerrit Nijhof, who always helps with the move, had joined us. The counterweight was first to come off the excavator, held in place by two pins. Once released, it was lifted clear and lowered down a floor, as were the attachments.

Next came the part I was intrigued to see most – the separation of the upper and lower structures – which are joined by a specially-made casing below the slew ring. Gerrit quickly loosened the six locking pins and plates and then disappeared briefly underneath the machine to loosen the eight hydraulic supply and return hoses to the track drive motors.

With the lifting chains secured, the upper-structure of the excavator was slowly hoisted skywards and then began its long descent to the ground. If this sight wasn't unusual enough, the engine was still idling during this manoeuvre, presumably to maintain the angle of the boom during the lift.

A few minutes later the shackles were back at the top of the structure for the undercarriage, which was lowered on to the next floor. The excavator's upper-structure was then hoisted-up and returned to its tracks on the 10th floor. The locking pins were quickly back in place as were the hydraulic lines to drive motors. A few minutes later the counterweight was reattached.

Less than one-and-a-half hours from start to finish, the excavator was ready for action. The two platform bases left on the 11th floor were craned off and Klaas could start on the stub of the upper floor core that was still in situ. When this was removed the platforms were craned back up, to provide a four-platform area for the excavator.

Quite possibly this demolition method will be sneered at by some advocates of high-reach rigs, but in essence it is no different to craning a mini to the top of the building, just on a larger scale. The Dutch equivalent of the Health & Safety Executive was heavily involved to ensure there was no compromise on safety.

However, lots of planning was needed to ensure the structures were all capable of supporting the weight, before the parts of the excavator could be craned to the top of the first 14-storey building. One of the flat-rack platforms also needed cutting to exactly fit between the supporting walls of the lower floor, and extra stress calculations were needed to ensure this had no detrimental effects on its load-bearing capacity.

Perhaps the understatement of the day came from Boverhoff's commercial manager, Erik Zwerver, who said, "There was lots of paperwork to complete before we were allowed to make a start."

The way the excavator splits apart is so brilliantly simple it is astonishing it has never been thought of before. Now with around 200 moves under their belts, the three-man team has perfected the art of transferring the excavator to a lower floor.

It took this team 11 weeks to complete the tricky first tower block. Some of the floors required two moves and up to a week of work. The close proximity of the newly-built structure meant that all debris from the demolition process had to be surgically removed and carefully lowered to the ground.

This same technique was also applied to the second building, which like the first had a 25 x 25m footprint. It was down in nine weeks.

Above: The engineering works undertaken by Rusch Special Products has resulted in this cunningly-simple system to marry the two halves of the excavator.

The men and machines reduced the third (roughly 20x20m) structure to rubble in just seven weeks. Sometimes they managed to remove a complete floor in one and a half days.

This last building is a similar size and the team aim to complete their work on it in just six weeks.

There is no doubt in my mind that a dedicated 60m high-reach machine would have been a quicker option to demolish the last two towers and would have also minimised the need for men to work at height. But there was no opportunity to use this technique on the first building and operating with a giant demo rig with no control of the debris on the second structure would have been problematic.

However, the R210 carries much larger attachments than any high-reach rig and the financial calculation certainly stacks up in favour of this method, even when the crane rental costs are taken into account. A used Hyundai with €50,000-worth of engineering works is still vastly less expensive than buying a dedicated 60m machine and is probably not that much different to what a competitor would have charged them to rent one.

Finally, a big feature is that the excavator can also be re-united with its bucket and returned to standard muck-shifting duties. During the past two years, this project was held up several times due to the discovery of asbestos. The excavator was packed up on a couple of occasions and used elsewhere to dig.

The company is looking forward to piling on even more hours on its Hyundai, which is now well on the way to 3500 hours.

First though, they plan to give it the same orange livery as the rest of the company's 18-strong excavator fleet, which they did not have time to do when they originally bought it. This excavator does not owe them any money and Boverhoff are now looking forward to securing future high-rise jobs, not just in the Netherlands but also the rest of Europe and even further afield.

Finally, pleased with the performance of this quickly-bought used excavator, Boverhoff has recently added a brand new one to its fleet. However, they have no plans to take this one to the top of a high-rise building.

With the last remains of the upper floor gone and all four platforms in place, work starts on the next floor.

Editor's comments

Well done to Steven Vale for getting up close and personal with this job site. As there was no staircase, the only way to visit the excavator was in a basket hoisted up by the crane, a trip that is certainly not for the faint-hearted.

Steven said, "After a morning exposed on the 11th floor I was getting used to being at height. However, a peek through the gap between two of the platforms revealed a vertical drop to the bottom of the lift shaft!"