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Hollowcore – more than just a vision for Portland Group

An essential element of the Portland Group's business values is a clear understanding of the importance and urgency of effective, quality systems of delivery, a philosophy which resounds throughout the group. Based in Durbanville, Cape Town, the company entered the precast hollowcore market in 2008, purchasing state-of-the-art equipment from Elematic in Finland. *Dale Kelly* visits the Hollowcore operation:

The writer firstly visited the facility in 2008 when the 3 000 m² roof-covered facility was under construction, with the batching plant on its way from Finland. A second briefing in September 2010 saw the plant in full operation, with hollowcore being utilised at the impressive 10 800 m² Pavilion development in Bredasdorp, among several others. At that time, KLS Consulting Engineering, the consulting-engineers for The Pavilion, cited several benefits of hollowcore, confirming the benefits of a cost-effective, fast erection time, which they said was the only slab design within their budget plan. The company used an integrated design with reinforced concrete beams and a factor off-shutter finish on slab soffit, with no propping of slabs during construction.

Architects Smith & Smith, looked at various options for The Pavilion's expansive floor area, including in-situ and pre-manufactured concrete slab. According to that company's Henk Smith, the cost of the pre-manufactured hollowcore option far outweighed the in-situ option. "The speed of the project could progress and the time savings from the normal erection and dismantling of formwork, together with labour costs, made hollowcore a viable option." He added that the



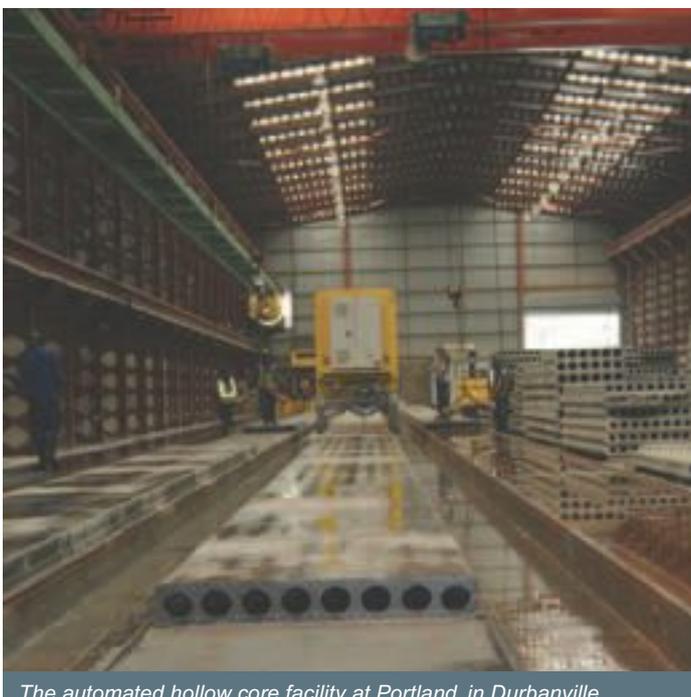
From left: Portland Group managing director Nico Heyns and Portland Hollowcore factory manager Sarel Pienaar.

slab structure with its hollowcores enabled the electrician to run conduits in the voids. "Additionally the underside of the slab is an off-shutter finished concrete of high standard. This finish is extremely smooth as a result of the quality control of regulated factory production. The floor finish is ideal for the application of waterproofing and other floor finishes."

Portland's founder and managing director Nico Heyns tells MQ that while things have gone slower than expected over the last few years, due mainly to the slump in the economy, he has always retained his vision for the future of hollowcore, and is very excited at prospects for this year. "It's my baby and I want to pull it through." And this he certainly has. The company has employed a specialised engineer, together with contracts manager Ann Child, who has a wealth of experience in the hollowcore industry, two draughtspeople and additional staff in the factory. Hollowcore specialist Stefan Marais is on the road on a daily basis, taking measurements and ensuring that the customers are happy, all of which has made a vast difference to the business.

Heyns has recently returned from a trip to Belgium to view and order adjustable staircase moulds "With our hollowcore decking, there are always staircases involved. The staircase mould we are using at the moment takes us about three to four days to complete, but with the adjustable staircase, we can complete one or two a day."

Ordered from specialist manufacturer of high-quality modular formwork systems and precast moulds, Cometal nv, the adjustable staircase moulds are used for casting straight run prefab stairs. The staircase mould can be variably adjusted by a mono command so that different types of prefab staircases can be cast, such as the amount of treads, height of riser, thickness of the stairs, etc. The mould guarantees an exceptionally



The automated hollow core facility at Portland, in Durbanville.



Above: Crushing takes place at the quarry, and the material is transported by loaders to the aggregate bins at the hollowcore facility.

Right: The concrete is carried directly from the mixing plant by the EB405 aerial shuttle which places the material directly over the bucket gantry, discharging the batch into the extruder.



smooth finish. Benefits include a wide adjustability range of pitch angle, riser, going and surface thickness of the stairs. It is adjustable by means of only one spindle or hydraulic hand pump; one-person operation; and easily disassembled through to the tilting side; closing partition on the side (with tooth) to be buttressed against four fixed stops. Heyns says that due to the horizontal discasing, the mould can be used in areas where height is at a premium. At the time of writing, the moulds were on the water, en route to Cape Town.

Hollowcore process explained

“Prestressed hollowcore slabs are one of the most advanced products in the precast concrete industry,” he tells MQ, especially with regard to their quality and low consumption of materials.” The slabs have longitudinal cores, with the main purpose of reducing the weight of the floor. The slabs can be used for most applications requiring a floor or roof system. For hotels and apartments, the hollowcore slabs are oriented to either span between load bearing shear walls or to span from the central corridor to the exterior walls. Slabs can be cantilevered up to 1,5 m.

As hollowcore is more cost effective than that of a normal slab, it has been particularly popular in regions where affordable and low-cost housing is a priority. A hollowcore slab has between four to six tubular voids, which extend its full length. The prestressing means longer spans, shallow depth and the ability to carry heavy loads. This also means better space planning and a lower floor height. Lengthening the span is economical with fewer slabs to make and install. Hollowcore is cast with continuous voids to reduce weight and cost, and as a side benefit, to conceal electrical wiring or mechanical ducts. When properly coordinated for alignment, the voids in hollowcore slabs can be used for electrical or mechanical runs. For example, routing of a lighting circuit through the cores can allow fixtures in an exposed slab ceiling without unsightly surface-mounted conduit. Slabs detailed to distribute heated air through the cores can be used as the thermal mass in a passive solar application.

The slabs can be supported on many types of supports



The state-of-the-art computerised control centre.



Hollowcore is cast with continuous voids to reduce weight and cost, and side benefit, for use to conceal electrical wiring or mechanical ducts.

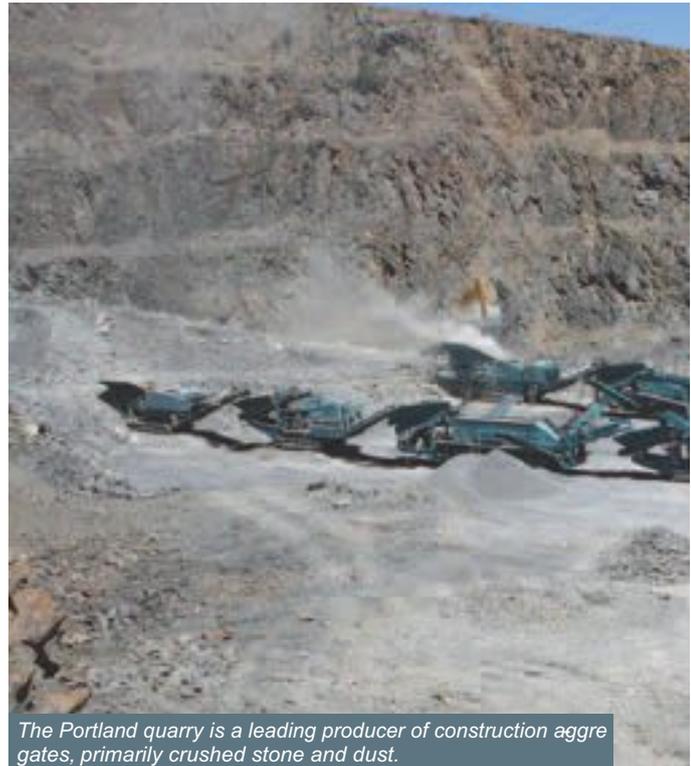


The single-grab lifting device is carefully guided towards the dedicated job area.

designed to carry the dead and live loads required. Precast beams, precast walls, poured concrete beams and walls, masonry walls, insulated concrete forming system walls, wood and steel stud walls and structural steel beams, are all suitable for use with hollowcore as load bearing systems. The slabs are designed as individual, one way, simple span slabs. When installed and grouted together at the keyways, the individual slabs become a system similar to that of a monolithic slab. A major benefit of the slabs acting together is the ability to transfer forces from one slab to another.

There is no doubt that hollowcore is economical. At Portland Hollowcore's state-of-the-art operation, the modular precast concrete floor and roof slabs are machine manufactured in a controlled environment, in the under-roof facility. The slabs are made on long-line casting beds and cross-cut to the exact length for each project. "At this stage we still have the four beds, but we can go up to seven if necessary," Heyns says. "The lanes are 120 m long and can vary in length and dimensions. We have two thicknesses at the moment – 160 mm and 200 mm – but with extra machinery, we would be able to go up to 500 m should the market pick up in the long term."

It was lovely meeting up once again with Hollowcore factory manager Sarel Pienaar, who proudly took MQ through the busy facility. He is very excited about the new adjustable staircase mould, and confirms that this will more than halve production time. Explaining the process from quarry to final hollowcore manufacture, he says crushing takes place at the quarry, and the material is transported by loaders to the ag-



The Portland quarry is a leading producer of construction aggregates, primarily crushed stone and dust.

gregate bins at the hollowcore facility. It is then carried up the incline conveyor to the mixer, which is fully computerised in terms of the material required for a specific job. For a wall panel, for instance, the mix will differ from a deck panel. This information is loaded into the high-tech computerised system before the casting process begins. Once the batching plant is finished mixing, the concrete is distributed from there by the EB405 shuttle, which places the material directly over the bucket gantry, discharging the batch into the extruder.

The casting beds have to be cleaned and lubricated before the casting process can begin. "The BedMaster cleans the casting bed after a completed slab has been removed, which ensures the quality of the next slab," he explains. "After cleaning, the BedMaster expends a mould-release oil, preventing the concrete from sticking to the bed, and giving the soffit side of the slab a very smooth finish."

The pulling and tensioning of the strands is one of the first steps in the production process, with the typical tension of each strand being up to 130 bar. After spreading the oil with a wiper, the strands are tensioned individually or in bundles, depending on the capacity required. Pienaar says the machine does about three runs from the live end of the factory to the dead end.

Explaining the purpose of the extruder, he says this is the key component in the entire production process, and extrudes the slabs in continuous mode. "The extruder consists of a universal power unit, and slab-specific, exchangeable nozzle modules, which make it possible to easily and quickly change over from one slab size to another. The number of feeding screws that the nozzle modules have, vary in accordance with the number of voids required in the hollowcore slabs. The extruder moves during the cast in reaction to the pressure created by the feeding screws."

Walking from the dead side of the factory to the live side, MQ was shown the massive overhead cranes which lift the extruder onto cables some 35 mm above the bed. The coils are imported from Portugal, and the cables are hooked onto the BedMaster, saving considerable manpower. "After the BedMaster expends the mould-release oil, you hook the cables onto the machine and it travels down, and decoils. We use



The coils are imported from Portugal.



Ordered from specialist manufacturer of high-quality modular formwork systems and precast moulds, Cometal nv, the adjustable staircase moulds are used for casting straight run prefab stairs (Photo courtesy Portland Hollowcore).

seven cables at a time, instead of 14 personnel, because after about 50 m this cable is very heavy to handle. For 120 m for instance, you would use two people per cable, so this machine does the work of 14 people, safely and effectively in three to four minutes." The entire system can run automatically, but, as Pienaar says, "at the end of the day you are still going to need the human factor to ensure that things are running correctly."

Asked about the casting process, he says there are two ways for curing the slabs. "We have heaters underneath the beds, with circulating hot water to generate the heat. As we cast, we have a tarpaulin that we cover the beds with, and combined with the added heat from the bottom, turnaround time is about 16 hours from casting to cutting." If there is no tight production schedule, Portland Hollowcore prefers a natural curing process, which is obviously more cost effective. For this process, the panels must rest for 72 hours (three days), before cutting can start.

Openings may be provided in hollow core systems by saw cutting. The company's Elematic 1300 saw enables automated cross, longitudinal and diagonal cutting. With impressive features including four automatic cutting cycles for crosscuts according to slab types, the unit travels on the side rails of the casting bed. After curing, the strand tension is released and the slab is cut to specification. The cutting operation is carried out with the diamond-tipped saw, travelling on the same rails as the extruder. After cutting, slabs are lifted from the casting bed by the overhead crane with clamps. Slabs, which are set on transfer wagons, then undergo quality control, after which the voids are fitted with sealing plugs.

Portland Hollowcore is extremely busy at this stage, and on the day of MQ's visit, Pienaar was completing a cutting list for six orders, part of which was being carried out simultaneously. "This keeps us ahead of the installation crew and it keeps the pressure down in the factory," he says, adding that the plant is capable of producing 500 m^2 /day.

Heyns says the company is supplying product for a massive shopping centre upgrade in Stellenbosch, and some 168 flats. "Hollowcore makes it a much simpler process. We are doing three floors there for NMC Construction Group. We've gained some land close to the shopping centre, and we start

manufacture at our facility and send the product to site. Some of our people are on site and with the help of NMC's tower crane, we are able to do about 600 m^2 /day."

The company also recently completed a major walling system for Hirsch's in Montague Gardens. Well known in Gauteng, this is the first Hirsch store in the Western Cape. Heyns says as the showroom was due to be opened in the Easter weekend, the walling system was a quick and viable option. "The height we went to here is over 6,0 m, I can't complain," he says with smile, it's going well, and there is a lot of other work coming in. It takes some time to get into the market, and as the Portland Group is already well known for its quality readymix and aggregates, we have taken a focused marketing strategy to get the Portland Hollowcore name out there, and the hard work has paid off for us this year."

Discussing the advantages of hollowcore, he says it is internationally the most widely used precast flooring and roofing product. "Reduced weight provides savings in foundations and other structures as well as in transport and installation. Hollowcore slabs have longitudinal cores, the main purpose of which is to reduce the weight of the floor. They are mainly used in buildings with large spans such as office buildings, hospitals, schools, shopping centres, industrial buildings, etc, and another common application is apartment buildings and houses because of the favourable costs and faster installation time."

Hollowcore is also suitable for longer and shorter spans, normally 1 200 mm wide with a choice of two depths: 160 mm



Portland Hollowcore is currently supplying product for MNK Projects for the development of several Curro schools, such as this one in Mossel Bay.

with a maximum span of 6,5 m; and 200 mm with a maximum span of 8,5 m. Other benefits include:

- longer spans, less supports, more freedom in floor plan and design;
- dry installation: only the joints need to be wetted and grouted;
- installation is faster and simpler due to the lower weight and precise dimensions;
- smooth soffit requires no skimming – only a textured paint finish;
- no propping, shuttering or site curing required; and
- no concrete topping – only a light finish screed is required.

Portland Hollowcore is currently supplying product for MNK Projects for the development of several Curro schools, in Langebaan, Durbanville, Hermanus and Mossel Bay. "The school close to Canal Walk in Cape Town is more of a campus at about 8 000 m², so we are very happy to be involved," Heyns confirms. Affordable housing is also keeping the company



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busy, with a lot more potential in this regard. "Our product is the best in the market, and our new adjustable staircase mould will take us to new heights," he tells MQ. Our guarantee at Portland Hollowcore is that we are well established and reliable, experienced and friendly, we work hard at achieving high customer satisfaction, our materials are top quality, we have a very capable supply chain and our prices are competitive."

Clearly this is a company with a very competitive edge, and from its early start as Portland Bouers almost 25 years ago, Heyns' forward thinking approach has taken this company from humble beginnings to a group to be reckoned with.

Report and photographs unless otherwise credited by Dale Kelly



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