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PRECAST PASSION FOR MUSIC

Embossed abstract music pattern at the new City of London Academy

BATCHING PLANT

Taking measures to complement other carbon-reduction initiatives

PERMEABLE PAVING

Imminent SuDS requirements on developments in England

PIONEERING 3D CONCRETE PRINTING IN THE UK

Versarien has developed a range of products for the construction sector containing graphene and related materials (GRMs), which can maximise the performance of construction materials, reduce cement usage and increase the durability and life of assets, leading to significant overall reductions of CO₂ emissions. Using a robotic arm printer that prints a low-carbon mortar mixture, the company prints complex structures using a modular build programme. **Stephen Hodge, Daniele Annicchiarico, Kane Meekel and Scott Williams** highlight some of the types of products and projects delivered in the past 18 months.



The 'Versarien Lunar' pod – the world's first 3D-printed concrete product enhanced by graphene.



LEFT:
Island Steps by Stuart Padwick at Design London, now situated at Highnam Court, Gloucestershire.

BELOW:
The 'Versarien Lunar' pod – the world's first 3D-printed concrete product enhanced by graphene.



3D concrete printing (3DCP) is very flexible from both design and materials perspectives; it allows architects to work on complex geometrical designs that would be otherwise expensive and difficult to achieve, and offers a range of materials to build from, including low-carbon options. 3D printing significantly improves resource efficiency; a reduced volume of concrete and steel reinforcement is typically needed, as well as reduced labour compared with traditional concrete casting techniques. The small amount of material wastage makes 3D printing more sustainable and there is a reduced need for the transportation of concrete mixer trucks to and from sites, or transporting large precast elements when the printing stage can be performed directly at the construction site. Safety is also improved, with less heavy lifting and the potential to build near busy roads and live railway lines with the workforce out of harm's way.

LUNAR

With the surge in popularity of garden offices and lifestyle pods, in 2022 a milestone project, dubbed 'Versarien Lunar' (demonstrator 3D-printed lifestyle pods), was the world's first 3D-printed product enhanced by graphene in the form of an aqueous admixture (Cementene). Graphene enhances certain characteristics of the mortar, such as compressive strength, curing rates and water impermeability. The unique wall design that can be achieved shows the level of detail, flexibility and precision that can be achieved with 3DCP (see Figures 1 and 2). Walling systems can be also designed with aesthetically pleasing façades to offer enhanced acoustic properties

for added privacy, openings for vegetation and integrated water storage (see photo below).

ISLAND STEPS

The late Stuart Padwick was a British artist and designer, best known for his furniture and lighting designs, and in more recent years he created a number of large-scale public sculptures often in support of mental well-being and the environment. Padwick's most notable pieces include *Head Above Water* on London's South Bank and the official COP26 legacy artwork

– *Hope Sculpture* – which was a series of three permanent public sculptures across Glasgow. Last year, Versarien teamed up with Padwick to create a 3D-printed installation reinforced with graphene. The team wanted to highlight not only the beauty of this advanced material but also its green credentials both in composition as well as its 3D manufacturing. *Island Steps* (image above and previous page) has been designed as a playful oasis and can be located both internally or in an outdoor environment. It was



The Fastwall range allows customers to design walls that suit their setting, allowing for complex geometry and features to be incorporated.



LEFT: *Island Steps* by Steuart Padwick at Design London, now situated at Highnam Court, Gloucestershire.

showcased at Design London and is now situated at Highnam Court, Gloucestershire.

MR & MRS DIY

Working with Contained Living and 3DCP Industries, Versarien successfully 3D printed and installed a garden office wall for Big Brother winner and DIY expert Craig Phillips. The 4 x 2.4m wall was printed and delivered in two panels, taking only 45 minutes each to print. This really showcased the creative freedom in architectural design that 3D printing offers.

CIRENCESTER COLLEGE

New 3DCP benches were placed outside the Digital Skill Centre at Cirencester College to create an outside teaching area. The wooden tops to the seats were selected by first-year construction students at the college who visited the Versarien factory during the bench-printing process (photo below left).

OMNIORE KIOSK, WESTFIELD STRATFORD

Working with design studio Attempo, Versarien delivered a modular retail kiosk that was painted black post-3D printing. The design brief for this jewellery kiosk was to produce something striking and different. The customer, Omniore, liked the idea of the contemporary features juxtaposed with rock-face-like finish created by 3DCP layered material.

Being able to create rendered visuals of the CAD models allowed the customer to see exactly what they were to receive and to tweak the design in line with their vision. The power of 3D printing was flexed to produce components to suit the non-standard geometry of the kiosk cabinetry. All 3DCP-delivered components were printed in a handful of print set ups with no moulds or formwork required.

WHAT'S NEXT

Having printed at live shows such as UK Construction Week 2022, work continues to push the boundaries with 3DCP further and see what can be achieved in large sectors (highways, marine, water, etc) that could help drive the implementation of 3D printing as an additional method in the construction toolkit. Like the *Island Steps*, some of the other 3D builds can now be visited at Highnam Court, Gloucestershire (see photo below right). **E**

BELOW LEFT:

3DCP benches outside the Digital Skill Centre at Cirencester College, creating a new outdoor teaching space.

BELOW:

Some of the 3DCP builds can be visited at Highnam Court, Gloucestershire.

