



# Harcourt Technologies Ltd

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Concrete Precision,  
Delivered Through 3D Printing

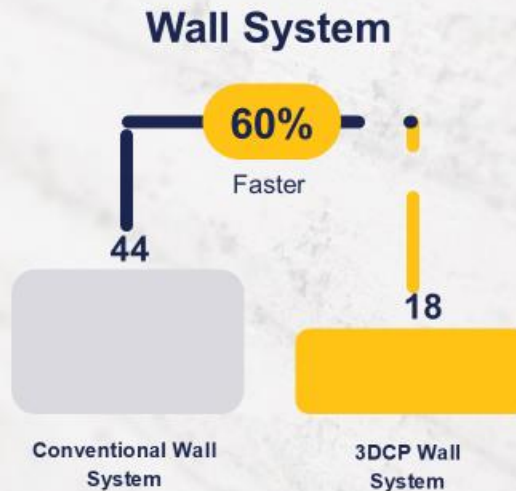
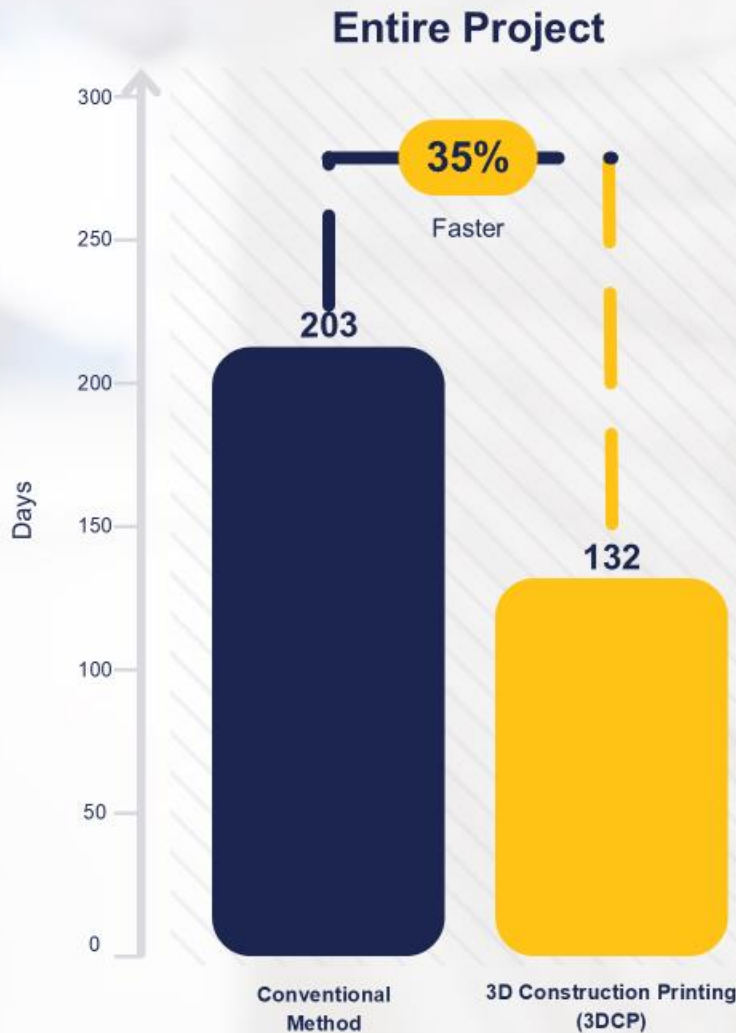
COBOD Connect | 11 September 2025



## GRANGE CLOSE, DUNDALK, CO. LOUTH

Ireland's 1st social housing development

# GRANGE CLOSE METRICS



## Completion Time

132 working days  
(**35% faster** than traditional methods)

## Total Superstructure

**18 days**  
(including set-up and set-down of printer)

330 m<sup>2</sup> over 12 days  
**60%** of time savings

28 Day Compressive Strength:  
**47 MPa**

**Regulations**  
BCaR, Eurocode 6 &  
I.S EN ISO/ASTM 52939:2023  
compliant

Airtightness  
**0.3 ACH**

C30/37  
EN206 RMC

**Lowest embodied carbon mix to save 278 kg CO<sub>2</sub>/m<sup>3</sup>**



# HTL Research & Development

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## HTL's Strategic R&D Innovation Pipeline

### Innovation Metrics

14+ Active R&D Projects | 16+ Research Partners | 3 Patents Pending | 2 EU Horizon Projects

Some of the Research Projects are:

# R&D PROJECTS

| PROJECT                                                                | PARTNER                                                                                                                                                                 | DESCRIPTION                                                                                                                                                            | OBJECTIVE                                                                |
|------------------------------------------------------------------------|-------------------------------------------------------------------------------------------------------------------------------------------------------------------------|------------------------------------------------------------------------------------------------------------------------------------------------------------------------|--------------------------------------------------------------------------|
| <b>Automated Quality Control for 3D Construction Printing (AQUA3D)</b> |       | Development and deployment of data-capturing sensors to automatically log quality control parameters of 3DCP in real-time                                              | Automated data capturing                                                 |
| <b>Fibre Optimisation</b>                                              |       | Investigating the ideal dosage, length, and type of fibres for maximum durability in 3D printable concrete.                                                            | Optimised durability of 3DCP material.                                   |
| <b>Sikatherm</b>                                                       |       | Cementitious foam insulation sprayed during print fills cavities and achieves A2 Fire Rating. Supports circular economy as building can be crushed and reused as C&DW. | Optimised insulation spraying during printing + improved sustainability. |
| <b>Layer and productivity optimisation</b>                             |   | Optimising the rheology of the material to improve print efficiency and productivity.                                                                                  | Increased layer heights to improve project execution timelines.          |
| <b>EcoCEM ACT</b>                                                      |   | Develop & test EcoCEM's ACT material for 3DCP applications in the UK under Flex 360, achieving +/- 70% Carbon Emission Reduction.                                      | Reduce clinker content to improve sustainability.                        |

# R&D PROJECTS (cont.)

| PROJECT                                                                                         | PARTNER                                                                                                                                                                                                                                                                                                                                 | DESCRIPTION                                                                                                                                                            | OBJECTIVE                                                                                |
|-------------------------------------------------------------------------------------------------|-----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|------------------------------------------------------------------------------------------------------------------------------------------------------------------------|------------------------------------------------------------------------------------------|
| Phase 2 Detail                                                                                  |                                                                                                                                                                       | The Phase 2 construction detail is optimised to reduce material use, maximise efficiency, and use thermal mass for heating and cooling moderation.                     | Reduced material use, improved efficiency + utilise thermal mass for climate moderation. |
| Graphene Infused 3DCP                                                                           |                                                                                                                                                                                                                                                        | Incorporating graphene as self-sensing concrete for security, reducing steel reinforcement, costs, and carbon footprint.                                               | Improved sustainability + real-time security applications.                               |
| DIGICRETE                                                                                       |     | AI-based 3DCP platform automates quality control, adapts in real time, and ensures structural integrity, consistency, and productivity.                                | Real-time adjustments to improve print quality and consistency.                          |
| Contracts for Innovation: Resource Efficient Construction Impacts                               |                                                                                                                                                                                                                                                       | TRL 7 demonstration of thin wall leaf for resource efficiency deviating from Eurocode 6. Reducing Carbon emissions by a further 50%.                                   | Reduce material usage and lower embodied carbon                                          |
| Project DAEDALUS. Horizon Europe 2025: Developing upcycling technologies into viable businesses |                                                                                                                                                                                                                                                      | Lead WP of demonstrator - 3DCP of 2-storey house with concrete upcycled from demolition waste supporting Rebuild of Ukraine; backed by Innovate UK Pump Priming grant. | Integration of upcycled concrete into 3DCP material.                                     |

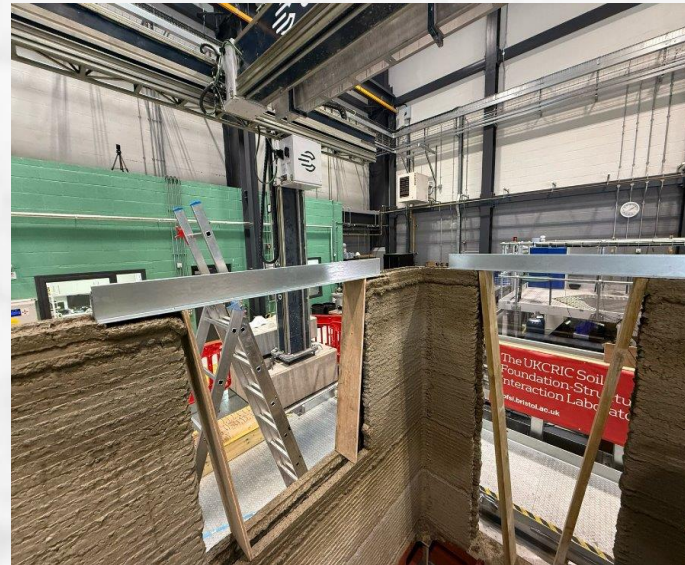
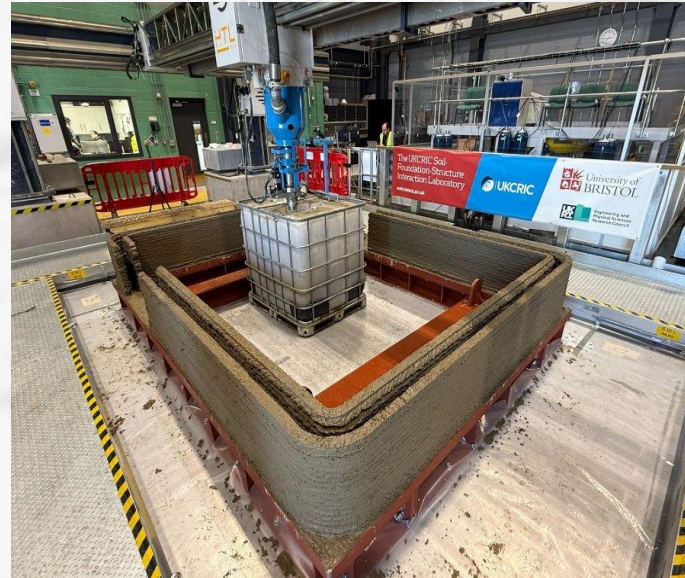
## Seismic Testing – 11 June 2025



# SEISMIC TESTING – Printing Phase



# SEISMIC TESTING – Printing Phase



# SEISMIC TESTING FOR 3DCP STRUCTURES

## Safety & Structural Integrity

- **Validates structural behaviour** under lateral, uplift, and torsional loads.
- **Assesses interlayer bonding** and crack propagation unique to 3D printing.

## Regulatory Approval & Compliance

- Provides **performance data** needed for Eurocode 8 / ACI / ASTM compliance.
- **Accelerates certification** and approval of 3DCP as standard building method.

## Material & Process Validation

- 3DCP uses layered concrete, unlike traditional reinforced concrete.
- Seismic tests show:**
- How **interlayer bonding responds** to seismic loading.
  - Impact of **rounded corners** on structural integrity
  - How **crack propagation differs** from conventional methods.

## Design Optimisation

- Refines wall geometries, reinforcement layouts, and print parameters.
- **Enhances ductility** and **energy dissipation** for earthquake resilience.

# SEISMIC TESTING FOR 3DCP STRUCTURES

- Eurocode 6 construction with no reinforcement and 50% wall thickness (50mm concrete leafs)
- Failure acceleration – 0.87g
- Equivalent to a magnitude 7 + earthquake
- Initial findings indicate that material homogeneity and rounded corners contribute to structural resistance (Data analysis ongoing).
- Results indicate application for low probability/high risk building typologies (inc. Nuclear, Health & Emergency infrastructure)
- Early data analysis indicates that the Grange Close building detail would withstand an 8+ magnitude earthquake.



# HEIGHT-OPTIMISED 3DCP



Increase printable  
layer height from  
**50mm → 75mm**



**Impact: 50% increase**  
in vertical output  
**(up to 1.8m/day)**

## Scope:

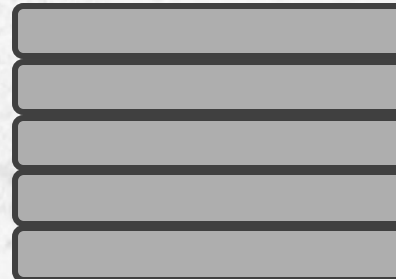
- Lab rheology testing (UCD + Roadstone + HTL)
- Field trials with HTL's COBOD BOD2 at R&D facility
- Mix design optimisation & validation under real site conditions

**Thicker layers allow us to build higher and faster**



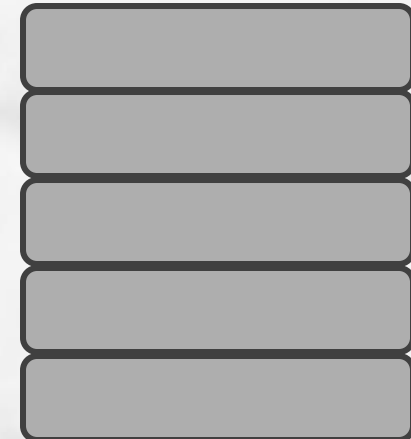
**Now**

**5 layers of 50mm**  
**= 250 mm**



**Future**

**5 layers of 75mm**  
**= 375 mm**



**HTL**  
TECH

# HEIGHT-OPTIMISED 3D CONCRETE PRINTING

## Main objectives:

1. **Increase vertical printing productivity** by up to 50% by printing thicker (higher) concrete layers.
2. **Optimise printable mix designs** using rheological parameters.
3. **Maintain high print speeds** (170-250 mm/s) under site conditions with thicker layers.
4. **Validate compliance** with slump, bond strength, and finish standards.
5. Share outputs with industry to **facilitate rapid scaling of 3DCP in housing**.





# Training

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## QQ1 Level 6 Training

Louth & Meath Education and Training Board

# QQI LEVEL 6 AWARD





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