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Student Design & Sustainability Competition 2027

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The Student Design and Sustainability Competition is run and managed by **The Concrete Centre**.

The Concrete Centre is the central development organisation for the UK cement and concrete industry. Its objective is to assist all those involved in design and construction to realise the full potential of concrete as an adaptable and sustainable construction material.

For more information on The Concrete Centre, visit **www.concretecentre.com.**

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The Student Design and Sustainability Competition is sponsored by **Cordek**.

Cordek provides a range of bespoke and complex formwork solutions for creating architectural features, finishes and shapes in concrete, including the construction of arches, columns, staircases, and ribbed slab soffits.

For more information on Cordek, visit **www.cordek.com**

Introduction

This is a national student competition which encourages students of architecture and the built environment to explore the benefits of designing sustainably with concrete. This year's brief is to submit innovative designs for a climate change resilient seed bank, research and education centre at the Ketton Cement works quarry site in Rutland. The competition is open to students studying at schools of architecture, landscape architecture and the built environment in the UK, and is free to enter.

Essential skills

The competition seeks to raise awareness and skills related to the design, specification and use of concrete, highlighting the sustainability considerations required of the built environment to address climate change.

The ubiquitous and versatile nature of concrete means that most, if not all, architects, designers and building professionals in their practicing life will need to specify concrete in some form in their buildings. There are key design and specification decisions that architects and designers can make to enhance the sustainability of the concrete used in their projects. This competition aims to upskill students, giving them agency to make more informed, responsible and sustainable decisions when designing and specifying concrete in practice.

Benefits for students

- Develop an understanding of ways to design with concrete to improve its sustainability credentials.
- Develop an understanding of the ways in which concrete can enhance a building's performance.
- Gain familiarity with innovation in the manufacture design and construction of concrete.
- A chance to enhance portfolios for prospective employers.
- Develop skills in communication, planning and technical design.
- A chance to win a share of the £3000 prize fund.
- A chance for recognition as a short-listed or runner up entry
- An opportunity to gain national recognition for the design work.

Reading list and learning resources

A suggested reading list and learning resources for students participating in this competition can be found at **www.concretecentre.com/designconcrete**

Front cover image:
California Academy of Sciences Building, San Francisco. Credit: Ali Chehade

This year's challenge…

To design a new climate resilient seed bank, research and education centre at the Heidelberg Ketton Cement works quarry site in Rutland. Further details of the site are detailed on page 5 of this document.

Seedbanks and research centres can play an important role in combatting biodiversity loss and the effects of climate change, both at a local and global scale. The effects of climate change in the UK are already being felt, with the increasing seasonal extremes of flooding, drought, overheating and risk of wildfire effecting communities, agriculture, economy and biodiversity.

The need to consider climate change impacts and prepare for them is recognised as being fundamental to the development of a resilient natural and built environment. The inherent resilience of concrete to the impacts of floods, heat waves and wildfire hazards provides an opportunity to embed effective and passive climate change resilience within our buildings and built environment through simple design choices.

There are no specific size or space requirements stipulated for the competition brief and it is up to students as to whether they create a design for a large or small number of seeds, researchers and visitors. A suggested schedule of areas for small medium and large building options has been provided as a guide by The Concrete Centre at www.concretecentre.com/designconcrete but students are also welcome to work to their own schedule of areas and spaces if desired.

The design must feature concrete as a significant component of the proposal and use the concrete skilfully, sustainably and creatively to provide resilience against flooding, drought, overheating and wildfire. The building must also consider thermal mass and natural ventilation to aid the consistent internal temperatures required for such a facility and reduce the operational energy demands of the building

The key design deliverables which will be assessed by the judging panel are outlined on page 4 of this document.

Image: Mole Architects

Shot-blasted concrete
The Houseboat, Dorset, by Mole Architects

Image: Blue Cube Marine Ltd

Textured concrete
Mumbles Sea Hive, Wales, by Blue Cube Marine Ltd, using Reckli rubber form liners

Image: Concept Shed Ltd

Fabric Formwork
The Root Dome at The Eden Project, Cornwall, by Concept Shed Ltd

GRC cladding panel
Elizabeth Line stations, London, by Grimshaw Architects and Bryden Wood

Image: Graphic Concrete

Surface retardant treated concrete
Pihlajalaakso sound barrier, Finland, by Ramboll and Graphic Concrete

Image: PCE Ltd

Acid-etched concrete
Bromley South Station, London, by TBA

Image: Iwan Baan, as featured in Concrete Quarterly, summer 2023

Sprayed concrete
Richard Gilder Center, New York, by Studio Gang

Image: Block Research Group

3d printed concrete
Striatus bridge, Venice, by Zaha Hadid and Block Research Group

Image: Graeme Massie Architects

Pigmented board marked concrete
Respite Pavillion, Scotland, by Graeme Massie Architects

Key Design Deliverables

Entrant's designs must feature concrete as a significant component of the proposal, demonstrating an understanding of how lower carbon concrete can be used to reduce whole life carbon, provide resilience to climate change and support a more circular economy. The judges will also be looking for design creativity and flair with proposals that exploit concrete's potential for unique forms, pattern, texture and colour. Entrants must also demonstrate their investigation into manufacturing and construction processes of concrete.

Entries will be judged against the following four design deliverables:

Design Deliverable 01 – Sustainability

The concrete structure must demonstrate material efficiency, lower carbon cements, responsibly sourced materials, support of circular economy principles and support of biodiversity.

Hints: *The use of local lower carbon concrete mixes, aggregates, recycled content, lean low-waste forms, and modern methods of construction, together with concrete's potential to provide passive climate change resilience and energy efficiency, are also just some of the ways in which concrete can be used within highly sustainable buildings.*

Find out more about low carbon concretes here:
www.concretecentre.com/lowercarbonconcrete

Design Deliverable 02 – Climate Change Resilience

The design must employ the use of concrete to provide protection and resilience against water ingress, flooding, overheating and wildfire.

Whilst it is expected that that seed bank portion of the proposed building will be mechanically ventilated and temperature controlled, the size and running costs of this equipment can be reduced by harnessing the thermal mass of exposed concrete paired active cooling. The research and education parts of the building must also reduce whole life carbon emissions by adopting a passive cooling approach pairing thermal mass with natural ventilation to regulate internal air temperatures and reduce operational energy demands of the building.

Hints: *Find out about the climate resilience benefits of concrete here:*
www.concretecentre.com/climatechange
www.concretecentre.com/energyefficiency

Design Deliverable 03 – Creativity

The design must demonstrate the entrant's understanding of concrete as a material. The concrete should be designed with imagination, flair, aesthetic appreciation and innovation in mind. Exploration of colour, texture, pattern, shape and form are encouraged.

Hints: *Concrete does not need to be boxy or grey! It offers great scope for achieving a range of textures, forms, colour and pattern. The possibilities are almost endless. Check out The Concrete Centre's case study web page www.concretecentre.com/Casestudies and Concrete Quarterly magazine www.concretecentre.com/CQ for inspiration.*

Design Deliverable 04 – Manufacturing and Construction

The entrants must outline what methods of concrete manufacture and construction they propose would be used for their design or different parts of their design. They must provide critical and reflective written narrative on why they have selected certain methods of manufacture and construction over others. Annotation and narrative should also be provided on the type(s) of formwork that would be used on the project.

Hints: *Understanding the process of making concrete and the materials that are used, either in the factory or on site, is key to exploring concrete's potential. Concrete can be used in many different parts of a building, including foundations, structural frame, walls, cladding, floors, roof and even furniture. It can be cast or sprayed in-situ, using formwork (moulds) or pre-made (precast) in a factory to be assembled on site. The concrete can be made especially for your project or selected from premade elements.*

Buildings often utilise a combination of techniques (hybrid construction).

Other more innovative manufacturing and construction techniques include use of alternative formwork, glass reinforced concrete, rammed or 3D printed concrete. The texture of whatever concrete is poured into will be imprinted into the surface of the concrete.

Conventionally concrete is poured into plywood or steel formwork, but it can also be cast against fabric, rubber, plastic, wax, cardboard, almost anything really provided you can remove the formwork. More often than not, concrete is left 'as struck' straight out of the formwork, but concrete's texture and colour can also be altered after it has been cast. These 'post-finishing' techniques include acid-etching, bush-hammering and grit-blasting to achieve varying degrees of roughness, revealing the colours of the aggregates within.

www.concretecentre.com/materialefficiency

The Site

The location for the project is Ketton Cement works, Rutland.

Ketton Cement works is located on the eastern edge of Rutland, the smallest county in England, on the boundary of the East Midlands and East Anglia – one of the driest areas in the UK. It is a long-established producer of cement in the UK and sits on the edge of the village, which has grown over time, around the work the plant provides.

The site's geology allows limestone to be extracted at source for cement production in phased areas, which are then restored to natural habitats once a section of quarrying operations has ended.

Re-wilding of quarry sites forms a key link in biodiversity in the UK. At the Ketton site, Heidelberg Materials has been working with Cranfield University exploring how seed mix applications can be used to restore biodiverse and resilient grassland, helping to support pollinators, improve soil health and connect wildlife habitats.

Around the site, tree planting has already taken place on a large area to the west (see yellow boundary on Fig.1). The site is home to other well inhabited biodiversity features such as a swift wall, an osprey eyrie and bat 'cave' and a redwood grove. The site has a range of wildlife which inhabits the water, stone and hedgerow landscape. It is also home to a growing population of 228 glow worms!

The intention is to allow public access to the re-wilded areas once established, via the route shown by the green arrow on Fig 1.

Site information

A full pack of site information including scaled drawings and photographs and can be downloaded at:
www.concretecentre.com/designconcrete

The site is currently a working quarry with strict health and safety policy, so is not open to the public. Access is not permitted, under any circumstances.

The site is fairly flat where the ground has been quarried and raises sharply towards the eastern boundary of the site, in a series of terraces, up to the original ground level, with a ramped track wrapping around the southern side of the redline boundary. Along this south-eastern edge, the remarkable site has an open geological seam, showing the natural strata of the ground (shown with an orange boundary on Fig1.). This is to be retained as it is regularly visited by several Universities for study visits.

At the base of the raised perimeter, on the northeastern part of the site, a lake has been formed to aid site drainage, with another 2 shallower bodies of water further west, outside the red line boundary.

Areas of farmland surround the site and in periods of drought that can mean greater risk of wildfires but also surface water flooding when the weather breaks after long spells of dry hot weather.

For the purposes of the Design and Sustainability Competition, the building can be located in any part of red line site area.

Entrants should work with the site features to encourage a link to the landscape but consider the five key climate risks in their design.

https://ukgbc.org/resources/adaptation-for-climate-resilience-non-domestic-buildings/

Fig 1. Aerial view of the site (Google maps) showing the site boundary outlined in red

Fig 2. Photomontage of site, from the northern end looking south-east

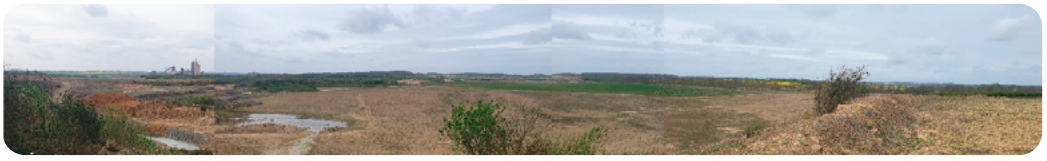


Fig 3. Photomontage of site, from the eastern boundary (upper level) looking west

Fig 4. Photomontage of site, from the eastern boundary (upper level) looking east

Assessment criteria

Design Deliverables checklist

The entries will be judged using the following assessment criteria:

Design Deliverable 01 – Sustainability

- The concrete structure must demonstrate material efficiency, lower carbon cements, responsibly sourced materials, support of circular economy principles and support of biodiversity.

Design Deliverable 02 – Climate Change Resilience

- The design must employ the use of concrete to provide protection and resilience against water ingress, flooding, overheating and wildfire.
- Whilst the seed bank portion may need to be mechanically ventilated, the thermal mass could be used to regulate temperature. The research and education parts of the building must reduce whole life carbon emissions by harnessing the thermal mass of exposed concrete paired with natural ventilation to regulate internal air temperatures and reduce operational energy demands of the building.

Design Deliverable 03 – Creativity

- The design must demonstrate the entrant's understanding of concrete as a material. The concrete should be designed with imagination, flair, aesthetic appreciation and innovation in mind. Exploration of colour, texture, pattern, shape and form are encouraged.

Design Deliverable 04 – Manufacturing and Construction

- The entrants must outline what methods of concrete manufacture and construction they propose would be used for their design or different parts of their design. They must provide critical and reflective written narrative on why they have selected certain methods of manufacture and construction. Annotations and narrative should also be provided on the type(s) of formwork that would be used on the project.

The interpretation of the above criteria by the award judging panel will be final and formal feedback will not be provided.

Eligibility

- Design Concrete is open to undergraduate and postgraduate students enrolled in UK schools of architecture, landscape architecture and the built environment.
- Entries can be single, joint, or from teams of up to four students.
- The competition is aimed at students in their second and third years of undergraduate study or above although alternative course structures are also eligible if agreed in advance.

University submissions

Each university will be asked to select a maximum of three students' work for submission.

Independent submissions

Independent submissions of work from students whose universities are not embedding the competition brief within their course will also be reviewed and considered but only ten such submissions will be shortlisted for judging at the national level alongside university submissions. Entries cannot be entered via both routes. Students submitting independently of their university must provide proof of an active university email address.

Submission stages

Step 1 – Registration

3rd July 2026 - 30th January 2027

Universities and independent students should register their interest to enter the competition by filling in the online form at **www.concretecentre.com/designconcrete** by 30th January 2027.

Once registered, each university will be provided with three unique finalist entry reference numbers to be included on their submissions along with instructions as to where the final submissions should be uploaded. Each independent student (i.e. those not at a university running the competition in their course) will receive their unique entry reference number and instructions on how to submit directly once registered.

Step 2 – Submission

Deadline: 9th April 2027

Each university/student is to upload their anonymous submissions and separate contact details forms to the online storage platform provided by The Concrete Centre. For team submissions, the contact details for every student involved in each submission must be provided. Submissions can be uploaded at any time during the competition period but must be uploaded before 5pm on 9th April 2027.

Submission requirements

A maximum of three A1 digital presentation boards are permitted for each student/team submission. The competition entries should be submitted as digital PDF files. It is essential that all submissions are anonymous from both a student and university perspective. Each entrant's unique entry reference number should be clearly marked on all boards forming the design entry. No other form of identification or distinguishing mark should appear on any part, or file name of the submission.

Presentation boards should visually communicate the design, sustainability proposals and the supporting ideas in a persuasive and descriptive way.

Entrant's designs must feature concrete as a significant component of the proposal. This should include the following as a minimum:

Scaled drawings

Scaled, annotated drawings should be included in the student's submission. Drawings may be prepared using appropriate CAD software, or by hand. In either case, notes and dimensions should not be smaller than the equivalent of an 11pt font when printed at A1.

Drawings must be to an appropriate scale. The drawings should show the following:

i. Site plan.

ii. General arrangement floor plans of all levels.

iii. Section(s) through the proposed design showing relationship to site context, methods of inhabitation and scales of space.

iv. Elevations of the proposed design showing its form shape and materiality in relation to the existing context.

v. Construction detail(s) showing interconnection of concrete building elements with themselves and with the surrounding context.

vi. A timeline series of section drawings showing the proposal during construction, 5 years after completion and 50 years after completion.

Models and views

Images of 3d modelling (either digital or physical) should be included on the student's submission boards. All 3d modelling must show the design proposal accurately located to scale in its surrounding context. 3d images should convey the unique atmosphere, character and inhabitation of the spaces and places being created by and within the design proposals.

Students are also encouraged to include referenced and annotated precedent images of existing concrete to illustrate inspiration of form, texture and colour and construction.

Awards

A shortlist of entries will be selected, from which the winners of the national competition will be chosen. Every winning and shortlisted student will receive a signed certificate and each prize winning university will receive a signed certificate.

A prize fund of £1500 is available for each of the undergraduate and postgraduate student categories. The judges reserve the right to award joint winners or a series of prizes in each category, in which case the awarded funds will be divided at the judging panels' discretion.

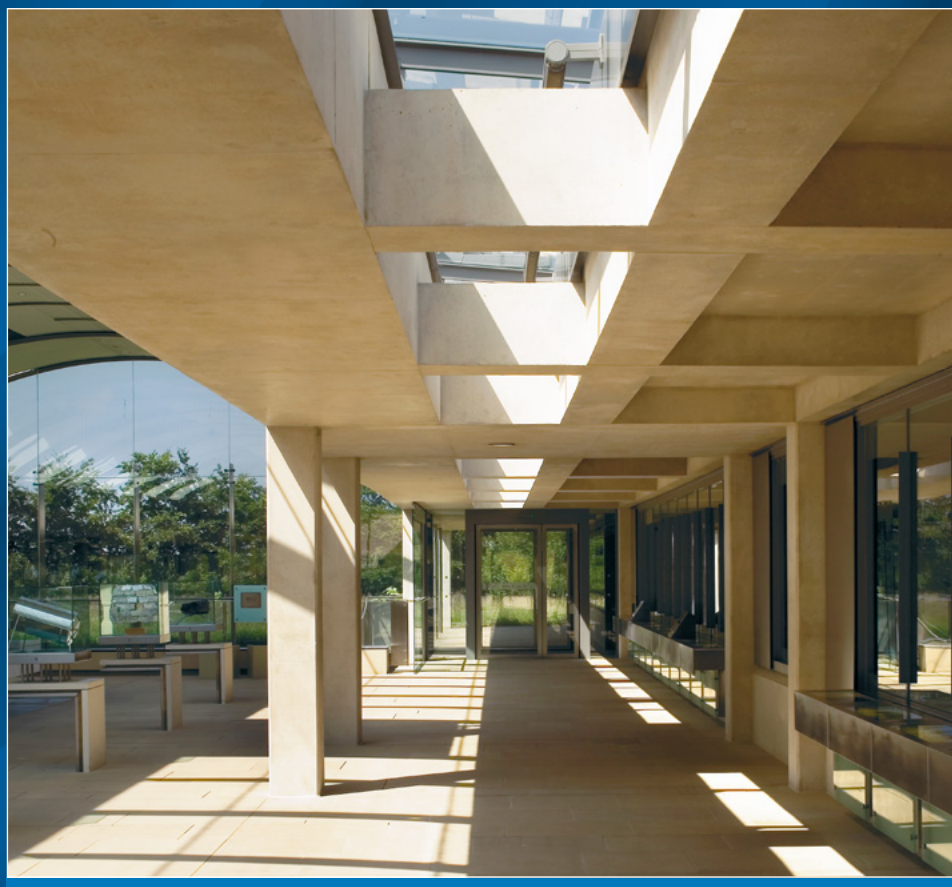
Presentation

The prizes and certificates will be presented at an event organised by The Concrete Centre. The prize winners and tutors will be notified of further details regarding date and location in advance. Extracts from the winning and shortlisted entries will also be exhibited and publicised on The Concrete Centre's social media platforms and website along with credits.

Rules

1. Complete design entries must be received by the final deadline of 5pm on the 9th April 2027. Late or incomplete submissions will not be accepted.
2. Each student will be allocated a unique entry reference number which should be clearly marked on all pages forming the design entry. **No other form of identification or distinguishing mark should appear on the boards or any part or file names.**
3. A successful competitor must be able to satisfy the judges that he or she is the bona fide author of the design that he or she has submitted.
4. Competitors should retain the originals of the designs and drawings submitted.
5. Any entry may be excluded from the competition if:
   - The competitor does not meet the eligibility requirements.
   - The entry is received after the competition closing date.
   - The competitor discloses his or her identity in the submission.
   - The entry does not comply with all of the submission requirements.
   - The competitor attempts to influence either directly or indirectly the decision of the award judging panel.
   - The entry does not use concrete as a significant component of the proposal or sufficiently meet design deliverables 1, 2, 3 and 4.

Millenium Seedbank, West Sussex.
Courtesy of Stanton Williams.



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The Concrete Centre is part of the Mineral Products Association, the trade association for the aggregates, asphalt, cement, concrete, dimension stone, lime, mortar and industrial sand industries.

www.mineralproducts.org

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Cordek provides a range of bespoke and complex formwork solutions for creating architectural features, finishes and shapes in concrete, including the construction of arches, columns, staircases, and ribbed slab soffits. Innovative thinking, engineering expertise, and state-of-the-art manufacturing equipment, enable Cordek to solve a wide range of engineering and complex formwork problems. Cordek is committed to supplying the best quality, value solutions, which are supported by the highest levels of personal service.

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