**Structural engineering**

Addressing the civil engineering challenges associated with construction materials, structural analysis, and extreme events and structural resilience.

This area involves understanding and addressing the civil engineering challenges associated with three core areas: construction materials, structural analysis, and extreme events and structural resilience.

Within these core areas, topics covered include:

* sustainable development of novel cement, concrete, steel and composites
* structural health monitoring
* sensor technology
* modelling and validation of structural measurements
* structural design
* structure performance under wind loads, earthquakes, fires and tsunamis
* recovery of structures after the events
* blast and impact assessment.

This area makes a key contribution to the UK construction sector. As well as exploring the requirements of early career researchers (ECRs), research areas will be characterised by the following core themes.

### Sustainability

In particular, reducing carbon dioxide emissions by using green construction materials and improved design of structures using less material. We will encourage interdisciplinary projects extending to research areas such as [materials engineering](https://www.ukri.org/our-work/browse-our-areas-of-investment-and-support/materials-engineering-composites/) and [built environment](https://www.ukri.org/our-work/browse-our-areas-of-investment-and-support/built-environment/), spanning both engineering and chemistry aspects.

### Resilient infrastructure

Researchers should investigate new methods for preventing damage, repairing ageing infrastructure and longer-life design. The community should continue to address challenges associated with structural resilience to hazards. This should incorporate multidisciplinary thinking, for example multi-scale approaches integrating all communities involved in designing, building, operating and using structures. Researchers should also seek to understand ways to minimise economic losses.

### Digital technologies

Collaboration with IT-based research areas will maximise recent growth in sensor technologies. Focusing on the use of digital technologies within [structural engineering](https://www.ukri.org/our-work/browse-our-areas-of-investment-and-support/structural-engineering/) will increase development of smart infrastructure and monitoring capabilities.

### Links with other research areas

This area is strongly linked to the [ground engineering](https://www.ukri.org/our-work/browse-our-areas-of-investment-and-support/ground-engineering/) and [built environment](https://www.ukri.org/our-work/browse-our-areas-of-investment-and-support/built-environment/) research areas, especially in an infrastructure context. We encourage researchers to place their research in the context of the wider system, address common challenges and improve translation to the construction sector.

Researchers should work to maximise the impact of the investment in the [UK Collaboratorium for Research in Infrastructure and Cities](https://www.ukcric.com/), and capitalise on the potential for UK leadership further strengthened by this investment.

We will work with the community to understand and address, where possible, any leadership or related skills challenges, particularly in relation to ECRs. We will address this alongside similar needs facing the built environment, infrastructure and urban systems, and ground engineering research areas.

This is an established area of research characterised by a number of world-leading investments, with the construction sector contributing nearly 7% gross value added to the UK economy. However, the rapid change towards a digital economy threatens to leave the UK behind if no action is taken. Further threats include continuing urbanisation, limited resources, climate change and population growth. There has to be increased focus on research in sustainability, infrastructure resilience and digital technologies.

These topics will remain of significant national importance and play a major role in addressing some of the fundamental challenges found in improving structural design and incorporating new materials. The [Construction 2025 strategy](https://www.gov.uk/government/publications/construction-2025-strategy) set targets to reduce carbon emissions through novel construction materials and improved structural design.

Climate change will affect structures in ways not yet fully understood and research into structures’ resilience will bring advanced solutions. UK-based consultancies and contractor firms need novel innovation to maintain competitive advantages. Infrastructure asset owners will depend on research in all facets of civil engineering to keep networks in optimum condition.

### Partnering with industry

Four-fifths of all construction-related science and engineering projects supported by EPSRC are delivered alongside industry partners. The Construction 2025 strategy, though, identified limited uptake of research by industry. It recommended that knowledge developed in the research community be made more visible in the wider construction industry.

### Facilities

Structural engineering has a highly distributed research capacity across the UK, with multiple centres on structural analysis and health monitoring, materials and resilience. In addition, the UKCRIC will build up major structural engineering laboratories across the UK.

### Skills provision

Two centres for doctoral training directly align to the priorities of this research area, with a further four overlapping with other civil engineering areas. There has been a gradual increase in overall student numbers associated with this area that are supported through the Doctoral Training Partnership and Industrial Collaborative Awards in Science and Engineering.

There is strong overlap with student training in the associated civil engineering research areas such as [built environment](https://www.ukri.org/our-work/browse-our-areas-of-investment-and-support/built-environment/), [infrastructure and urban systems](https://www.ukri.org/our-work/browse-our-areas-of-investment-and-support/infrastructure-and-urban-systems/), and [ground engineering](https://www.ukri.org/our-work/browse-our-areas-of-investment-and-support/ground-engineering/). Skills provision is key to the wider construction sector.

This research area has a low number of early career researchers funded by EPSRC, in terms of first grants and early career fellows, with overall funded ECRs falling. This trend is reflected in other areas related to civil engineering.