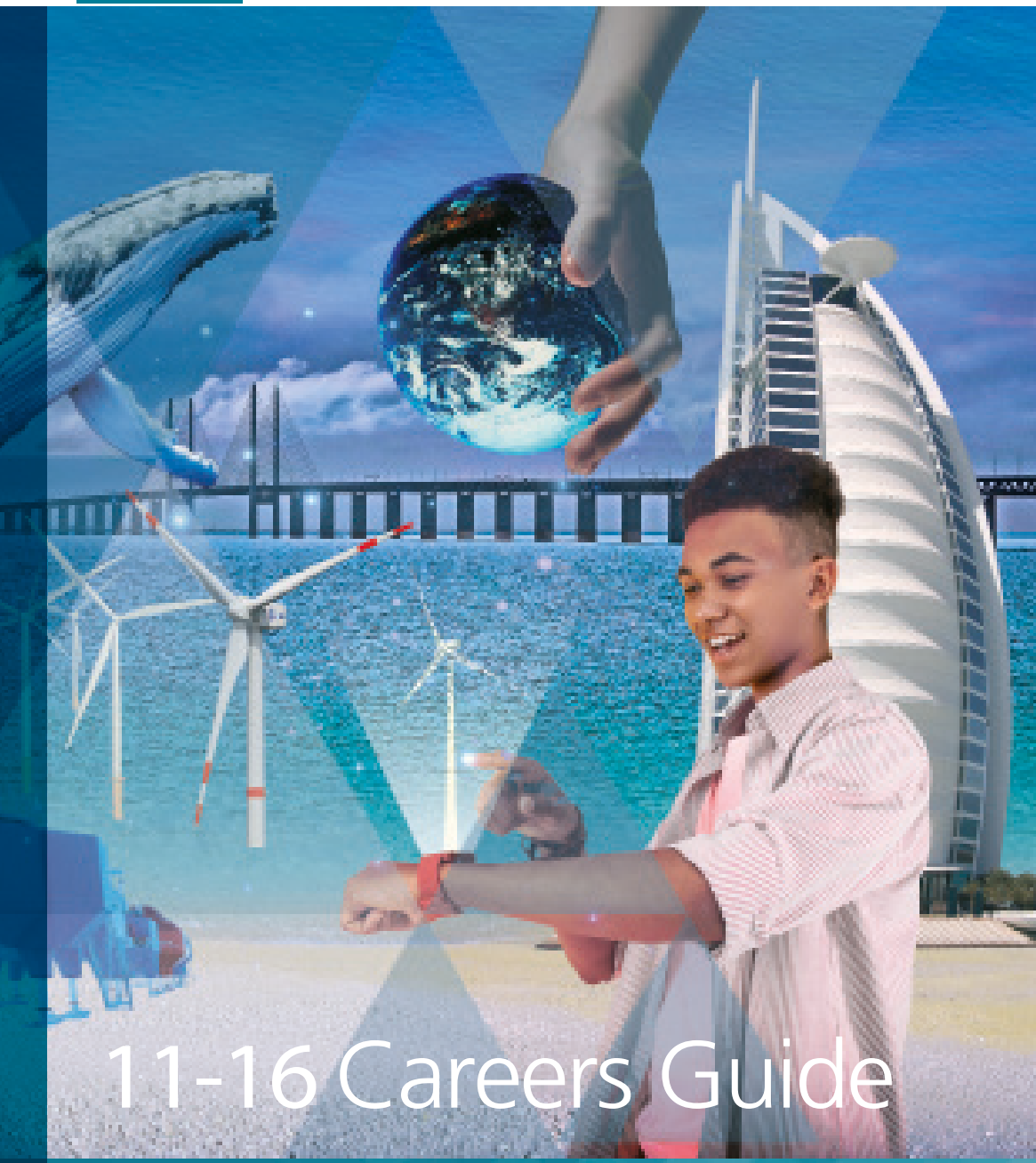
ice
Institution of Civil Engineers

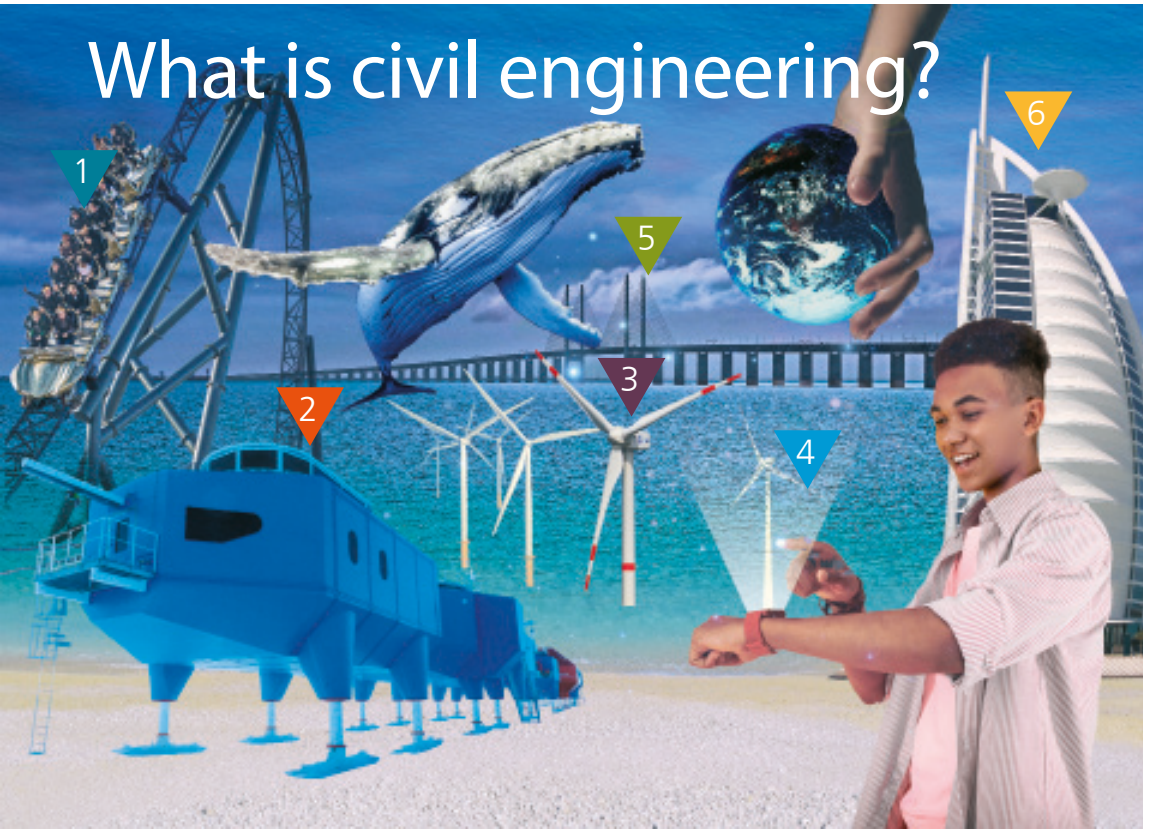
Civil Engineers Shaping the World



11-16 Careers Guide

ICE-inspire.co.uk

What is civil engineering?



Civil engineering is the art of planning and building the world we live in. In other words: roads, buildings, wind turbines, bridges, railways, airports, tunnels, flood defences and much much more.

Civil engineers shape our world and transform lives by designing and building safe structures and providing essential life-giving services. They also tackle global environmental problems like climate change and pollution and take part in disaster relief efforts.

1 ICON rollercoaster

Designing the world's most interactive rollercoaster was a complex engineering feat. See pages 4-5.

2 Halley VI Antarctic Research Station

A moveable base sheltering scientists and researchers from extreme polar weather. See pages 6-7.

3 Whales and wind turbines

Engineers took inspiration from the shape of a whale's flipper to design effective wind turbine blades.

4 Virtual Reality (VR)

VR is used by civil engineers to check their designs, as well as for the gaming and entertainment you might be familiar with.

5 Oresund Bridge

The world's longest cable-stayed bridge connects Denmark and Sweden. See pages 8-9.

6 Burj Al Arab

This iconic hotel in Dubai sits on an artificial island – both designed and built by civil engineers.

Civil engineers designed and built...

ICON rollercoaster

Blackpool, UK

A complex engineering feat to create a thrilling but safe new ride on a busy site.

ICON is the UK's first double launch rollercoaster. It accelerates at 0-80km/h in 2.25 seconds before reaching heights of nearly 27m at speeds of up to 85km/h.

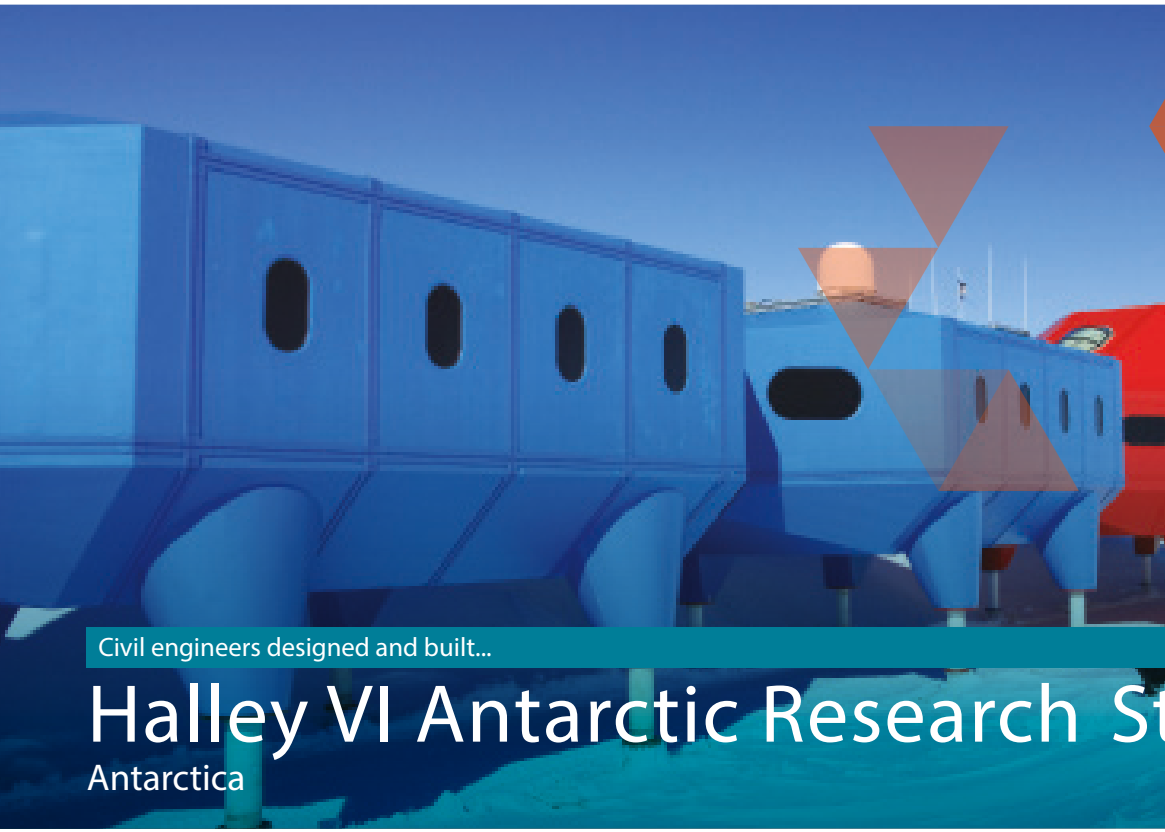
The ride interacts closely with other rides and attractions 15 times during its high-speed journey across the Blackpool Pleasure Beach park – making it the world's most interactive.

Engineers designed the complex supporting structure using a digital 3D Building Information Model (BIM), to bring together the separate track, ground structures and ride safety envelope (the clearance area around the ride vehicle), and the structure of the nearby rides with which ICON interacts.

Engineers dug a deep cutting so that the two electromagnetic launches could pass side-by-side in an underground, smoke-obscured passage to create an awe-inspiring opening sequence to the ride.

Engineers had to make changes to other rides to create ICON's complex path that weaves between and through The Steeplechase, Big Dipper, Avalanche and others.

Find out more: ice.org.uk/icon-rollercoaster



Civil engineers designed and built...

Halley VI Antarctic Research St

Antarctica

An Antarctic research base that can be easily moved when the ice breaks.

Antarctica is a unique and unspoilt environment, ideal for studying many earth sciences – including ecology, biodiversity and climate change.

The previous five Halley bases had to be dismantled or abandoned when moving ice threatened them but Halley VI has skis attached to each leg to allow it to be dragged to another location when needed. The legs of the base also lift hydraulically - to prevent it being buried by the 1.5m of snow which falls every year. The eight living and working modules are made from steel clad in highly insulated fibreglass panels.

The base has a small environmental footprint, meaning that the presence and work of the researchers doesn't pollute the pristine environment which is home to emperor penguins, weddell seals and many species of whales and seabirds.

Station

Halley VI can withstand extreme temperatures of -56C and winds up to 100mph.

Construction of the base could only happen in the summer months – about 12 weeks a year – so the build took 4 years!

Find out more: ice.org.uk/halley-vi

Images courtesy of AECOM

Civil engineers designed and built...

Oresund Bridge

Denmark - Sweden

A crossing connecting the Danish capital Copenhagen and the city of Malmö in Sweden – part of the Øresund fixed link.

The link is made up of an 8km-long bridge, a 4km underwater tunnel and 4km of an island which engineers have reclaimed from the sea. The bridge is the world's longest cable-stayed bridge and carries both a road and a railway on stacked decks.

Engineers chose a tunnel for part of the crossing to make sure radio signals from nearby Copenhagen Airport weren't disrupted. It also means ice floes won't build up to block the strait in winter so it stays clear for shipping.

The bridge has made it much easier for people and goods to move – what used to be a one-hour ferry trip was replaced by a 10-minute high-speed rail journey.

The bridge is constructed as a 490m-long curving span with two side spans of 160m and 141m.

Most of the bridge parts were made on the mainland and then floated out to the construction site for assembly.

Find out more: ice.org.uk/oresund-bridge

Images courtesy of BCIA

Could you be a civil engineer?

If you like designing or building, solving problems or improving people's lives then you'd enjoy a career in civil engineering!

GSCE / Scottish National level

The best subject to choose is Physics and you'll need Maths too. A good maths grade will help you secure an apprenticeship.

Other useful subjects for civil engineering include Geography, Art and Design, Design Technology, Computing, English and some specialist courses such as the Design Engineer Construct! programme.

A Level / Scottish Highers level

Maths is needed to get onto nearly all civil engineering degree courses.

Physics is also asked for by many universities.

Top career facts

SALARY The average start salary for UK civil engineers is around £30,000, rising to around £70,000 for experienced engineers and over £100,000 for those at the top of the profession. Professional qualification with an institution like ICE can help you earn more.

INTERNATIONAL Civil engineers' skills are also in demand across the world and many get the chance to travel to and work in exciting places.

OPPORTUNITIES Studying to become a civil engineer can open doors to other careers: it keeps your options open!

WELLBEING Civil engineering regularly features in polls of the top happiest jobs!

DEVELOPMENT It's a career which has clear routes through study and qualification.

STATUS Qualified engineers have a high status similar to doctors and lawyers.

EMPLOYMENT The UK needs lots more civil engineers in the near future.

Find out more: **ice.org.uk/wice**

Real-life civil engineers: shaping the world

Ayo Sokale

Graduate Civil Engineer,
The Environment Agency

I got interested in engineering as a child when I saw how engineers had transformed the lives of a community in Nigeria.

One of the best things about being a civil engineer is the variety. Some days I'm in the office writing a business case, or organising planning and the next I'll be on-site speaking with contractors or surveying.

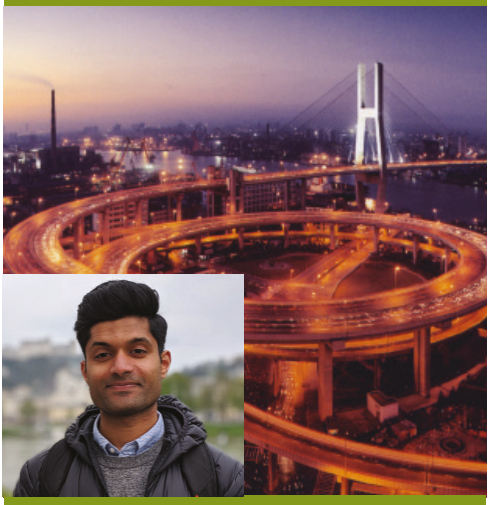
My favourite part of the job is helping people - for example, protecting families from flooding.

ice.org.uk/ayo-sokale

Kishore Ramdeen

Graduate Civil Engineer,
Highways England

I originally thought that civil engineering was just about buildings and doing complex maths. But it's so much more. It's about communication, working together, building businesses, creating new forms of transport and fighting climate change. There is some maths (not my best subject), but it's achievable and hasn't held me back! My work involves planning and building road systems and motorway structures. It's great because it's both challenging and rewarding. It's also one of the very few jobs where your work will be there for decades into the future!



ice.org.uk/kishore-ramdeen

Civil engineers can be designers, technicians, managers, researchers or consultants and work in a whole range of specialisms – like tunnelling, structures or environmental.

Lauren Cunningham

Undergraduate Highways Engineer, WSP

I didn't originally enjoy STEM subjects but an after-school club changed my mind – so much so that I opted for a Design Engineer Construct GCSE level qualification. My day-to-day job varies but mostly I'm using design software – working on aspects of multi-million-pound projects. I really enjoy problem-solving in my job. I've worked on a huge variety of projects already, including Britain's longest road (A1). I achieved my NVQ and qualified EngTech status aged only 18 and now I'm studying for a civil engineering degree on day release.

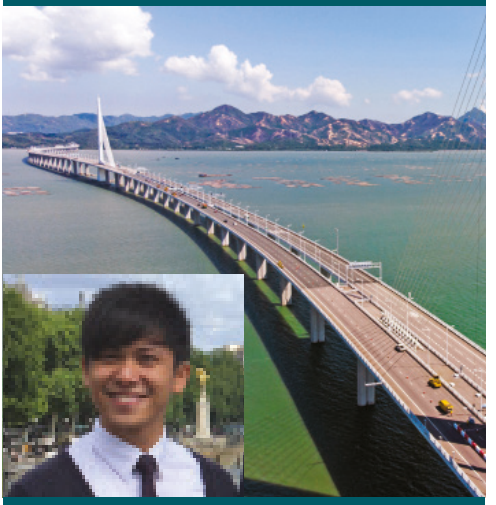
ice.org.uk/lauren-cunningham

Eric S. W. Leung

Assistant Resident Engineer, AECOM, Hong Kong

One of my first jobs was the detailed design of the 1.8km Cross Bay Link Bridge in Hong Kong. This landmark structure serves a million residents, myself included, and will significantly improve traffic flow.

I'm excited about what civil engineering will do in the future to transform lives. We're using smart technology to build sustainable cities and address the biggest global environmental issues – it makes me proud to be part of that.



ice.org.uk/eric-leung

How do I become a civil engineer?

There are many different routes you can take.

A vocational course (such as BTEC or HND) combines study with 'hands on' experience and can give you a fast-track to qualified Engineering Technician status. If you get taken on as an apprentice by a company you'll get paid as well as be given time off each week to learn. It's possible to progress from this role to become a civil engineer with enough job experience.

Studying at university can give you a fast-track route to Chartered Engineer status and the top jobs in the profession.

There are more ways to study and enter industry than ever before – including starting while still at school (foundation apprenticeships) and working and getting a degree at the same time (degree or graduate apprenticeships).

Find out more: ice.org.uk/wice

Financial support

Apply for funding to help you study civil engineering at either university or a vocational course through the ICE QUEST fund.

- QUEST Undergraduate Scholarships ≤£8,000
- QUEST Technician Scholarships ≤£1,000

Find out more: ice.org.uk/quest

Free student membership

When you begin studying civil engineering you can sign up for free student membership of ICE.

You get lots of great benefits like career advice and resources to help you learn about the industry.

Find out more: ice.org.uk/student

What next?

Be inspired by amazing people and projects, play CityZen Pollution Control and much more in our virtual civil engineering careers centre:
ICE-inspire.co.uk

Follow our social media accounts on Twitter, Instagram or Youtube:
@ICE_schools
@ICE_engineers
Institution of Civil Engineers

Research our scholarships giving financial awards to study:
ice.org.uk/quest

Ask a question or invite an ICE STEM Ambassador to your school or college:
careers@ice.org.uk

Research all types of engineering careers:
neonfutures.org.uk

V2 October 2022

ice
Institution of Civil Engineers