

16-18 Careers Guide



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.

Civil engineers are problem-solvers. New technologies are an important part of working as a civil engineer. For example:

- Computer Aided Design (CAD)
- Augmented and virtual reality (AR and VR)
- Drones and satellite technology to measure and photograph structures
- Designing and testing new materials e.g. self-healing concrete



1

The High Line

This innovative park in the heart of New York is a haven for wildlife and city dwellers. See pages 4-5.



2

Kingfisher and Bullet Train

The front of the high-speed Japanese Shinkansen train was redesigned to mimic the shape of a Kingfisher's aerodynamic beak.



3

ArtScience Museum

A stunning modern and eco-friendly building which houses cutting-edge exhibitions. See pages 6-7.



4

Virtual Reality (VR)

Civil engineers use virtual reality to assess their designs for flaws and potential improvements.



5

Forth Rail Bridge

This iconic bridge is one of three vital crossings across the river Forth built between 1890 and 2017. See pages 8-9.



6

Burj Khalifa

The tallest building in the world, it helped to move Dubai's economy away from being reliant on oil to tourism.



Civil engineers designed and built...

High Line

New York, USA

An abandoned raised railway line turned into a park.

Engineers faced many challenges constructing the High Line – almost every aspect of creating a typical park is different when you’re building it up to 9m above ground-level!

The park has a ‘keep it wild’ planting scheme and as they sit on a man-made floor – like a green roof – the varieties chosen are easy to look after (although there is also a built-in watering system).

Many steel rails and other original features were used to reduce costs as well as environmental impact, including a playground built of parts of the original structure covered with a special rubber coating to create a comfortable play surface.

The park is 2.3km long and located on Manhattan's West Side.



It has become the most popular tourist attraction in New York – 8 million people visit every year and it's encouraged a massive regeneration of the city.

Find out more: ice.org.uk/high-line



A low-angle photograph of the ArtScience Museum's iconic 'fingers' reaching towards a bright blue sky. The building's curved, metallic surfaces are highlighted by the sun, creating a dramatic play of light and shadow. A large, stylized blue 'X' graphic is overlaid on the right side of the image.

Civil engineers designed and built...

ArtScience Museum

Marina Bay, Singapore

This spectacular building is part of the Marina Bay Sands complex, built on land reclaimed by the sea, next to the famous Bay Gardens.

The construction has a circular core around which radiate ten 'fingers' housing different galleries. Each 'finger' gallery space has a large window at the end allowing a lot of natural light to illuminate the curved spaces within.

The ArtScience Museum conceived by architect Moshe Safdie and designed by engineering company Arup has 21 gallery spaces with a total area of 6,000 square metres. The diverse exhibitions focus on connecting art and science through digital technologies and allowing young people to explore the real and digital world. in new ways.

The building's eco-friendly credentials include harvesting rainwater for domestic use which is channelled through the bowl-like roof, falling in a spectacular waterfall into a central pond.



The museum has its air conditioning built into the floor to help save energy – by lowering the temperature at the visitor's height, rather than trying to cool the entire space.

Find out more: ice.org.uk/artscience-museum





Civil engineers designed and built...

Forth crossings

Scotland, UK

The bridges across the downstream River Forth have been a vital part of national infrastructure – providing transport links for people and important industries – for 130 years.

The iconic 2,467m long Forth Rail Bridge is a cantilever structure completed in 1890 and is still used by 200 trains a day. It was awarded UNESCO World Heritage site status in 2015.

The first road bridge was built in 1964, replacing a ferry service. A new bridge - the Queensferry Crossing - was built in 2017 to provide more road capacity. Traffic across the two road bridges is managed strategically with heavy vehicles and most car traffic directed across the newer crossing, and buses, bicycles and motorbikes mostly using the old crossing.

The Queensferry Crossing is the longest three-tower, cable-stayed bridge in the world.



The Forth Road Bridge is a 2,500m long suspension bridge. It previously carried 70,000 vehicles - including 7,000 HGVs - and 100,000 people a day.

Find out more: ice.org.uk/forth-crossings



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!

To become a civil engineer you'll need to choose the right subjects at school or college. Check the requirements for any courses you're interested in, as they can vary a lot.

Maths at A level or Scottish Highers is needed to get onto nearly all civil engineering degree courses. A good grade at GCSE or equivalent will help you secure an apprenticeship.

Physics at A level or Scottish Highers is also asked for by many universities.

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.

Top career facts

SALARY The average start salary for UK civil engineers is around £30,000, rising to around £70,00 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 an 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.

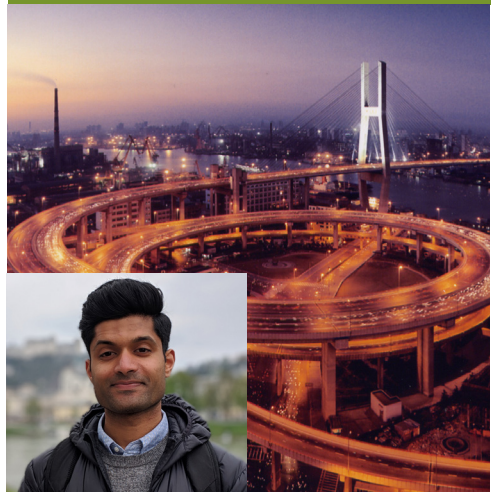


ice.org.uk/ayso-sokale

Kishore Ramdeen

Graduate Civil Engineer,
Highways England

I originally thought that civil engineering was just buildings and doing complex maths. But it's so much more - like communication, working together, building businesses, creating new forms of transport and fighting climate change. There is maths (not my best subject), but it's achievable and hasn't held me back! I plan and build 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/question

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](https://ice-inspire.co.uk)

Follow our social media accounts on Instagram, YouTube or Twitter:



@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

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