

A TO Z OF ENGINEERING

WORKSHOP 3: Structures

Welcome to Engineer Academy where we're exploring an A to Z of Engineering – everything from acoustics to zoos!

So what does engineering actually mean? Well, anything that is built – whether a bridge, building, washing machine and even your smartphone, must first be engineered.

An engineer is a person who designs and builds complex products, machines, systems or structures. They want to know how and why things work, and have scientific training that they use to make practical things. Engineers often specialise in a specific branch of engineering, such as civil, electrical, mechanical and chemical engineering. You can think of engineers as problem solvers – so if you like solving puzzles you might make a great engineer!

Some of the different types of engineers you will come across are...

Heritage Engineering: Historic buildings structures and even vehicles are part of our heritage. Specialist engineers are expert in conserving, repairing and sustainably maintaining these things so we can continue to enjoy them.

Ventilation Engineering is all about the air that moves through the spaces we live in. It is important to keep us warm, or cool, or to remove impurities from the air which could make us ill.



Royal Academy
of Engineering

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Find out more at www.funkidslive.com/engineer

Engineering through the Ages ✨

From the first tools to high speed trains, from kettles on a hob to drones, engineering has been a big part of human history for thousands of years.

Today's engineers use the most advanced technologies, alongside established scientific principles, to apply cutting edge solutions and innovation to real world challenges.

One of the most exciting types of engineers is all about creating things on a SUPER scale to help get out, about and around – and not worry about things that might be in the way!

T is for Tunnels ✨

Tunnels are brilliant for going through or under things – from mountains to the sea! There are two basic types of tunnel construction.

Cut-and-cover where tunnels are constructed by digging out a trench, and then covering it over. Modern technics are used to create green tunnels that cause less harm to the their environment and are more sustainable.

Bored tunnels – not boring tunnels! – are tunnels which are constructed using tunnel boring machines – the technical version of a giant mole! They're a lot deeper than cut-and-cover tunnels and more suitable when you want to be dry.

Tunnel engineering is a specialised subset of civil engineering, and tunnel engineers need to have a deep understanding of different types of soils and rocks, how different grounds behave and the interaction between the ground and structure built inside!



B is for Bridges ✨

Bridges are brilliant to going across wide valleys and across rivers!

You'll find bridges pretty much everywhere – some are massive structures that span valleys and motorways, others are smaller to help us cross rivers and railway lines. They can be made from many different materials – from wood and stone to metal and concrete.

Did you know there's over 75,000 bridges across the UK – some of which date back to when the Romans lived here.

The longest bridge is the Bromford Viaduct which carries the M6 motorway along the River Tame valley – it's a whopping 3.5 miles long. Now, whilst bridges come in all shapes and sizes, there's actually only a handful of different styles – from Arch, Beam and Cantilever to Suspension and Truss.

Academy Challenge

Step 1: Using plain paper (or even better used paper that can be recycled), scissors and sticky tape make the **TALLEST** structure you can.

Some ideas you might like to use:

- Folding the paper
- Rolling and sticking the paper into cylinders
- Twisting the paper

Step 2: With the same materials make the **STRONGEST** structure you can – can it support a tin of baked beans – or maybe 2, 3 or more?!

Wordsearch

C D W B E U J E Z K N C G J I A Z R
S E W R H Y T U N N E L S E Y B V Z
A M S P E S U S P E N S I O N O V A
L O O A M C A N T I L E V E R R M R
A L L X D I K X P F T E X Z L I Q C
U I D W Y Q B I G A F G Q U T N R H
T T Q Q X T D E N R U F M H P G I U
R I X B U Y O F J G B C D A X D M L
U O L R V B F R H G B H W H S W S X
S N X B Z G O U C N Z A B E A M M U
S E V F N O K J B H Y D L A N D D V
Z J R E X P L O S I V E S L K L M T

**Can you find
these words?**

Arch
Beam
Cantilever
Suspension
Truss

Tunnels
Boring
Demolition
Wrecking Ball
Explosives
Oxytorch

Did you know... Over half of the HS2 route between London and the West Midlands will be in tunnels or cuttings. They are using 10 giant tunnel boring machines –self-contained underground factories up to 170m in length and weighing 2,000 tonnes – the equivalent of 340 African bush elephants, to dig 103 kms of tunnels at depths of up to 90 metres. In total, 130 million tonnes of earth will be excavated – that’s enough to fill 15 Wembley Stadiums!