

The **Institution**
of **Structural**
Engineers

Bridges in a Modern World

Activity pack for 14-16 year-olds

Bridges in a Modern World

A key role of structural engineers to provide safe designs for buildings and bridges in our world, and therefore you now have the opportunity to design your very own bridge. The best structures transfer load safely and efficiently through the structure to the foundations using the minimal amount of materials. Your task as a structural engineer is to design and construct a model paper bridge that spans between two towers formed from spaghetti and jelly babies. Your structure will then be tested to ultimate failure.

Activity Materials List

Each group will need:

- 500g uncooked spaghetti
- 4 x A4 sheets of paper
- 2 x pencils
- 1 x 1m sticky tape
- 1 x 190-250g pack of jelly babies
- 1 x 30cm ruler
- 1 x carrier bag
- 1 x pair of scissors

Testing equipment needed:

- Weights for loading the carrier bag
(This could be everyday items such as an apple or our favourite...chocolate bars!)

Inspirational Bridges

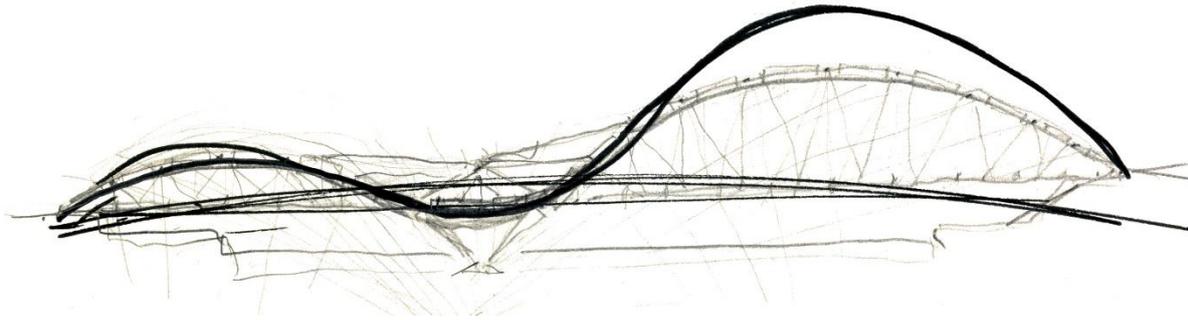
Check out the bridges below for some inspiration for your bridge design - they're all award winning bridges!



Activity Instructions

Planning stage: 10 minutes

This is the time to read through *all* the instructions and then plan out your structure. Think about how the forces will flow through to the foundations, and how the bridge will bend and deflect under load. You should spend some time coming up with ideas on how you will construct the towers and bridge. Try discussing ideas with your peers and communicating these with one another through simple sketches, using the pencils and paper provided.

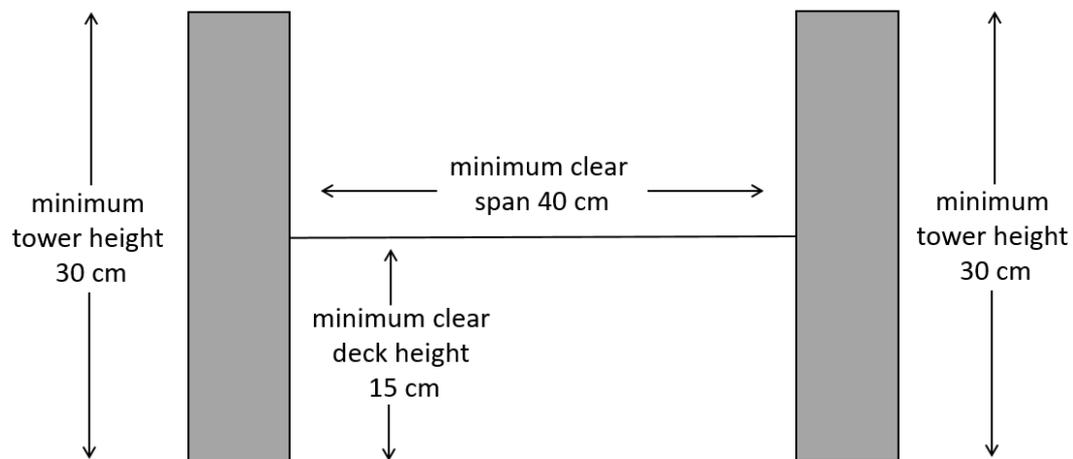


Construction stage: 30 minutes

Prepare the towers:

The towers should be at least 30 cm in height and will be constructed from the jelly babies and spaghetti only. Their purpose is to support the paper bridge deck, which must be raised at least 15 cm above the tower bases.

Tip: Triangles make for some of the strongest shapes that we know!



Prepare the bridge deck:

The paper bridge deck – constructed from the paper and sticky tape provided - will need to span at least 40 cm between towers, and support the carrier bag loading rig at its mid-point. This will be used during the testing stage to determine how strong your bridge is.

Tip: Stiffness is key here; so make sure your designs include a strong paper deck

Test your structure as a class: 20 minutes

The carrier bag loading bag is used to test the structure to absolute failure. Once finished, each bridge is tested by adding individual items into the carrier bag. Record the maximum weight or number of chocolate bars that your bridge supports before failure occurs. Whilst the structures are being tested, have a think about:

- How many items does your structure hold?
- How did it fail? Was it the deck or support towers? How strong were your connections?
- Why did the winning bridge carry the most load?

Find out more!

The organisations below all support and promote structural engineering as a career that is essential in the modern world. Have a look at their websites to find out more...

Institution of Structural Engineers

The Institution of Structural Engineers serves to promote structural engineering and guide students and graduates through their professional careers to allow them to become members of the institution. Visit the Institution's website for more information.

www.istructe.org

Bridges to Prosperity

Bridges to Prosperity is a charity dedicated to helping communities around the world by providing safe structural engineering solutions. Through building bridges they are able to innovate, educate communities and inspire the next generation of engineers.

www.bridgestoprosperty.org



Engineers Without Borders

Engineers Without Borders' initiatives enable practicing engineers to apply their skills in developing countries, and each year their volunteers provide much needed support for communities across the globe. They also promote learning and provide crucial training for engineers in fields such as water, sanitation and public health.

www.ewb-uk.org