

# Beat the Flood

*Materials Testing*



For details of all routes into engineering go to [www.tomorrowsengineers.org.uk](http://www.tomorrowsengineers.org.uk)

# Beat the Flood

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Engineers

## What do you need to know?

### Organiser's notes

This activity will give students the opportunity to explore materials and their properties while learning about the important role engineers play in supporting international development.

#### Guidance

- Read through the instructions and familiarise yourself with the procedure
- Do a test run so that you know how to help students complete the challenge
- Use the discussion topics to introduce, summarise and provide context for the activity
- Make sure students have sufficient time to read and understand the instructions

#### Discussion topics

- Flooding affects the lives of many people around the world, how can engineers help?
- What materials are best suited to building a flood-proof home?
- How might the choice of materials used to build a home have an effect on the environment?

#### Curriculum links

KS3 Science	Scientific attitude
KS3 Science	Experimental skills and investigation
KS3 Science	Physics: Forces, Matter
KS3 D&T	Technical knowledge: properties of materials

#### Get involved

##### Further reading and resources

This activity is taken from the Beat the Flood challenge developed by Practical Action. Beat the Flood gives pupils the opportunity to apply their STEM skills to design, develop and test a model of a flood-resistant house. It includes teaching resources, pupil activity sheets and posters. For more information visit: [www.practicalaction.org/beattheflood](http://www.practicalaction.org/beattheflood).

Visit Practical Action's website for STEM challenges and case studies, and to find out how technology is improving the living conditions for people all over the world: [www.practicalaction.org](http://www.practicalaction.org).

##### Tomorrow's Engineers

Structural and civil engineers and engineering geologists are all involved in constructing new houses and buildings in a disaster zone, they are in our Construction Crew. Try the Whose Crew Are You? quiz to find out which crew you're in: [www.thebigbangfair.co.uk/whosecrewareyou](http://www.thebigbangfair.co.uk/whosecrewareyou).

##### Find out more about careers in engineering

Tomorrow's Engineers provides engineering careers materials for young people aged 11-14, and other resources for teachers: [www.tomorrowsengineers.org.uk](http://www.tomorrowsengineers.org.uk).

For lots more hands-on science and engineering activities visit the National Science & Engineering Week website: [www.nsew.org](http://www.nsew.org).

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*Are you ready for an engineering challenge?*

## Beat the Flood

You are a structural engineer working for international development organisation, Practical Action. You are currently based on Watu Island, an area which is prone to flooding. Your job is to test materials and recommend which ones are most suitable for building flood-proof homes.

### Your task

The best materials for building flood-proof homes are those that are both strong and water resistant. Your task is to test the tensile strength (the maximum amount of stress a material can take before breaking) and the absorbency of a range of materials. Once you have tested the materials, you must decide which are most suitable for building the homes.

### Get involved

International development organisations operate worldwide to improve the lives of millions of people living in poverty by providing access to education, health care, shelter and water. Engineers play a vital role in this.

For example, year after year, floods destroy homes and crops, often hitting the poorest hardest. Flooding in Bangladesh alone kills over 700 people annually, damages four million homes, and wipes out over a million hectares of crops. Structural and civil engineers work with international development agencies to design simple and affordable flood-resistant housing.

In recent years heavy rainfall has led to flooding and devastation in a number of regions in the UK. In 2012 alone flooding cost the UK more than £1 billion. As many scientists predict that global warming will lead to an increase in adverse weather conditions, engineers are currently looking at how to develop flood resilient communities, both abroad and here in the UK.

To find out more about Practical Action's projects in disaster risk reduction, including flooding, visit the website: [www.practicalaction.org/disaster-risk-reduction](http://www.practicalaction.org/disaster-risk-reduction).

To find out more about structural engineering visit the Institute of Structural Engineers website: [www.istructe.org](http://www.istructe.org).

To find out more about civil engineering visit the Institute of Civil Engineers: [www.ice.org.uk](http://www.ice.org.uk).

### Find out how you can become an engineer

If you have enjoyed this activity and would like to find out more about careers in engineering, Tomorrow's Engineers can help.



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## Get Engineering Materials Tensile Strength Test

### Activity Materials List

#### Each group will need:

2 x stands and clamps

Set of 10g weights

Materials for testing (such as cling film, plasticine, plastic bottles, foil food trays, straws, lolly sticks, clay, aluminium foil, grass or leaves)

Scissors



### Instructions

#### First set up the stands

They should be about 15cm apart and the clamps should be facing each other.

#### Next prepare your materials

Measure and cut materials to a standard size of 15cm x 2cm to ensure a fair test. Attach a piece of material between the two clamps.

#### Test your material

Add 10g weights to the mid-point of the material, one after another, until the material breaks or bends.



#### Finally, record your results

Record the maximum weight that the material tolerated whether the material held the weight, or buckled or snapped.

**Next, complete the materials absorbency test.**



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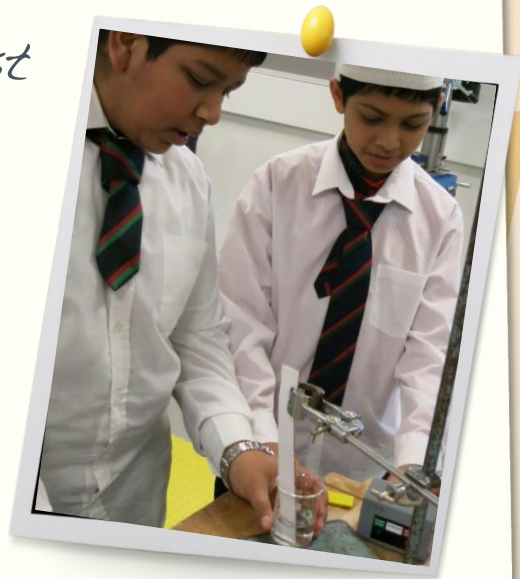


## *Get Engineering Material Absorbency Test*

### Activity Materials List

#### Each group will need:

- 1 x stand and clamp
- Timer
- 6 x 100ml glass beakers
- Food colouring
- Ruler
- Materials for testing (as before)
- Scissors



### Instructions

#### First set up the stand

The clamp should be about 15cm high.

#### Next prepare your material

Measure and cut materials to a standard size of 15cm x 2cm to ensure a fair test.

#### Test your material

Attach a piece of material to the stand and clamp so that it is held in a vertical position over a glass beaker containing 25ml of coloured water. (Use water dyed with food colouring to make it easier to see the progress of the coloured water soaked up by the material).

Start the timer as you lower the material into the water. Leave the material in the water for 3 minutes, then remove from water.

#### Record your results

Record the distance the water has travelled up the material. Repeat for each of your materials.

#### Follow on

Once you have completed the tensile strength test and the absorbency test, decide which of the materials is most suited to build a flood-proof home.



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*Testing materials for strength and absorbency*

Material	Height that the water was absorbed to (cm)	Weight added to material (g)	Observations



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