

# we the curious

## Theme Day



### On Shaky Ground UKS2 duration: 3 hours

### KS3+4 duration: 4 hours

Earthquakes are caused by the Earth's natural processes but have very human consequences. Each year around 10,000 people lose their lives in earthquakes, with many more losing homes and livelihoods. This exciting day shows how science and engineering can help solve these real-world problems - using demos, games, and hands-on activities in an authentic civil engineering experience. Students build and test their own earthquake-resistant buildings – applying key design principles that can reduce damage to buildings and save lives. Natural seismic events are also compared with human-made ones. On Shaky Ground has been developed as a collaboration between WTC education team, Bristol University Civil Engineering and Geophysics, and engineers from Mott MacDonald and development was funded by the Royal Academy of Engineering.

**Key Words:** Engineering, Design, Geology, Earth, Earthquakes, Seismicity, Construction, Forces, Waves, Energy.

**Learning objectives** Recognise earthquakes have significant physical, human, and economic consequences  
Increase awareness of and enthusiasm for career opportunities in civil engineering and geophysics  
The Earth's layered structure, and that its crust is made up of tectonic plates that have moved over time  
Earthquakes are crustal movements resulting from a sudden release of energy  
Recognise the damage to buildings typical in earthquakes and that engineering design can help reduce this  
Understand the impact of design on daily life and the wider world  
Work in small teams to apply engineering principles to design and build a model water tower  
The properties of materials and performance of structural elements to achieve successful solutions  
Test buildings for a range of simulated earthquakes on a purpose-built shaking table  
Appreciate that risk is evaluated as a combination of probability and consequence

### UKS2 Example timetable

10:00 Arrival  
10:15 Earthquakes: What's going on?  
10:45 Design and build  
12.00 Break  
1.00 How are Earthquakes measured?  
1:15 Let's break some buildings! Testing Buildings...to destruction!  
2.15 End of On Shaky Ground, with more time to explore WTC (venue closes at 5pm)

### KS3+4 Example Timetable

10:00am Arrival & introduction  
10:15am Earthquakes: What's going on?  
10:35am Consequences of Earthquakes – and how engineering can help  
10:50am Break  
11:00am Building for Earthquakes: creating model buildings  
12.30pm Lunch  
1.00pm How are Earthquakes measured? (The Richter Scale & relative magnitude of earthquakes.)  
1:15pm Unnatural Causes: human causes of seismicity  
1.20pm Risky business: using probability and consequence to make informed decisions  
1:30pm Testing Buildings...to destruction!  
2.15pm End of On Shaky Ground? activities, with more time to explore WTC (venue closes at 5pm)

### Curriculum Links:

#### UKS2

**Human and physical geography:** Describe and understand key aspects of:

Physical geography, including: climate zones, biomes, and vegetation

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**Number – number and place value:** Read, write, order, and compare numbers to at least 1 000 000 and determine the value of each digit

**Working scientifically:** Planning different types of scientific enquiries to answer questions, including recognising and controlling variables where necessary

**Forces:** Explain that unsupported objects fall towards the Earth because of the force of gravity acting between the Earth and the falling object  
Identify the effects of air resistance, water resistance, and friction, that act between moving surfaces

### KS3

**Science:** Ask questions and develop a line of enquiry, based on observations of the real world, alongside prior knowledge and experience

Select, plan and carry out scientific enquiries

Evaluate risks; Make and record observations and measurements

Earth and atmosphere: the structure of the Earth

Heating and thermal equilibrium; energy associated with movements, temperatures and elastic distortions

Forces as pushes and pulls and using force arrows in diagrams

Forces associated with deforming objects

**Geography:** Understand the key processes relating to geological timescales and plate tectonics

**Design and Technology:** Design and make products that solve real and relevant problems

Draw on disciplines such as mathematics, science, engineering, computing and art

Understand the impact of design on daily life and the wider world

### KS4

**Science:** Explain everyday and technological applications of science

Evaluate risks in practical science and the wider societal context, including perception of risk in relation to data and consequences

Apply knowledge to select appropriate techniques and materials

Forces and their interactions, including contact force and friction

That stretching, bending or compressing an object requires more than one force to be applied

Longitudinal and transverse waves

Waves at material interfaces: applications in exploring structures

**Geography:** Apply geographical knowledge and understanding to real world contexts and to contemporary situations and issues

The use of digital material including the use of Geographical Information Systems (GIS), to obtain, illustrate, analyse and evaluate geographical information

Geomorphic processes and landscape – How geomorphic processes at different scales, operating in combination with geology, climate and human activity have influenced and continue to influence the UK

**Design and Technology:** Develop realistic design proposals based on exploration opportunities and needs

Develop a knowledge of materials, components and technologies and practical skills

Explore a range of real-world contexts, representing contemporary issues and concerns

How environmental, social and economic challenges create opportunities and constraints on designing and making

**Potential Hazards:** Burns from use of glue guns.