



**BRONZE AWARD**

# A CLEAN BREAK



Typically 10 hours of project work  
Recommended for 11-14 year olds



**Practical  
project**

Study materials to learn about  
how to investigate breaks

**#physics**  
**#materials**  
**#crime**



# HOW TO RUN CREST USING THIS ACTIVITY

Looking for some support? Find a mentor by contacting your local STEM Ambassador hub:  
[www.stem.org.uk/stem-ambassadors/local-stem-ambassador-hubs](http://www.stem.org.uk/stem-ambassadors/local-stem-ambassador-hubs)

To use their project to achieve a Bronze CREST Award your students will need to:

- **Complete a minimum of 10 hours of project work**
- **Consider the broader impact of their project and demonstrate an innovative approach**
- **Complete the project workbook or short report in another medium**
- **Reflect on their work during the project using a student profile form**

## Preparation

Ready to get going with CREST? Sign up for a CREST account here: [www.crestawards.org/sign-in](http://www.crestawards.org/sign-in)

Create a new Bronze Award project with the name(s) of the student(s) and the title of their project. If you don't have all the details, you can fill these in later!

## Run the project

We have some super handy workbooks and profiles for your students to use when running a CREST Award. You can download these when you create your CREST account by following the link above.

Encourage your students to use the workbook or profile to plan and carry out their project, keeping a record of all their amazing progress.

Make sure you consider safety and risks!

## Reflection

So, your students have been hard at work and completed their CREST project, but don't let this be the end of their learning. They should now fill in any remaining sections of their workbook. This is a chance for them to reflect on all the interesting things they've learnt and the invaluable skills they have used.

## Enter your project for a Bronze CREST Award

Hard work deserves a reward! Celebrate and certify your students' achievements by entering their project for a Bronze CREST Award. Simply:

Log in to your CREST account at [www.crestawards.org/sign-in](http://www.crestawards.org/sign-in)

Select the project and upload a sample of the students' workbooks or other project evidence.

Check the participating students have met each of the criteria on the teacher assessment page.

Finally, complete the delivery and payment details to order your snazzy certificates.

Congratulations on completing CREST Bronze!

## What next?

The scientific discovery doesn't need to end here. Students can have a go at the next level up - CREST Silver.

Don't keep all the fun to yourselves, encourage others to take part in CREST projects and share the wonder of science. For free ideas on how to get started, see [www.crestawards.org](http://www.crestawards.org)

# STUDENT BRIEF

## A clean break

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Sometimes, what looks like an accident turns out not to be. It may be vandalism, insurance fraud or even murder. Accident investigators need to establish whether an incident happened accidentally, or was caused deliberately. For instance, did something break through wear and tear, or was it tampered with? In this project, you will study various materials that have been broken in various ways. Your objective is to find ways of distinguishing between the various causes by studying the broken pieces.

### Getting started

How many ways of breaking (not cutting) solid materials can you think of? Devise and carry out experiments to see which types of materials break under various conditions.

#### Gradually increasing tension:

Hold strips of the material in a clamp and hang a mass so it pulls down on the material. Gradually add more masses until it stretches or breaks. It might be wise to design these experiments yourself but ask a trained adult to help you carry them out. If something needs a really large mass to break it, then just make a note of the fact – don't keep increasing the mass until it does break! Examine and compare the broken edges.

#### Working at the cutting edge of science:

Try cutting and sawing the same materials. Examine the cut/sawn edges carefully, looking for tell-tale marks or patterns that indicate the separation method. Compare cut and sawn samples, and also compare them with the samples above. Investigate whether the type of blade or saw affects the results.

#### Getting to know the ropes:

Ropes are designed to be very flexible, so impact or bending won't break them. They are also designed to withstand tension, so snapping would need more force than you could safely apply. Think up a way to scale down the experiment so that you can snap the fibres. A rope might also wear away by rubbing against a hard and/or rough surface. Think up a way of simulating this to obtain samples that have worn through. Examine the fibres of cut, sawn, snapped and worn ropes. Look for tell-tale differences. Try both natural and synthetic fibre ropes. To see the effect of weathering, test string (for example, garden twine) that has been left out in the open air over winter. Compare it with new string of the same kind.

#### Investigating a claim:

Imagine that you are insurance claim investigators. You have been given two pieces of rope and you need to decide how the end of the rope became separated from the rest. Use the knowledge you gained above to examine the rope end and draw conclusions. Present your findings to the claims assessor with supporting evidence. Explain how the evidence supports your conclusions.

#### Things to think about

You could investigate the effect of:

- Sudden impact, for example, dropping a mass onto the material.
- Gradually increasing the load or the bend angle. Hold the material in a vice and hang a mass on one end, gradually add extra masses so the material bends.
- Flexing backwards and forwards.
- Sudden tension, for example, if someone is attached to a climbing rope and they fall there will be a sudden tension pulling on the rope. How can a test 'mimic' this?

Why not see if you can get in touch with real-life accident investigators

# STUDENT BRIEF

## BRONZE AWARD



### Health and safety

Science project work is both dynamic and exciting but can also carry some risk. To avoid any accidents, make sure you stick to the following health and safety guidelines before getting started:

- find out if any of the materials, equipment or methods are hazardous;
- assess the risks (think about what could go wrong and how serious it might be);
- decide what you need to do to reduce any risks (such as wearing personal protective equipment, knowing how to deal with emergencies and so on);
- make sure your teacher agrees with your plan and risk assessment.

**If you're going to test things like ceramic tiles or glass (which could shatter when they break) or wires (which can whip around when they snap) make sure you are properly supervised and take extra precaution.**

**If you're sawing materials, make sure you hold them in a vice. When you use a knife to cut, make sure you use a safety rule to cut against.**

### Remember!

Science isn't just about data. The most successful projects will demonstrate good communication skills and show original ideas that address a real-world problem.

Look at the world around you and consider all the innovative ways that you could address the challenge. Even if things go wrong, use this to show what you have learned. Don't forget to use the student profile form to help structure your project.