

## Overhead lines

### Introduction

Overhead lines are usually the most cost effective way of distributing electricity from the power stations to the consumers. These lines need to be held safely above ground. For low voltage lines this is done with wooden poles and for high voltage lines this can be done with much taller steel pylons.

Designing and building pylons is a technical business and requires knowledge of structures and the forces that act on them. In this activity you will use your knowledge of forces to design and build your very own model pylon.

### What you need

- 15 craft straws
- A glue gun
- Scissors
- Four pieces of string about 30 cm long
- Four 20 g masses
- A ball of modelling clay about 3 cm across
- A desk fan

### Building your pylon

The rules for building your pylon are:

- you may only use the craft straws provided for the structure
- you may only use the glue gun to stick the straws together
- you may use the modelling clay provided to fix your pylon to the desk
- your pylon must include a structure which will support 4 cables at a height of 30 cm above the desk on which the pylon is built
- the cables must all be supported at the same level and must be kept at least 1cm apart
- your pylon must be able to support the weight of the cables which is simulated by hanging the four 20 g masses from the point on the structure where the cables are designed to fit
- your pylon must be able to cope with a wind blowing from any direction simulated by the desk fan blowing on its middle setting from 30 cm away.

### Extension tasks

- When building your pylon think about how real pylons are constructed.
- Once you have shown that your pylon can withstand the required conditions test it rigorously and make a note of at what point it fails.
- How much extra weight can your pylon stand before it fails?
- How much extra wind can your pylon stand before it fails?
- Based on your testing, what percentage safety factor do you think your design has? For example if it collapses under a weight of 120 g this means it has a safety factor of about 50% as 120 g is 50% more than the design requirement of 80 g.
- How do you think this compares with the safety factors for real pylons?