# What Makes a Structure Strong and Stable

KS3 Ages 11-14 ⏰ 3 min read

## What Makes Structures Strong?

Every building, bridge, and tower needs to be **strong and stable**. This means it can hold its own weight plus everything inside it, and it won't topple over when the wind blows or an earthquake shakes the ground. But what makes some structures rock-solid while others crumble? The answer lies in **shape, materials, and how forces work**.

**Shape is everything**. A **triangle** is one of the strongest shapes in nature and engineering. This is why roof trusses (the beams that hold up roofs) are always triangular. Triangles can't be bent or twisted out of shape without breaking, unlike squares or rectangles which can collapse sideways.

Think of it like trying to push the corners of a square shape—it folds easily. But push a triangle and it stays firm because the angles lock together.

## Materials Matter

The **materials** you build with are crucial. **Steel** is flexible but very strong, which is why it's used in skyscrapers. **Concrete** is hard and can support huge weights. **Wood** bends slightly, making it great for earthquake-prone areas because it moves without breaking. Engineers choose materials based on what forces a structure needs to resist.

Think of it like choosing between a plastic ruler (bends but doesn't snap), a pencil (snaps easily), and a rubber band (bends lots without breaking).

## Understanding Forces

Structures face many **forces**: their own weight (called **gravity**), wind pushing sideways (called **lateral forces**), and earthquakes shaking from below. A strong structure distributes these forces safely into the ground through its **foundations**.

**Wide bases** are more stable than narrow ones—this is why pyramids never fall over and why tall buildings have deep, wide foundations. The wider the base, the harder it

is to tip.

Think of it like a pyramid of stacked blocks versus a pencil standing on its point—the pyramid is almost impossible to knock over.

## Real-World Examples

The **Eiffel Tower** in Paris uses a triangular lattice design and a wide base to stay standing in fierce winds. Modern **suspension bridges** like the **Golden Gate Bridge** use cables and clever angles to hold up the deck while resisting enormous forces. Engineers test structures with computers before building them to make sure they'll be safe.

Whether it's a school building, a playground climbing frame, or a stadium roof, the same principles apply: the right shape, the right materials, and careful planning to manage forces keep our world from crashing down!