

# Buildtastic

Driving innovation as part of  
National Construction Week



[wsc.ac.uk/buildtastic](http://wsc.ac.uk/buildtastic)

# CONSTRUCTION CHALLENGE

## Can you build a Paper Tower?

a blended learning challenge, for Key Stage  
3 and up, at home or in school, developed by

NASCENT



**PLACE 21**

Connections, Qualifications  
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## WHAT ARE YOU GOING TO DO?

You are challenged to design and construct a model tower out of paper and sticky tape. This activity mirrors the challenges that engineers are given in the real world with objectives, requirements and constraints such as budgets, material limitations and deadlines - an engineering team that can design a structure to meet the objectives with the fewest materials (hence, less cost), is favoured over other companies that cannot use the given materials as effectively.

Your main aim will be height, but to achieve that height you will need to consider stability too. When you are thinking about your design approach, consider the real skyscrapers you have seen as inspiration, including the tallest buildings and towers in your home town. What are their shapes? What are their foundations like?

Much of this activity is an abridged version of [https://www.teachengineering.org/activities/view/duk\\_tower\\_tech\\_act](https://www.teachengineering.org/activities/view/duk_tower_tech_act)

## YOU WILL NEED

- **Paper**, this can be newspaper, scrap paper, any type of paper
- **Sticky tape**, such as Sellotape or masking tape
- **Scissors**
- **Tape Measure**

## WHERE TO BEGIN

There are many solutions to this design challenge, some more obvious than others, but don't be afraid to "think outside the box" as unexpected designs often work quite well. Some ideas to get you started are:

- Rolling several small tubes to attach to the bottom or a central tube of paper is a good design. The more narrow and slender the tower is at height, the better it can withstand any breeze from opening and closing doors or passing people, as less surface exists for the air movement to act upon.
- Another idea is a tripod type design, while most of the paper is used to build up, toward the bottom, three tightly wound newspaper rolls extend down from the tower to the base at an angle, giving more stability. Even if you are not opting for a tripod having a very wide base for the tower to sit on, like a foundation, will improve stability.

NOW YOU'RE READY TO GET BUILDING!

## USEFUL VOCABULARY AND DEFINITIONS

**buckling:** When a column fails by bending at some point in the height of the column, usually towards the midpoint caused by a vertical force.

**bundled tube:** The design principle that the Willis (formerly Sears) Tower in Chicago is built on. The building is basically a collected bunch of tubes, with all the supporting columns of each "tube" located on the perimeter of the tube. This structure is very good at resisting wind loads.

**civil engineering:** The field of engineering pertaining to non-moving structures such as roads, sewers, towers, buildings and bridges.

**deflection:** The amount a structure bends or moves from its "at rest" position.

**lateral force:** A force that impacts a structure horizontally (that is, wind and earthquakes).



Willis (formerly Sears) Tower

**tube-style support:** Implemented on building such as the Willis Tower (pictured) and many newer structures. Most of the supporting columns are moved to the perimeter of the tower instead of spread throughout, allowing for open expanses of floor space on every floor.

## **CROSS-CURRICULAR LINKS**

You might think that construction is not part of the curriculum you are studying, well you'd be wrong, your curriculum topics are embedded in construction and in carrying out this activity you will be using your skills in the following topics

**English:** you've read and understood this challenge, you'll have written a plan and notes on what you intend to do, you might even add to the terms and definitions described on the previous page

**Maths:** can you figure out what mathematical considerations would be involved in real life tower design, what forces are acting on your tower and how are they described in maths and physics.

**Science:** is everywhere, you'll be using your unconscious knowledge of science and engineering throughout this challenge, you'll also be working scientifically and planning a fair test if you are carrying out the activity as a classroom competition.

**History:** where and when was the first skyscraper built? Is it still standing today?

**Geography:** where is the tallest tower in Suffolk / UK / World?

**Modern Foreign Languages:** could you write a guide to your construction in a language other than your own or English

**Art, Design and Technology:** you have designed your tower, have you considered the aesthetics of it? in the real world a tower design would need to meet certain criteria, what might they be?

**Citizenship:** if you have worked as a group to create your structure you will have been practicing your citizenship skills, you will have thought about the different strengths and weaknesses of each team member and recognised that everyone has a meaningful role to play.

**Computing:** can you investigate what a CAD programme would add to this activity? What are the latest programmes used to aid tower design? could you create a replica of your finished tower using Minecraft, do you know the software the construction industry work with to manage projects?

## **FIND OUT MORE: USEFUL LINKS**

These links of short videos and written resources should help you understand more about this construction challenge

WEB RESOURCE: The national curriculum in England

The entire national curriculum is available to all as a PDF or Word Document

<https://www.gov.uk/government/publications/national-curriculum-in-england-primary-curriculum>

WEB RESOURCE: Tallest 20 in 2020 – Then and Now

Research teams at CTBUH (Council on Tall Buildings and Urban Habitat) in the US review projections they made in 2012, the assumptions that guided them, and the roller-coaster reality of what has come hence. <http://www.skyscrapercenter.com/tallest-in-2020>

WEB RESOURCE: Where are the tallest buildings on every continent?

An interesting map and clear line drawings illustrate this article

<https://www.visualcapitalist.com/worlds-tallest-buildings/>

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WEB RESOURCE: How to Make a Tower Out of One Piece of Paper  
<https://sciencing.com/make-out-one-piece-paper-6284616.html>

WEB RESOURCE: Paper Tower Challenge  
Video and instructions that are very easy to follow  
<https://sites.google.com/site/soccerjudo10/paper-tower-challenge>

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