

Shatin Tsung Tsin Secondary School

S.3 Physics

Tower Project



Website List:

- <http://en.wikipedia.org/wiki/Tower>
- [http://en.wikipedia.org/wiki/Drinking\\_straw](http://en.wikipedia.org/wiki/Drinking_straw)
- <http://voices.yahoo.com/how-build-straw-tower-capable-holdin-g-baseball-2169080.html>
- [http://www.ehow.com/how\\_5076942\\_use-straws-make-tower.html](http://www.ehow.com/how_5076942_use-straws-make-tower.html)

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# Introduction of Tower

## Principle of Tower

A tower is a tall structure, usually taller than it is wide, often by a significant margin. Towers are distinguished from masts by their lack of guy-wires.

Towers are generally built to take advantage of their height, and can stand alone on the ground, or as part of a larger structure or device such as a fortified building or as an integral part of a bridge, the term also denoting a raised structure on a ship or other vehicle.

## History

Towers have been used by mankind since prehistoric times. The oldest known may be the circular stone tower in walls of Neolithic Jericho (8000 BC). Some of the earliest towers were ziggurats, which existed in Sumerian architecture since the 4th millennium BC. The most famous ziggurats include the Sumerian Ziggurat of Ur, built the 3rd millennium BC, and the Etemenanki, one of the most famous examples of Babylonian architecture. The latter was built in Babylon during the 2nd millennium BC and was considered the tallest tower of the ancient world.

Some of the earliest surviving examples are the broch structures in northern Scotland, which are conical towerhouses. These and other examples from Phoenician and Roman cultures emphasised the use of a tower in fortification and sentinel roles. For example, watchtower elements are found at Mogador from the first millennium BC, derived from Phoenician or Carthaginian origins. The Romans utilised octagonal towers as elements of Diocletian's Palace in Croatia, which monument dates to approximately 300 AD, while the Servian Walls (4th century BC) and the Aurelian Walls (3rd century AD) featured square ones. The Chinese used towers as integrated elements of the Great Wall of China in 210 BC during the Qin Dynasty. Towers were also an important element of castles.

Another well known tower is the Leaning Tower of Pisa in Pisa, Italy built from 1173 until 1372. The Himalayan Towers are stone towers located chiefly in Tibet built approximately 14th to 15th century.

## Structure of Tower

Up to a certain height, a tower can be made with the supporting structure with parallel sides. However, above a certain height, the compressive load of the material is exceeded and the tower will fail. This can be avoided if the tower's support structure tapers up the building.

A second limit is that of buckling- the structure requires sufficient stiffness to avoid breaking under the loads it faces, especially those due to winds. Many very tall towers have their support structures at the periphery of the building, which greatly increases the overall stiffness.

A third limit is dynamic; a tower is subject to varying winds, vortex shedding, seismic disturbances etc. These are often dealt with a combination of simple strength and stiffness, as well as in some cases tuned mass dampers to damp out movements. Varying or tapering the outer aspect of the tower with height avoids vibrations due to vortex shedding occurring along the entire building simultaneously.

# Types of Tower

## Skyscrapers

A modern type of tower, the skyscraper, uses less ground space as a ratio of total building interior square footage. Skyscrapers are often not classified as towers, although most have the same design and structure of towers. In the United Kingdom, tall domestic buildings are referred to as tower blocks. In the United States, the World Trade Center had the nickname the Twin Towers, a name shared with the Petronas Twin Towers in Kuala Lumpur. A tower's has very deep foundation's.

## Strategic advantages

The tower throughout history has provided its users with an advantage in surveying defensive positions and obtaining a better view of the surrounding areas, including battlefields. They were installed on defensive walls, or rolled near a target. Today, strategic-use towers are still used at prisons, military camps, and defensive perimeters.

## Potential energy

By using gravity to move objects or substances downward, a tower can be used to store items or liquids like a storage silo or a water tower, or aim an object into the earth such as a drilling tower. Ski-jump ramps use the same idea, and in the absence of a natural mountain slope or hill, can be human-made.

## Communication enhancement

In history, simple towers like lighthouses, bell towers, clock towers, signal towers and minarets were used to communicate information over greater distances. In more recent years, radio masts and cell phone towers facilitate communication by expanding the range of the transmitter. The CN Tower in Toronto, Canada was built as a communications tower, with the capability to act as both a transmitter and repeater. Its design also incorporated features to make it a tourist attraction, including the world's highest observation deck at 147 stories.

## Transportation support

Towers can also be used to support bridges, and can reach heights that rival some of the tallest buildings above-water. Their use is most prevalent in suspension bridges and cable-stayed bridges. The use of the pylon, a simple tower structure, has also helped to build railroad bridges, mass-transit systems, and harbors.

Control towers are used to give visibility to help direct aviation traffic.

## Other towers

- To access tall or high objects: launch tower, service tower, service structure, scaffold, tower wagon
- To access atmospheric conditions aloft: wind turbine, meteorological measurement tower, tower telescope, solar power station
- To lift high tension cables for electrical power distribution transmission tower
- To take advantage of the temperature gradient inherent in a height differential: cooling tower, chimney
- To protect from exposure: BREN Tower
- For industrial production: shot tower
- For surveying: Survey tower
- To drop objects: Drop tube (drop tower), bomb tower, diving platform
- To test height-intensive applications: elevator test tower
- To improve structural integrity: thyristor tower
- To mimic towers or provide height for training purposes: fire tower, parachute tower
- As art: Shukhov Tower
- For recreation: rock climbing tower
- As a symbol: Tower of Babel, The Tower (Tarot card), church tower
- The term "tower" is also sometimes used to refer to firefighting equipment with an extremely tall ladder designed for use in firefighting/rescue operations involving high-rise buildings.

# Famous Towers in the World



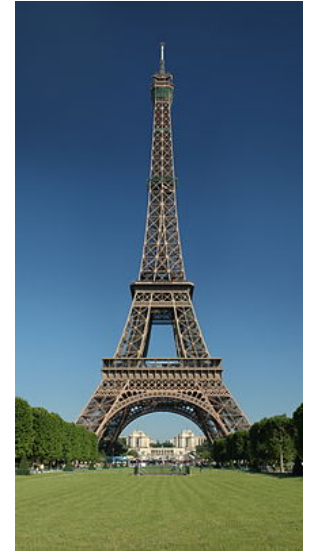
CN Tower (world's third tallest freestanding structure) in Toronto, Ontario, Canada.



Watchtower in the Israeli West Bank barrier



The Milad Tower in Tehran, Iran is the tallest concrete tower in the Middle East.



The Eiffel Tower in Paris, France.



The TV Tower in Prague, Czech Republic.



Tower in Islamic architecture : the Great Mosque of Kairouan, city of Kairouan, Tunisia



The Hyperboloid lattice shell of Shukhov Tower in Moscow, Russia.



Typical modern water tower in Carmel, Indiana, United States.



The Historic 17th Century Pelion Tower in Greece



The Sosruko tower in Nalchik, Russia



El Faro towers in Buenos Aires, Argentina, one of the tallest constructions in the city.



Roman tower in Cologne with decorative inlay

# Introduction of Straw

## Properties of Straw

A drinking straw is a short tube intended for transferring a beverage from its container to the mouth of the drinker by use of suction. A thin tube of plastic (such as polypropylene and polystyrene) or other material, straight or with an accordion-like living hinge, it is employed by being held with one end in the mouth and another end in the drink. Muscular action reduces air pressure in the mouth, whereupon atmospheric pressure forces the drink up the straw.

## History

Historians don't know when the idea of a straw was first invented, though it is believed to be very old. The first known straws were made by the Sumerians, used for drinking beer, probably to avoid the solid byproducts of fermentation that sink to the bottom. The earliest extant drinking straw was found in a Sumerian tomb dated 3,000 B.C., it is a tube made from gold and the precious blue stone lapis lazuli. Argentines and their neighbors used straws for thousands of years, it is a similar metallic device called a bombilla that acts as both a straw and sieve for drinking mate tea.

In the 1800s the rye grass straw came into fashion because it was cheap and soft, but it had an unfortunate tendency to turn to mush in liquid. To address these shortcomings, the modern drinking straw was patented in 1888 by Marvin C. Stone, made of paper. He came upon the idea while drinking a mint julep on a hot day in Washington DC, the taste of the rye was mixing with the drink and giving it a grassy taste which he found unsatisfactory. He wound paper around a pencil to make a thin tube, slid out the pencil from one end, and applied glue between the strips. He later refined it by building a machine that would coat the outside of the paper with wax to hold it together, so that the glue wouldn't melt in bourbon.

Early paper straws had a narrow bore similar to that of the grass stems then in common use. It was common to use two of them, to reduce the effort needed to take each sip. (The cocktail straw, which is sometimes used in pairs, may be derived from such early straws.) Modern plastic straws are made with a larger bore, and only one is needed for ease of drinking.

## Health and environment

One particular advantage of using a straw when drinking is the reduction of tooth decay. Many soft drinks have acidic properties, and using a straw reduces the liquid contact with the teeth, reducing tooth decay and the risk of cavities.

Drinking straws are a form of plastic consumption when made, and become a landfill item when discarded. Made from polypropylene, they are strong and can be reused rather than recycled into other products. Waste straws in Uganda are collected from beer and soft drink depots, cleaned, and woven into mats for picnics and prayers or joined to form bags.

# Types of Straw

- A basic drinking straw is straight for the full length.
- A bendable straw or "bendy straw" (known in the industry as an "articulated straw") has a concertina-type hinge near the top for convenience. This variation was invented by Joseph Friedman in 1937.
- A "crazy" straw is hard, transparent or translucent plastic and has a number of twists and turns at the top. When liquid is sucked through the straw, it quickly flows through the winding path, creating an interesting spectacle.
- A spoon straw features a cut-away shape at one end that functions as a miniature spoon. It is intended for slush drinks.
- Candy straws, such as licorice straws (or lico-straws), are made from some type of chewy candy.
- A miniature straw is often attached to a drink box.
- A depiction of the various widths of drinking straws. A wide straw is used for sipping bubble tea. The larger diameter is necessary to accommodate the drink's characteristic tapioca balls. Also for stirring.
- "Sanitary" straws are individually wrapped to avoid contamination. Straws were originally marketed as a means for people to reduce the risk of contracting an illness from improperly washed containers, glasses, or cups.
- The Sipahh is a drinking straw that contains flavoured tapioca beads that dissolve as milk passes over them, adding colour and flavour.
- A recent addition to the straw family is the cereal straw, such as the ones made by Kellogg's.
- Polypropylene is becoming favored over polystyrene for manufacturing plastic drinking straws as polystyrene is brittle and tends to crack easily. Polystyrene is also denser than water, causing straws to sink when placed into beverages. Polypropylene straws, by contrast, are much more durable and do not sink.
- Special "color-changer" straws given with meals at Friendly's change color as cold liquid passes through them.
- Extendo-straws come in small plastic wrappings like miniature straws, but can extend to reach the bottom of the carton.

## Alternatives to plastic straws

Plastic straws aren't recyclable and end up in landfills or the ocean. There are, however, alternatives to disposable plastic straws:

- Paper straws
- Bamboo straws
- Bioplastic straws
- Glass straws
- Stainless steel straws

# Examples of Making A Straw Tower

## Material List:

1. 55 Plastic Straws
2. Roll of tape
3. Pair of scissors

## Assembly Procedure:



| Example 1                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                     | Example 2                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                           |
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| <ol style="list-style-type: none"> <li>1. Obtain 55 plastic straws.</li> <li>2. Use five of the plastic straws to create a base for the tower by taping each of the straws together to create a pentagon.</li> <li>3. Create six vertical single-straw towers. For five of the towers, use seven straws each, and for the sixth only use six. Connect each straw together by carefully cutting one end roughly an inch up vertically. Then, squeeze the cut end together and insert into the straw. Continue to do this to each of the selected straws until all six single-straw towers are built.</li> <li>4. Secure each joint on the single straw towers, do this by using a piece of tape.</li> <li>5. Carefully tape one end of each of the outside towers onto a corner of the pentagonal base. Make sure the joint is secure!</li> <li>6. Take five straws from the unused straw pile, and cut one fourth of the straw length off.</li> <li>7. Use the <math>\frac{3}{4}</math> straws to attach the middle single straw tower to each of the outer towers. The straws should be attached roughly <math>\frac{3}{4}</math> up the tower.</li> <li>8. Using the leftover <math>\frac{1}{4}</math> straws, follow step 7, but roughly five inches from the top of the tower.</li> <li>9. Cut 3 regular length straws in half. Use each half to secure the middle single straw tower to the outside towers. Secure it roughly half way down the tower.</li> <li>10. Secure each joint on the tower with tape.</li> </ol> | <ol style="list-style-type: none"> <li>1. Unwrap 55 plastic straws. Take 5 straws to form the base of the tower. Tape them together to form a pentagon shape.</li> <li>2. Make 6 long, single-straw posts for your tower. For 5 of the posts, you'll use 7 straws connected together, and for the sixth post, you'll use 6 straws connected together.</li> <li>3. Connect the straws together by making a 1 inch vertical cut up the end of each straw. Pinch the cut end and stick it into the bottom of another straw. Repeat with each straw until you've completed your 6 single-straw posts. Reinforce each straw-to-straw connection by taping around the straws where they connect.</li> <li>4. Tape one end of each of the 5 longer posts to a corner of your pentagon base. Use enough tape to make a solid connection.</li> <li>5. Get 5 new straws and cut <math>\frac{1}{4}</math> of the straw off each one. Set your leftover post vertically in the middle of the pentagon. Take the <math>\frac{3}{4}</math> straws and attach one end of each to the middle post with tape, about 6 inches up from the bottom of the tower. Tape the other end to each of the outer posts. Take the leftover <math>\frac{1}{4}</math> straw pieces and tape one end of each to the middle post, about 4 inches from the top of the tower. Tape the other ends to the outer posts.</li> <li>6. Take 3 more straws. Cut them in half. Find the center of your middle post. Take each straw half and tape one end to the middle post, and the other end to the outside posts. This will secure your tower in the center. Tape over every connection again, to make the tower extra-secure.</li> </ol> |

~ THE END ~