



LKS2 D.T: STRUCTURES KNOWLEDGE ORGANISER



Overview

Shell Structures

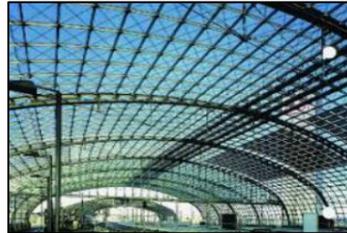
You should already know that structures are things that are built for a purpose, for example to support something or hold something.

-Shell Structures are structures with a solid outer surface (which may be curved or flat) and a hollow inner area.

-Shell structures can serve many different purposes. Often, they are used to protecting, containing and/or presenting (e.g. packaging).

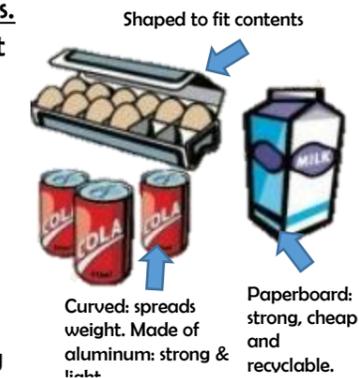
-Some examples of shell structures are food packaging, tunnels, helmets, drinks cans, and boats.

-A rounded outer surface is particularly strong, because it spreads forces throughout the whole structure, which means every part of the structure supports only a small part of the load.

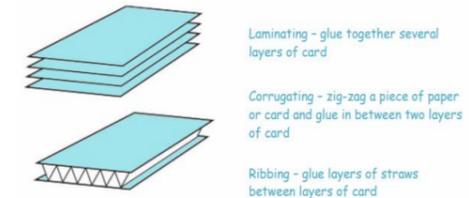


Designing – How does a shell structure contain, protect, present?

- Shell structures may be used to contain things.
- The structures need to be able to take the weight of their contents.
 - Consider the 3-D shapes that are most appropriate for this purpose: cubes, cuboids, prisms, are all possibilities.
 - Remember, curved shell structures are effective at spreading weight evenly.



- Shell structures may be used to protect things.
- The materials used are important for protecting interior contents. Some shell structures can be shaped to fit their contents, protecting them from movement and damage (e.g. egg cartons).
 - Shell structures can be stiffened through folding, layering, corrugating, ribbing or lamination.



- Shell Structures may be used to present things.
- Shell structures are designed to be visually appropriate for their purpose and attractive to their audience.
 - Whilst the shape needs to be strong & durable, it also needs to be appealing to the users. Designers should think about these stylistic choices.
 - For this reason, the choice of colour, the look, and the feel are all important.
 - The use of logos and fonts (styles of lettering) should be considered.

Key Vocabulary

- Structures
- Shell Structures
- Packaging
- Purpose
- Forces
- Style
- Font
- Durable
- 3D Nets
- Tabs
- Folding/Layering
- Corrugating/Ribbing
- CAD

Example Structures



Name: St. Peter's Basilica Dome

Location: Rome, Italy

Height: 136m

Built in: 1590

Purpose: Protecting

- The dome on St. Peter's Basilica is one of the most famous sites in the world.
- There are many other dome-like shell structures on religious buildings all across the world.
- As the surface is curved, there is no need for joints. Often the material is quite light and streamlined.
- This dome is made with a lightened concrete/rock mix (it was made a long time ago).
- As with other shell structures, the dome does not carry a load (a triangular structure beneath supports the spire).
- Rather, it is a roof, that protects the interior.



Name: Sweets Tubes

Purpose: Protecting, Containing, Presenting

Materials: Cardboard tube, plastic lid.

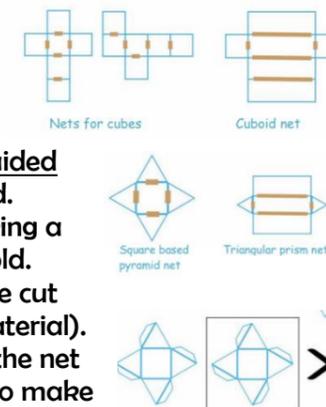
- Sweet tubes are another example of strong curved shell structures.
- They are normally made of a thin, lightweight material such as card or cardboard. These materials are normally cheap, durable, easy to work with and recyclable.
- Despite being thin, card/cardboard are still strong enough: the curved surface spreads the load of the sweets inside equally around the tube.



Making & Evaluating

Making

- Nets can be used to make 3D products.
- Nets can then be assembled using either CAD (computer aided design) systems or by hand.
- Scoring is the process of marking a sheet to make it easier to fold.
- Outer edges of the net can be cut out (apparatus depends on material).
- Tabs are additional strips on the net that can be scored and folded to make a surface for sticking vertices together.



Evaluating

- How well does your structure work? Does it meet its purpose?
- How did you make your shell structure strong and durable? How could you make it more stable?
- Which materials did you use? Why did you make these choices? How does your product protect and contain? How could it do this more effectively?
- How does your product look? How could it look more appealing?



Health and Safety

-Remove any jewellery and tie back long hair. Keep belongings clear.

-Wear an apron where necessary and roll up your sleeves.

-Walk safely and calmly around the classroom/workshop.

Keep your work area and floor area clear – regularly tidy up to avoid accidents.

Follow the teacher's cutting/ machinery instructions carefully.

Make sure that you are wearing the correct equipment for tasks, including safety goggles.

Should you need to move around with sharp objects, hold them appropriately.

Report and clean all spillages & other potential hazards.