


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

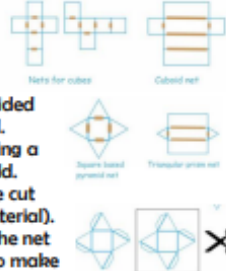


| Example Structures | | |
|---|---|--|
|  | <p>Name: St. Peter's Basilica Dome</p> <p>Location: Rome, Italy</p> <p>Height: 136m</p> <p>Built in: 1590</p> <p>Purpose: Protecting</p> | <ul style="list-style-type: none"> -The dome on St. Peter's Basilica is one of the most famous sites in the world. -There 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. |
|  | <p>Name: Sweets Tubes</p> <p>Purpose: Protecting, Containing, Presenting</p> <p>Materials: Cardboard tube, plastic lid.</p> | <ul style="list-style-type: none"> -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.