



Tunnels

A feat of engineering, an opening to a magical land, a means of escape.....

STOAmCiNAtion



“Wherever my story takes me, however dark and difficult the theme, there is always some hope and redemption, not because readers like happy endings, but because I am an optimist at heart. I know the sun will rise in the morning, that there is a light at the end of every tunnel.” Michael Morpurgo



The great tunnel portals, which exude grandeur, were admired when they were built and continue to impress passengers to this day. Of the many fears of the first railway travellers however, the speed and a journey through a dark tunnel was one of the worst.

Tunnels

A tunnel is an underground passage. They are used by cars, railways, people, boats, animals, cables and even as sewers. Tunnels are created for a variety of reasons. Railway tracks and roads need them in order to bypass obstacles such as mountains or water and the underground train network was created to avoid disturbing the infrastructure above. Animals build tunnels as their homes and for safe passage. Tunnels can connect military posts so that soldiers will not be seen by the enemy and even criminals have used tunnels to escape from prison!



Why build a tunnel and not a bridge?

Tunnels are usually more costly than bridges but sometimes land constraints mean that a tunnel is necessary. Bridges have a larger footprint on each shore than a tunnel. Some tunnels in the past were built for defence purposes-feeling that enemy aircraft would bomb a bridge more easily than a tunnel.

Construction Methods

Tunnels are built within various types of material ranging from soft clay, to hard rock. Construction methods will depend upon a variety of factors including how deep the tunnel is to be situated, and how strong the roof will have to be. Tunnels can be dangerous, especially with regards to fire risks and so designers try to reduce these risks by installing emergency ventilation systems or emergency escape passages parallel to the main tunnel. There are three main ways to build a tunnel: Cut and Cover, a Bored Tunnel and an Immersed Tunnel.



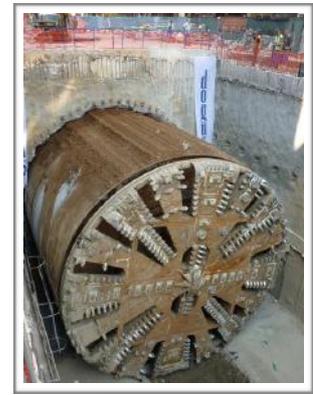


Cut and Cover: In this method, a large trench is excavated and the sides are supported as necessary.

Tunnels can then be built in situ, originally from brick. Or in modern times a pre-cast tunnel can then be lowered into the ground and carefully backfilled to reinstate the surface roads etc. More often, this method is used when a shallow tunnel is required as there is a great deal of disruption to the surface. Recently, London Underground stations such as Canary Wharf have used large cut and cover boxes.



Bored Tunnels: In this method, a tunnel boring machine allows tunnels to be built much deeper underground. They are very expensive to transport to site but they allow tunnels to be built, without disturbing the ground above and they can be used in a variety of soil types. Boring machines are about 150 metres long, with a large circular cutting plate at one end. This disk slowly rotates, and a tunnel is carved out of the ground. As it moves forward, hydraulic equipment pushes rings of concrete in place to create the tunnel and to stop the ground from collapsing.



These machines then carry waste material on long conveyor belts back to the surface. It took three years for the tunnel boring machines to meet under the channel, whilst building the channel tunnel and some of the machines were as long as two football pitches!

Immersed Tunnels: When a tunnel is to be built underwater, pre-cast tunnel sections are floated out and lowered into already-prepared trenches, in sections. They are then joined together underwater.





Teaching Resources: Tunnels

Introduction

By investigating tunnel construction past and present, children are able to cover all aspects of the design and technology curriculum whilst touching on literacy, historical, geographical and scientific concepts.

KS1 National Curriculum Links

Design and technology

Through a variety of creative and practical activities, pupils should be taught the knowledge, understanding and skills needed to engage in an iterative process of designing and making. They should work in a range of relevant contexts. When designing and making, pupils should be taught to:

Design : Design purposeful, functional, appealing products for themselves and other users based on design criteria.

Generate, develop, model and communicate their ideas through talking, drawing, templates, mock-ups and, where appropriate, information and communication technology.

Make : Select from and use a range of tools and equipment to perform practical tasks [for example, cutting, shaping, joining and finishing].

Select from and use a wide range of materials and components, including construction materials, textiles and ingredients, according to their characteristics.

Evaluate : Explore and evaluate a range of existing products.

Build structures, exploring how they can be made stronger, stiffer and more stable.

Explore and use mechanisms [for example, levers, sliders, wheels and axles], in their products.

History

- Events beyond living memory that are significant nationally or globally.

Literacy

- Write sentences by composing a sentence orally before writing it and sequencing sentences to form short narratives.
- Develop positive attitudes towards and stamina for writing by writing for a variety of purposes.





Looking at the activity sheets, ask the children to think about tunnels. Have they been in a tunnel? Why do we need tunnels? Encourage the children to really use their imagination whilst discussing how they might feel entering a tunnel. Could they see the end of the tunnel when they entered?

Explain to the children that tunnels are now found in lots of places but that in Victorian times, tunnel engineering was just beginning.

Now choose from one of our tunnel book activities to have more fun exploring the concept of tunnels.

Useful stories featuring tunnels:

The Tunnel - Anthony Browne

The Train Ride - June Crebbin (author), Stephen Lambert (illustrator)

Marge and the Secret Tunnel - Eglantine Ceulemans (illustrator), Isla Fisher (author)

Oxford Reading Tree: Level 5: More Stories A: Underground Adventure - Oxford Reading Tree - Roderick Hunt

