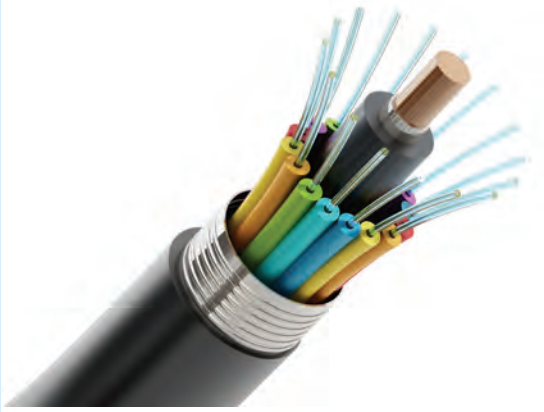
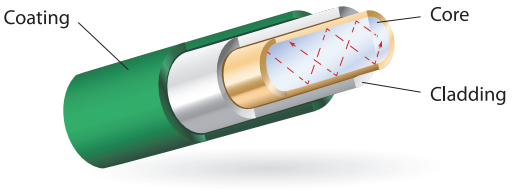
Fibre Optics

When you use the internet or a landline phone you are most likely using fibre optics. 'Fibre' refers to a filament or hair-like structure and 'optics' to light energy. In simple terms, this is a form of communication that uses light energy to transmit messages through thin tubes, by sending pulses of light. The benefits of this method are that data and information can be sent quickly over long distances in a very efficient way. The structure of a fibre optic cable is very important as it allows the light to bounce along in a controlled manner without being lost or absorbed along the way. There are four key parts to the cable:

1. **Thin glass strands**: Only as thick as a human hair and are bundled together to make a light-channelling core. Glass is transparent so it allows the light to move through it.
2. **Cladding**: A layer composed of silica acts as a giant reflector around the glass core. This bounces the light back in so no light (data) is lost.
3. **Plastic fibre-filled coating**: This protects the cable and allows it to bend. It is only semi-flexible because the glass would break if the cable was bent too much.
4. **Cable jacket**: A waterproof, rubbery plastic layer that adds further protection and holds the internal structures together.





It might seem weird that messages made of light can bring you the internet or a phone call but that is exactly how this marvellous system works. The data or information is entered into a transmitter which converts the electrical signal into a light energy signal. The information is produced by changes in strength and pulse speed. It then bounces through the core of the cable much the same as the light from a torch shone down a dark narrow pipe, except that the cladding stops any losses along the way. If the data has to move a very long distance then it will go through an optical regenerator. This boosts the light energy by copying the message and sending a more powerful (re-energised) duplicate. When the signal reaches its destination it is decoded and turned back into a format that can be understood by whatever device it has been sent to (e.g. computer or telephone). When you search something on the internet, let's say 'dancing cats', coded light is sent speeding off at around 300, 000 km/s to bring you a result.

The use of fibre optics allows quick, speedy data communication much faster than previous methods. The precursor to fibre optics was copper wire. Data was sent as a series of electrical impulses through the wire. This is comparatively slow and also there is a high rate of data loss along the way, making it much more inefficient. Apart from its main function in the world of communication, it is also used for lighting and viewing the inside of a person during surgery due to its small flexible nature. This has eliminated the need for some large cuts to be made and has allowed surgery to occur in some delicate, complex, hidden places like deep in the brain. Because the surgery is far less intrusive, people heal a lot faster. Machinery can also be inspected easily without having to take it apart. Fibre optics is being used to look inside intricate machines for faults and to check on wear and tear. While fibre optic cabling is very expensive and can break easily if not properly cared for, the positives of speed, efficiency and quantity of data carried far outweigh the costs.