

Electrical safety and compliance

How to ensure the safety of your church and the people using it

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The uses of electricity in churches

- Lighting
- Small power
- Heating
- Public address and audio visual
- Organ
- Security



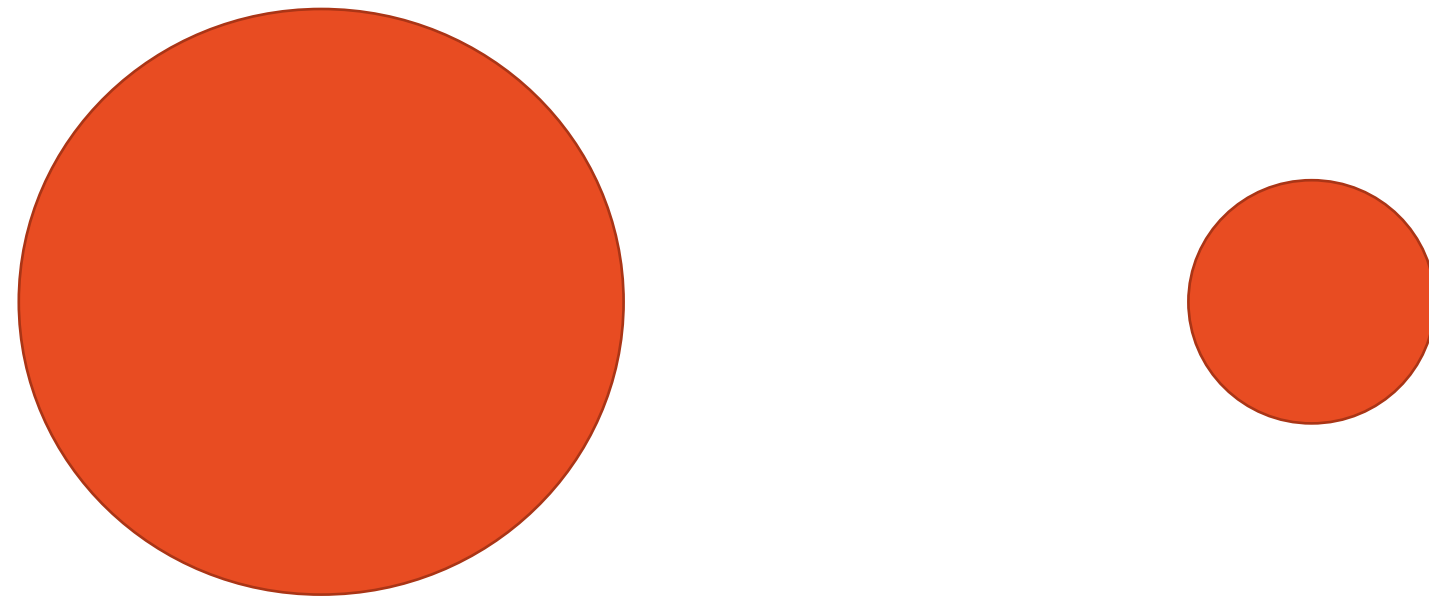
How does electricity work?

- Generated in a power station
- Transmitted at high voltage to a substation
- Transformed down to suitable voltages



Why are high voltages necessary?

- Power=voltage x current or **watts= volts x amps**
- For a given amount of power, if we increase the voltage we reduce the current



- The problem with high voltage is the need to insulate the conductors to avoid danger of electrocution.
- At low voltages pvc is generally used
- At 11kV, XLPE or paper may be used
- At higher voltages bare wires with ceramic insulators are necessary (transmission line)



Electrical Distribution

Upon entering the building, the cables terminate in a service cut out and then pass via the meter to distribution boards





- What happens if you try to push through the crowd in the tunnel?

Electrical Distribution

- Overload protection, either fuses or circuit breakers, are fitted in each circuit to disrupt the supply if the current is too large for the cable to cope with.
- Circuit breakers can be reset after operation but should be isolated if they trip more than once until the fault has been found



Cables

A cable is one or more conductors each covered with insulation to provide protection from shock.

The insulation itself is therefore very important and must be protected as appropriate and checked and tested regularly for damage.

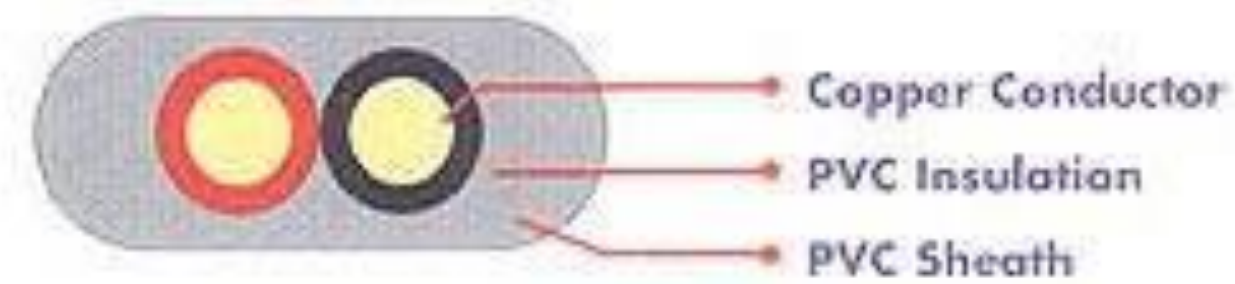
The type of cable and sheathing chosen will depend on the environment in which it is to be installed.



Wiring Types

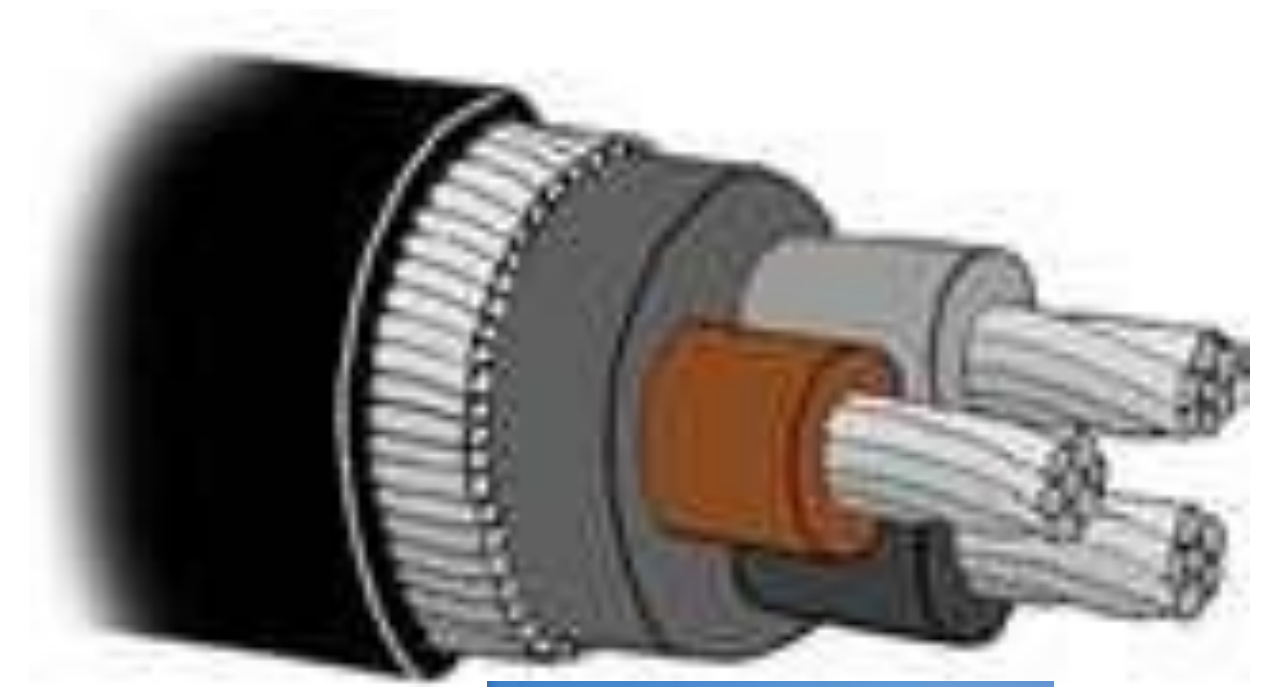
Wiring can either be run on the surface or concealed in the construction. Main wiring types are:

Sheathed. 2 or more wires each with their own insulation are enclosed in a protective sheath. This cable can be surface fixed or concealed in floors etc. However it must be protected by metal channels or conduit when buried in a wall where it could be accidentally damaged e.g. by a nail.

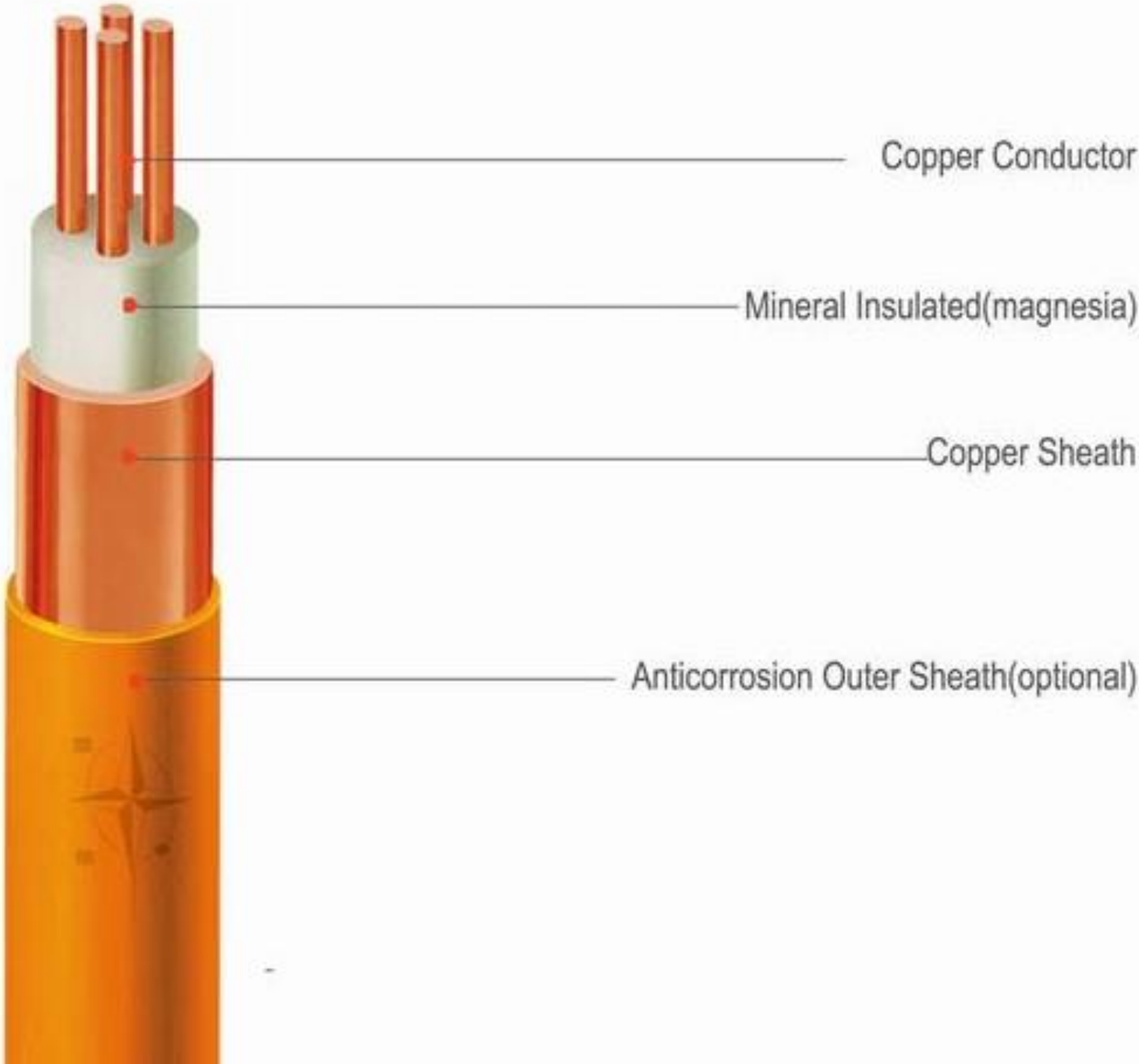


Wiring Types

- SWA (steel wire armoured) cable is extremely robust and can be laid directly in the ground if necessary.
- Fire resistant cables (MICC, FP200 etc) still operate in fire and, although expensive, are often used on fire alarm and emergency lighting circuits.



MICC cable (pyro)



Damp on MICC cables

- Damp and lime mortar can cause verdigris/corrosion of the copper outer sheath on MICC cables. Pinholes can then occur leading to breakdown of the insulation which is hygroscopic.



FP200 cable

- Easier to install and cheaper than MICC cable
- Insulation does not absorb water
- **Larger bending radius than MICC cable**





Wiring Routing

For convenience and safety, many cables are run in trunking or conduit. This can be made from plastic, aluminium or steel and is often integrated into the finished product.



What are the dangers with electricity?

Fire- if cables carry too much current they will overheat and may cause fire, damaging or destroying a building.

Can be prevented by good cable sizing,



Earthing

All metal surfaces on any equipment connected to an electrical supply must be connected to earth using the green/ yellow earth conductor in its cable.

Should the electrical equipment become faulty, persons will not then receive an electric shock.

Certain electrical equipment (electric drills) is doubly insulated and therefore does not require an earth connection.



Lightning

- There are more than 100 flashes of lightning per second on earth
- Each year 100 people are killed in Europe.
- The Empire State Building is struck 8 times per year.
- There are around 0.6 strikes/ sq. km each year in London and 0.3 strikes/ sq. km each year in Scotland
- Each strike discharges around 5000 billion watts of power- enough for a small town for 6 months



Lightning protection

A strong robust Faraday Cage system is usually installed using a grid of copper tape.

This is usually run along the ridge of a pitched roof or perimeter of a flat roof with a grid of at least 20m by 10m for large roofs.

Vertical down conductors are installed and these terminate in earthing rods in the ground.



Surge protection

- Nearby lightning strikes can hit overhead power lines and cause spikes on the supply cables.
- Surge arresters can minimise the effect on the building and its precious electrical systems.



Damage to electrical cabling

- Can be caused by physical damage
- Rodents
- Overheating
- Etc

Prevented by good physical containment, regular inspections and testing



Legislation

Electricity at Work Regulations 1989 regulation 4(2) provides that “As may be necessary to prevent danger, all systems shall be maintained so as to prevent, so far as is reasonably practicable, such danger.”

The IET Wiring Regulations are non-statutory.

Periodic testing

- Fixed electrical installation- normally every 5 years
- Portable appliance testing- frequency depends on risk assessment for equipment and how it is used.

Questions and comments

https://www.churchofengland.org/sites/default/files/2018-11/CCB_Electrical-wiring-installations-in-churches_Apr-2013.pdf