ISO9001 ISO14001 OHSAS18001

Electrical fires

Understanding, the first step toward staying protected

Oldlang Smart Electrical

Innovative Energy-Saving Emission Reduction
Leading The Recycling Econmy

www.Oldlang.com
Oldlang_sale@163.com

Good to know

What you need to know about electrical fires

Oldlang Smart Electrical

How domestic electrical fires start

1 Electrical fire, a constant danger.
2 Are fuses, circuit breakers, and surge protectors really enough?

Oldlang Smart Electrical

Where and how electric arcs occur

3 Poor electrical connections, a potential hazard.
4 Everyday situations, hidden risks

Oldlang Smart Electrical

Preventing the inevitable

5 Detection, the best way to stay safe.
6 Protecting your property made easy.
7 Arc fault detectors, for peace of mind.

Oldlang Smart Electrical

Good to know

In Europe, there is a domestic electrical fire every

3 mn

Of the 250000 fires

reported every year in France

25% are electrical in nature

Electric arcs kill **200** people per year in France, **3** times more than electrocutions

Good to know

70% of fatal fires start at night

Electrical fires are responsible for several million euros in damaged or lost property each year

Electrical fires can be prevented! Inside you will find everything you need to know about how electrical fires start, and how you can keep your home, property, and the people you love safe.


How domestic electrical fires start

What causes domestic electrical fires?

Electrical fires can be caused by a number of malfunctions:

- Short circuits
- Earth leakage current
- Overloads
- Lightning
- Overvoltages
- Dangerous electric arcs

Increase your knowledge

Electrical malfunctions, their causes and consequences

• **Short circuits** occur when two conductors come into contact. This causes the electrical current to increase sharply within a very short lapse of time, destroying electrical wiring and generating short circuit arcs that can catch any materials in the vicinity on fire.

• **Earth leakage current** generally occurs when the electrical insulation is damaged or in the presence of moistureZ or corrosion. The electrical current escapes from the circuit and naturally flows toward the earth or nearby conducting materials. Earth leakage current can cause fires or, if it comes into contact with a human body, electric shock or, worse, electrocution.

• **Overloads** occur when the electrical installation is overtaxed (like when you plug in a backup electric heater, for example) or when too many appliances are plugged into a single outlet. The wire or cord gets abnormally hot and can catch any materials in the vicinity on fire.

• **Lightning** can suddenly send extremely high voltages through electrical appliances, which can be destroyed or catch on fire.

• **Overvoltages** occur when an appliance operates at higher than usual voltage. If they last too long, overvoltages cause the appliance's components to get abnormally hot and can cause a fire.

• **Dangerous electric arcs** arise when a wire or cord is damaged or when an electrical connection becomes loose, creating a hot spot or leakage current resulting in carbon deposits which, over time, can be caught on fire by a subsequent electric arc.

What are the risk factors for electrical fires?

• One-fourth of electrical fires are due to:

- Outdated electrical installations:

worn or poorly insulated wires and cords

or

- Improper use of appliances:

plugging several home appliances into a single outlet, increasing the risk of a faulty connection;

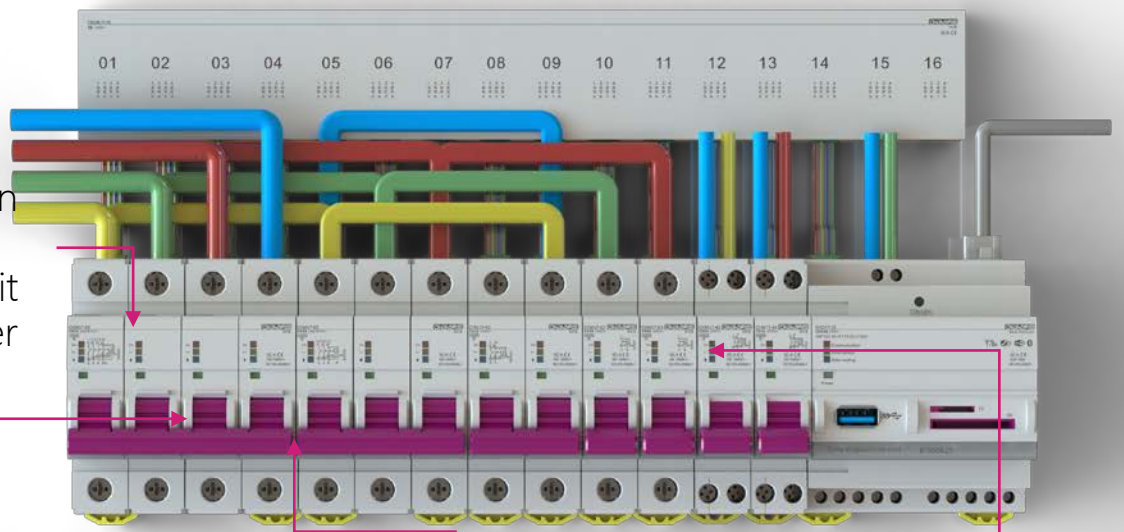
improper use of extension cords; a non-professional adding electrical outlets to the installation; exposing equipment to harsh conditions.

• **Wires and connections can suddenly burst into flames** and the fire can spread to nearby objects, even if there are no flammable or explosive materials or substances in the vicinity of the electrical incident.

An electrical fire can happen anywhere, at any time regardless of the age and condition of your home and its electrical installation.

What you need to protect your home from electrical fires?

The safety devices in your electric switchboard required by international standard IEC 60-364 (and even those required by the most recent standards) cannot protect you from all types of electrical hazards.



Overvoltages
In many countries, an overvoltage trip function is either recommended or required (at the circuit breaker or main incomer breaker).

Lightning
Surge protectors are required in some cases.

Earth leakage current
Residential building codes require residual current devices.

Short circuits and overloads
Circuit breakers or fuses. Your electric switchboard must have one of the two.

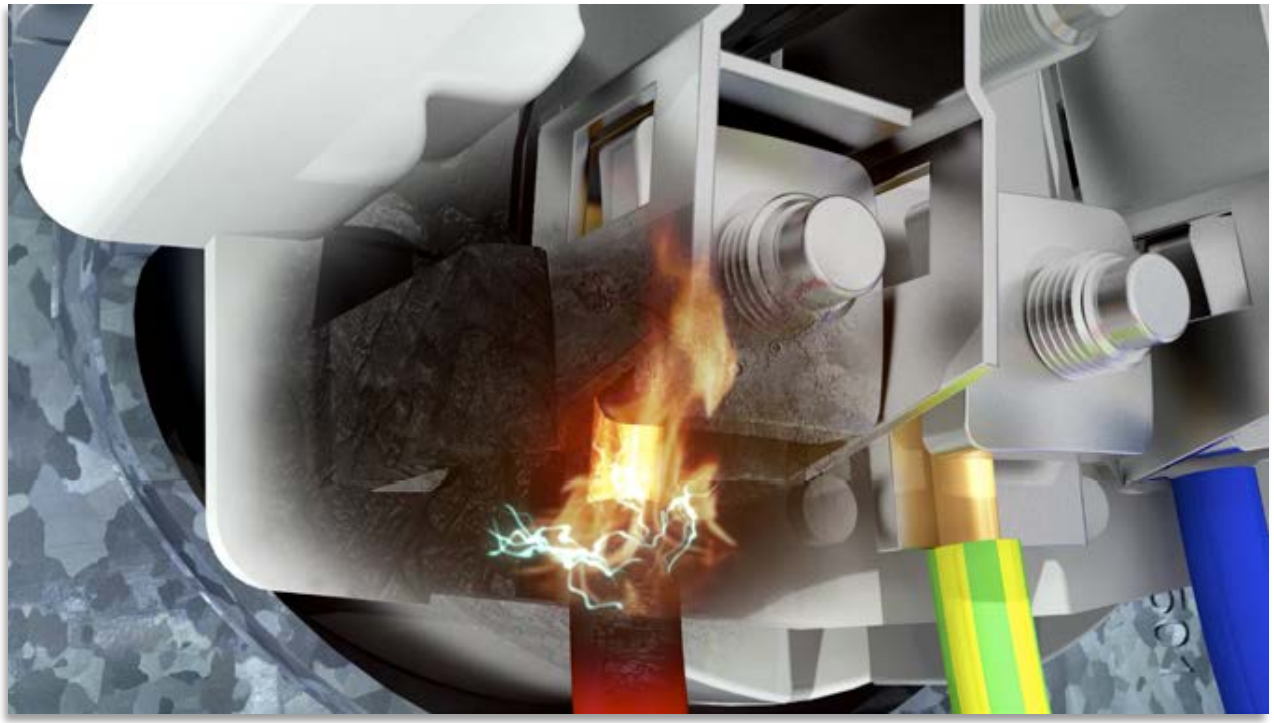
Smoke detectors send the alert and help keep people safe

In the United States and Canada, smoke detectors have been required in residential buildings for two decades. The requirement is more recent in the United Kingdom and Scandinavian countries, and will soon come into force in France.

In the event of a domestic fire, the smoke detector alerts the home's occupants to the danger. Of course, while smoke detectors cannot keep a fire from starting, they do save lives. In countries where smoke detectors are mandatory, fire-related deaths have been reduced by half.


Where and how
electric arcs
occur ?

How electric arcs cause fires



Bucking the conventional wisdom

• I thought electrical fires could only start in the vicinity of flammable materials.

Wrong! Electric arcs release a substantial amount of energy, causing the temperature to rise to several thousand degrees. Which means that a damaged electrical wire or cord can catch on fire all by itself.

• Doesn't the current have to be really high for an electrical fire to start?

Not necessarily! At 230 V and 2.5 A it only takes one second for damaged electrical insulation to catch on fire!

How electric arcs cause fires

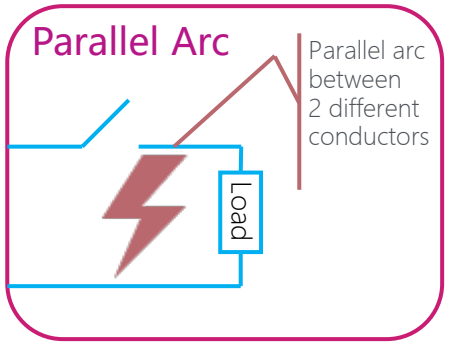
Dangerous electric arcs, a potential cause of fire.

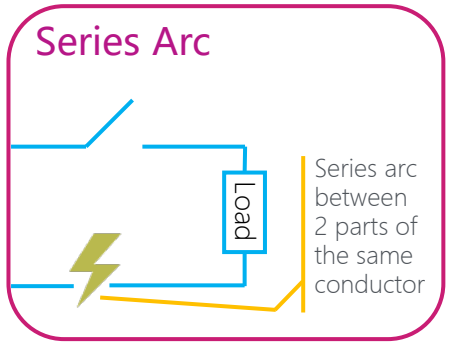
An electric arc is a discharge of electricity inside the insulation of an electrical connection or damaged wire.

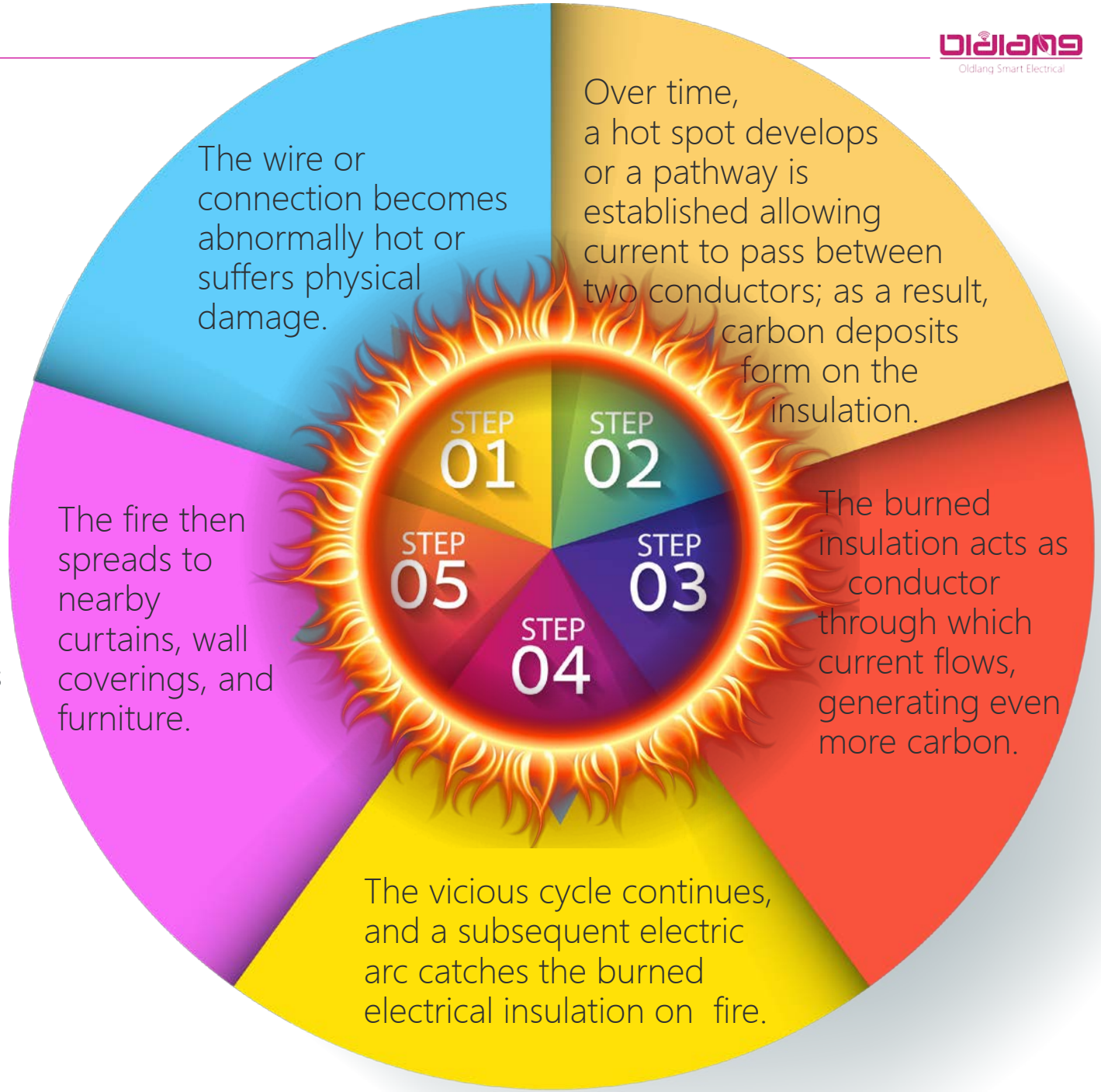
Electric arcs occur in a specific location and set off of a chain of events that can ultimately cause a fire.

There are two types of electric arc:

- Parallel arcs, which occur between two different conductors
- Series arcs, which occur between two parts of the same conductor







Increase your knowledge

How parallel and series arc faults occur

Parallel electric arc faults are a type of short circuit (also called "slow" short circuits). Because they occur gradually, they cannot be detected by your circuit breakers. This type of arc fault has two causes:

- **Damaged insulation** (like an electrical cord that has been left in a bent position for a long time).

The electrical current forms a pathway between the phase and neutral, creating electric arcs. Each electric arc burns the insulation, and the burned insulation ultimately catches on fire.

- **A damaged conductor** (like a vacuum cleaner cord that becomes weakened by harsh use).

The damaged spot on the conductor creates an area of high electrical resistance resulting in a hot spot (the insulation becomes abnormally hot in that location). The excessive heat slowly burns the insulation. The burned areas then create a pathway through which current can travel between two conductors, ultimately catching the wire or cord on fire.

Oldiang
Oldiang Smart Electrical

Increase your knowledge

How parallel and series arc faults occur

Series electric arc faults are caused by a single damaged conductor (like when an improperly used extension cord gradually gets hot).

The excessive heat slowly burns the insulation. The current continues to travel through the burned areas on the insulation, causing electric arcs and, ultimately, fire.

What everyday situations contribute to causing electric arcs?

Electric arcs are caused by two main factors:

Behavioral

- Improper use of electrical wires/cords and connections (or use of low-quality equipment): poorly mounted outlets, repeated careless plugging and unplugging, etc.
- Inappropriate or excessive stress to equipment: cords pinched behind or under furniture, twisted or bent cords, etc.

Environmental

- Subjecting cords and connections to harsh conditions: bumping objects up against cords running along walls or baseboards, heat, cold, moisture, UV rays, rodents, etc.
- A non-professional adding on to the existing electrical installation

Tips from a pro

Whether it is indoors or out, electrical cords inevitably get damaged. Loose electrical outlets and worn electrical cords are easy to see. However, with more and more electric appliances and devices, it is hard to keep an eye on everything you have plugged in throughout your home. The only thing you can do is take care not to pinch electrical cords behind or under furniture, overload electrical outlets, or use multiple extension cords—all "little things" that can cause serious damage. Fortunately, there are now ways to stay safe.

Christian, age 55
firefighter, Paris, France


Preventing
the inevitable

Protecting your home against electric arcs

When it comes to electric arcs, prevention is the best and only way to stay safe.
Today, there is a simple solution: the arc fault detector. Developed through years of scientific research, this new system prevents fires by detecting dangerous electric arcs. The device only trips (switching off power) if an arc is dangerous.

The device's integrated electronics are programmed to detect only those electric arcs that are dangerous. When a dangerous arc occurs, the detector trips, cutting the concerned circuit off from the rest of the installation.

The arc fault detector: 15 years of use in the US, where they are called arc fault circuit interrupters (AFCIs)

Arc fault detectors have been in use for around 15 years in the United States (and have been required for around a decade). The devices have significantly reduced the number of arc-related electrical fires.

Learn more at: www.nfpa.org

An expert's opinion

Electric arc testing and research carried out in several countries allowed us to distinguish between two types of electric arcs. The first are "benign" electric arcs which occur all the time in an electrical installation without presenting a fire hazard. And the second are dangerous electric arcs.
These occur randomly, but share characteristics like intensity, duration, and instability.
We started by looking at electrical parameters to determine a threshold above which an arc is considered dangerous. Our R&D team then set out to develop a new worldwide product standard (via the International Electrotechnical Commission, or IEC, the organization that establishes standards for electricity, electronics, and related techniques). The standard aims to ensure:
• Proper operation of the device in the event of a dangerous electric arc
• Sufficient responsiveness to prevent fires from starting
• Compatibility with appliances and devices that generate non-dangerous electric arcs

Pascal
R&D Manager, Schneider Electric

Increase your knowledge

How arc fault detectors work

An arc fault detector monitors in real time a number of different electrical parameters on the circuit it protects. It is designed to pick up information that indicates the occurrence of a **dangerous electric arc**.
This information includes deformation of the electrical current sine wave when it goes through zero, which indicates the need for minimum voltage for the current to flow. This occurs, for example, when the current only flows after the occurrence of an arc, which requires a certain minimum voltage.

To ensure that the arc fault detector only trips on dangerous electric arcs, several sources of data from different electrical parameters must be analyzed simultaneously.
This is due to the fact that harmless electric arcs appear frequently during normal operation of an electrical circuit (switches, relay contactors and other command systems, and the motors of the various loads plugged in to the circuit).

Therefore, the arc fault detector must analyze a wide variety of electrical parameters that include:

- The presumed intensity of the arc (which is not considered dangerous if it does not exceed 2.5 A)

- The duration of the arc detected (switches produce arcs of short duration during normal operation)

- Irregularity (arcs produced by motors are regular enough not to be considered dangerous)

- Disturbances at different frequencies that occur when an electric current passes through heterogeneous materials.

Installing an arc fault detector

Arc fault detectors are easy to install.

Depending on the country, your electrician will do one of the following:

- Add an arc fault detector in series with your usual circuit breakers or fuses
- Replace an existing circuit breaker with a circuit breaker with arc fault detection capabilities

Both installation methods are effective at protecting your home from previously-undetectable fire hazards.

Which circuits should be protected?

So-called high-risk circuits should be equipped first.

- Circuits with aging wiring
- Circuits most likely to be damaged, such as outdoor circuits exposed to the sun's UV rays, circuits with cords or wires running along baseboards likely to be bumped by furniture and other objects, circuits in attics and basements exposed to rodents, and circuits in wet areas
- Circuits with outlets, extension cords, and junction boxes that are subject to frequent use

On average, three arc fault detectors per home is a good rule of thumb.

Kill two birds with one stone!

If you are planning to have smoke detectors installed by your electrician, take advantage of the opportunity to ask about arc fault detectors and which circuits in your home should be equipped first.

What happens when an arc fault detector trips?

When the arc fault detector trips, it means that the device has detected an electric arc considered dangerous to your installation and has disconnected the damaged circuit.

You can keep your electrical installation operating safely by:

Checking outlets, cords, and wiring for damage as often as possible:

- Are all wires and cords in good condition (insulation is free from tears and cuts and wires have not been bent or pinched)?
- Are any wires pinched behind or under furniture?
- Are all outlets properly mounted and in good condition?
- Are all connections tight?
- Do any cords and outlets have a sooty residue or smell burned?

If your arc fault detector trips and you can't find the problem, call a licensed electrician.

Innovative Energy-Saving Emission Reduction
Leading The Recycling Economy

Oldlang Smart Electrical

www.Oldlang.com
Oldlang_sale@163.com