



White paper

DO YOU NEED THIRD PARTY CERTIFICATION FOR YOUR WIRE AND CABLE?

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Do I need third party certification for my wire and cable?

Poor quality and non-compliant electric wire and cables are sold and installed throughout the world. Substandard wire and cable significantly increase the probability of circuit failure and greatly increases the risk of fire. Non-compliance is common in conductors, in insulation and in sheathing materials. Electric cables are particularly important because the insulation and sheath materials often represent a significant percentage of the fixed fire-load in constructions. They connect to all parts of buildings and can provide a path to propagate fire and spread smoke.

Cables provide the connectivity which keeps the lights on, air-conditioning working and the lifts running. Cables power our computers, office equipment and provide the LAN connections for computer networks, entertainment systems, telephones, PA and communication systems. Even mobile phones need to connect with wireless GSM antennas which in turn are connected to the telecommunications network by fibre optic or coaxial cables. In addition, electric cables enable the life safety, firefighting and security systems by connecting fire alarms, smoke and heat detectors, break glass alarms, fireman's telephones, early warning intercommunication systems and closed-circuit television. They connect smoke extracting fans and shutters, air pressurisation fans and dampers, emergency and exit lighting, fire sprinkler pumps and so many other features of a modern building management system.

So where can it all go wrong?

Electrical malfunctions cause 13% of residential fires in the USA with electrical distribution and lighting systems responsible for almost 50% of these fires. Of these, 67% are directly attributable to electrical wiring and its related equipment according to NFPA research [4].

This correlates well with similar international research in developed countries [1], [2], [3], although it is recognised these percentages may well be higher in countries with less stringent electrical regulation. Figure 2.

Figure 1. Home fires involving Electrical Failure of Malfunction by equipment involved in ignition 2012-2016

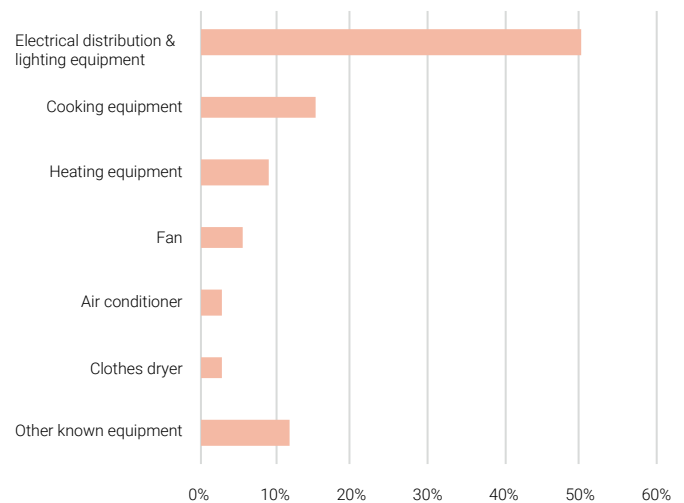
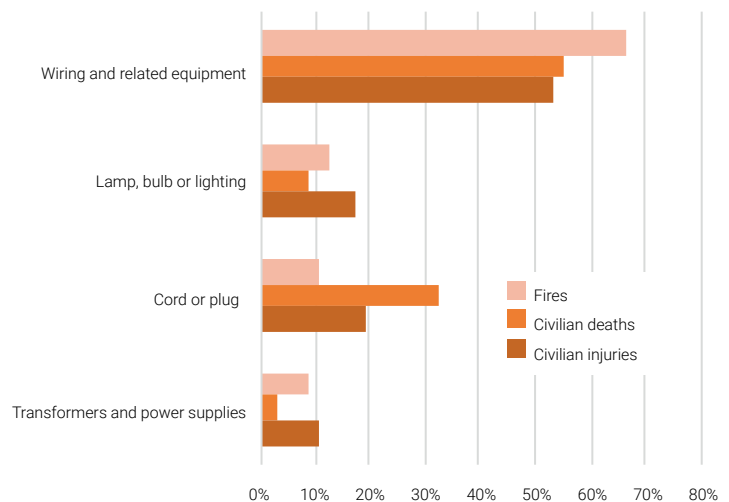


Figure 2. Types of Electrical Distribution or Lighting Equipment involved in home fires 2012-2016



The structure of cable

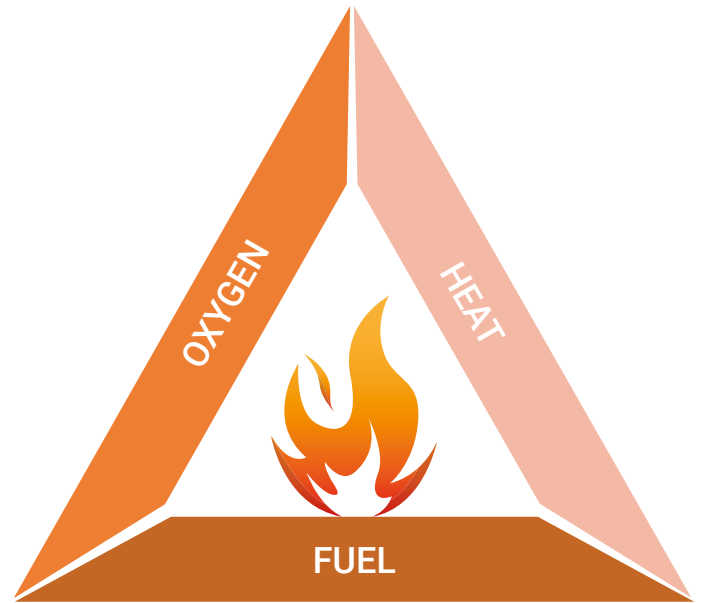
The insulation and sheath layers of flexible wire and cable are made of polymers (fuel). The Fire Triangle shows that combustible materials (fuel), oxygen (air) and ignition (spark, heat) are the only necessary elements for a fire to start. Where installed in air and heated by external or internal temperature sources (current, voltage), pyrolysis gases can be released to both ignite and support combustion.

Electric cables are one of the few products in a building that have all 3 elements needed to start a fire.

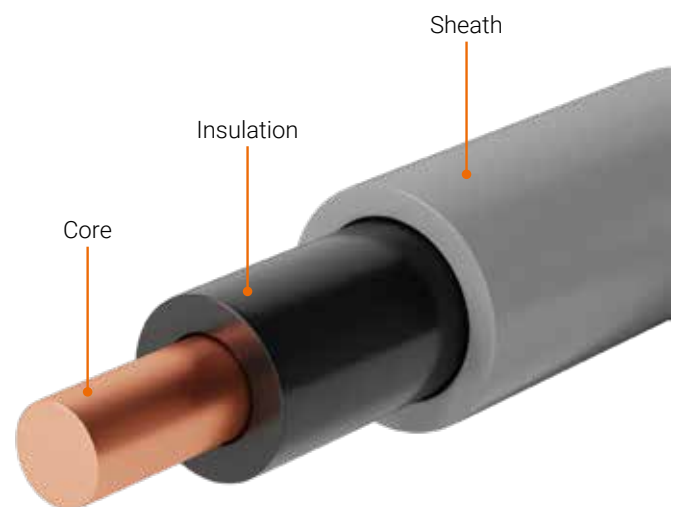
Most common flexible cables are made from hydrocarbon (oil) based polymers. These base polymers are often not flame retardant and have high calorific values (fuel element), so cable manufacturers add chemicals to make them more suited to electrical cable use. Halogens like Chlorine are particularly good additives which help retard flame propagation and do not significantly impact the dielectric properties of the polymer, so halogens are used in both cable insulations and in cable sheaths. These halogenated polymers (example: PVC) can have a negative side effect in fire, because they will release the halogens as halides which are toxic and when combined with the moisture in eyes, mouth and lungs are very irritant. Often standard PVC cables can also release large amounts of acrid smoke.

Authorities, specifiers and designers often realise the dangers of fire spread, halogen & toxic gasses, as well as the smoke release from cables in fire, so they specify cables to have 'Halogen-free', 'Flame-retardant' and 'Low-smoke' properties (as required by the European/UK CPR regulations). For these cases, cable manufacturers need to use non-halogenated materials, mostly with flame retarding fillers. While effective in retarding flame propagation, some of these fillers may negatively affect the polymer by reducing dielectric performance or affecting mechanical properties and water resistance. For this reason, many non-halogen flame retardant additives are used only in the cable sheath.

Halogen-free flame-retardant cables most often use purer polymers like Polyethylene (PE/ XLPE) or EPR for the insulation, which have good electric and mechanical properties but may not be very flame retardant.



Often the best flame-retardant cables are halogenated because both the insulation and outer sheath are flame retardant. When we need Halogen-free cables, we find it is frequently only the outer sheath that is flame retardant and the inner insulation is not. This has significance because while cables with a flame-retardant outer sheath may pass flame retardance tests with an external flame source, the same cables when subjected to high overload or prolonged short circuits have proved, in industry tests at universities, to be highly flammable and can even start a fire [11].



Worldwide application

In the USA, many building standards do not require halogen free cables. This is not because Americans are not aware of the dangers, rather the approach taken is that: "It is sometimes better to have highly flame-retardant cables which do not propagate fire, than minimally flame-retardant cables which may spread or contribute to a fire". A small fire with some halogens may be better than a large fire without halogens.

The United Kingdom, Europe, Australia and many other countries around the world often have a different approach, preferring both Halogen-free and Flame-retardant performance. Whilst this seems desirable, the reality can be rather different. In asking for both flame retardant and halogen free properties, cable manufacturers must often compromise between using halogenated materials with high flame retardance, or using non-halogenated materials, which can have reduced flame retardance or compromised cable performance in other areas.

This is not an easy balance for wire and cable and compound manufacturers, but many reputable wire and cable manufacturers do achieve an optimum performance and achieve full standards compliance for their products. The difficulty comes when these quality cable manufacturers must compete in markets where regulation or specification does not mandate third party accreditation and allows producers to self-certify their cables. This makes any desktop comparison or assessment of cable quality between suppliers virtually impossible.

Non-compliant cables

Of note is Australia, where manufacturers and importers have been allowed to self-certify electric wire and cable, for fixed installation in buildings to respective manufacturing and performance standards. This resulted in some manufacturers and importers bringing into the market low price, low quality products, which were claimed to comply. On inspection it was found that they did in fact, not conform with local standards.

This situation initiated mandatory Government recalls of wire and cable from resellers and contractors, as well as ordering the removal and replacement of installed non-

compliant wire and cable from domestic, industrial and commercial buildings. This situation is now causing huge financial and legal problems for the industry.

Building owners, operators, builders and installing contractors are being held liable under law for:

- ✓ Rectification orders and other sanctions
- ✓ Prosecution, fines and potential loss of licences, if the sanctions are ignored
- ✓ Financial liability in case of property damage, injuries or loss of life

Between 2010 and 2013, 3.9 million meters of non-compliant cable was imported into Australia. Currently 403km have been recovered from warehouses, 283km installed have been remediated, 787km are planned for remediation but over 2,400km are still installed, much in unknown buildings [7].

The Commonwealth of Australia, along with State regulators, have determined that the cables failed to meet safety standards due to poor quality plastic insulation coating. Tests have shown that the cable may become prematurely brittle, from 2016 onwards, which could cause fires or electric shock if the cables are disturbed. Regulators have since implemented mandatory one-off testing for building wire, but many other cables are still not regulated.

For this reason, it is imperative that the cables you choose, for your projects, fully meet the requirements of all cable construction and performance standards.

In addition to the potential fire or shock risk, it is highly unlikely insurance companies will insure or honour their obligations to policies for domestic, industrial and commercial buildings where non-compliant cables are installed [12]. As a manufacturer or specifier, this is not a conversation you want to have with your customer.

Of course, Australia and New Zealand are not the only countries exposed to non-compliant and dangerous wire and cable products. The UK has had similar issues, and in 2010, 11 million metres of cable was recalled [10].

Unfortunately, it is not only Australia and UK which are exposed to the impacts of poor cable quality.

China, India, Europe, Malaysia, USA, Canada, New Zealand have all reported cases of non-compliant wire and cable. South Korea was forced to suspend the operation of two nuclear power stations and extend a shutdown of a third station in 2013, due to electric cables which were supplied with fake certificates [14].

In many other countries where there is no mandatory requirement for third party certification of electrical wire and cable, it is certain that there are many millions of meters of non-compliant cables already installed. This creates a serious contingent liability for building and asset owners as these cables age and become more dangerous.



Source: © Commonwealth of Australia

Who is BASEC?

BASEC – the British Approvals Service for Cables, focuses exclusively on serving the needs and customers of the worldwide wire and cable industry. Established in 1971, BASEC is recognised as the mark of reassurance for those manufacturing, specifying, buying and installing cable. The BASEC name is synonymous with quality and safety with cable certification and testing services trusted and respected around the world.

BASEC is accredited by UKAS for ISO/IEC 17065 for product certification, ISO/IEC 17025 for testing, and ISO/IEC 17021-1 for quality management systems and environmental management systems certifications. This accreditation is accepted by IAF MLA partners in 89 countries. BASEC also holds Notified Body status in the UK (NB2661) and Europe (NB2851).

What does BASEC do?

Working to worldwide standards, BASEC ensures that wire and cable products meet all the appropriate national and international standards. In carrying out detailed examinations of manufacturers' management systems, production processes with regular, rigorous electrical, physical and fire testing, BASEC assesses product performance and compliance to:

- ✓ International standards
- ✓ European standards
- ✓ British and other national standards
- ✓ Private specifications
- ✓ Sector-specific standards e.g. rail, marine etc
- ✓ Utility standards

BASEC provides a testing, accreditation and listing service for manufactures of wire and cable products.

Why BASEC?

BASEC is the only testing, certification and listing service exclusively for wire and cable. This means BASEC has an unparalleled knowledge of wire and cable materials, technology and performance. A team of technical cable experts has been built to ensure a deep understanding of the constraints cable manufacturers experience. In partnering with the cable industry, BASEC works closely to ensure the consistency of quality and performance for cables.

Comprehensive product testing and approvals provides specifiers, purchasers and contractors with the peace of mind that the cable they use is compliant, safe, fit for the intended purpose and will provide years of reliable service.

The BASEC certification scheme is recognised as one of the most demanding in the industry. Manufacturers of BASEC approved cables are subject to regular factory inspections and cables are sampled and tested several times a year to ensure ongoing conformity.

This thoroughness means that when specifiers, end users, purchasers and contractors demand BASEC approved cable they can be sure that the first meters of cable supplied, to the last meters delivered, will all fully meet the required quality standards and conform with the relevant regulatory requirements.

What BASEC means to you?

As an authority, designer, contractor or end user:

When you demand BASEC product certification (PCR) you ensure that all of the wire and cable purchased and installed, in your projects, will fully and consistently meet all criteria of the required production and performance standards. It will cost you nothing, while ensuring non-compliant wire and cable is excluded.

Third party accreditation means you do not need to rely upon and accept manufacturer or distributor provided test reports. You can be sure that the manufacturer and the products supplied are both valid and continuously monitored, so that the first meters installed are as compliant and current as the last meters installed. You can check the accreditation status of all approved manufacturing companies, their production plant and products on BASEC's online, homepage search service at www.basec.org.uk

As a wire and cable manufacturer:

Obtaining the BASEC Product Certification Requirement (PCR) tells your local and export customers that you are a world class, responsible and quality manufacturer of wire and cable. It tells them that you commit to third party accreditation because you want your customers to know they can rely on you for consistent quality, of both product and performance. It demonstrates that your company and manufacturing process continuously improve, adopt world's best practice and have nothing to hide.

Gain your competitive advantage with BASEC product certification, by differentiating your products from the many cheap competitors. Product certification defends you:

- ✓ Cable price
- ✓ Value proposition to customers
- ✓ Differentiates you from many cheap competitors
- ✓ Reinforces your market reputation, and
- ✓ Positions you as a technology leader

Compliance to both the BASEC PCR and the EU required CPR gives you access to major projects and markets where specifications and regulations request evidence of third-party certified cables.

The BASEC certification process works together with your quality teams and processes to identify areas for continuous improvement, thus improving your productivity and quality.

Conclusion

In today's world of free trade agreements, instant communication and fast, inexpensive transportation of goods, competition for supply of building products around the world has become truly international. Unfortunately, regulation has remained largely national and the effectiveness of national laws across international borders is complex at least.

Many builders under extreme competitive pressure, have been taking advantage of this internationalism of supply, choosing and even chasing ever more competitive offers for building products from around the world. This has led to producers in some, less regulated, countries making products which may claim compliance but in practice or production fail to meet or maintain compliance. Whilst excluding the many cases of falsification of test reports and documents, even good-intentioned producers without the pre-requisite management systems and controls can struggle or fail to maintain consistent quality.

Where electric cables are required for fixed installation in buildings and for major public infrastructure projects, safety must always be the priority. This is why building regulations are mandated by governments, and product compliance with national and international standards are often required by law.

Unfortunately, in the case of many opportunistic trading companies, who are commonly established with minimal capital and limited liability, have evaded responsibility by simply syphoning profits and declaring bankruptcy, leaving the significant legal and financial liability to be shouldered by the installing contractors, building owners and operators.

In Australia, and in many other countries, an official product recall means that the cost and liability for remedial process of removal and replacement falls on the installing contractor and/or project owner [7] [8]. This may also have ramifications for designers and consultants where it can be shown 'reasonable skill and care' may not have been applied [13].

Analysis after the Grenfell disaster in London, as can be seen in the "Building a Safer Future. Independent Review of Building Regulations and Fire Safety" 2018 [6] and from the Australian Building Products Innovation council report "Rebuilding Confidence" 2018 [5], have identified many deficiencies in regulatory responsibility in these countries. The message, however, for many other countries around the world is exactly the same.

The question for authorities, owners, operators, consultants, designers, contractors and installers today must be:

"What can I do to prevent the risks of non-compliant products being used on my projects or in my equipment?"

The answer for wire and cable products is simply to demand third-party product accreditation for all Low and Medium Voltage fixed wire and cable products.

The BASEC PCR & CPR approvals provide the best possible assurance, that cables purchased and installed will consistently meet or exceed all the required product manufacturing standards and operational performance requirements.

The Author



Richard Hosier is the Regional Technical Manager in Asia for the BASEC organisation. He has lectured at institutions and universities around the world publishing technical articles including 2 JICABLE papers on advanced fire safe cable design. He was the winner of the Institute of Fire Protection Officers UK technical trophy award in 2014 for his research into fire performance wiring systems and previously served on 3 Australian and New Zealand technical standards committees for fire safe wiring systems and cables.

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Contact the experts at BASEC today via marketing@basec.org.uk to organise an on-site educational seminar, or to schedule an online presentation. These are provided free of charge to industry organisations, manufacturers, authorities and consultants.

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