

Fire suppression for electrical panels.

Electrical panels are present in most industrial and commercial premises as part of the power supply network that feeds electricity into the site and distributes it around the buildings. They differ in size, purpose, voltage and power levels and are critical to business continuity. They also present a risk of causing electrical faults and fires and managing these risks effectively is important for any business.

When fires occur in electrical panels the typical costs associated with the fire range between £5k and £50k provided the fire remains within the panel. This is often under the threshold of the insurance excess for many companies and can't be recovered through an insurance claim. Typical costs include

- > replacement of the damaged electrical panel and associated labour costs
- > fire/heat/smoke damage to other equipment and the building structure
- > clean-up costs for the smoke and heat damage within the building
- > increased costs of working by alternative means at alternative premises or for longer hours
- > loss of sales due to business interruption.

Unfortunately, when a fire escapes from an electrical panel and ignites nearby combustibles or combustible construction there is no limit to the potential for fire spread. This is one of the reasons insurers ask for all combustibles to be removed from electrical plant rooms or kept at least 1.5m clear of any electrical panels or equipment in open areas.

In the worst case a fire that spreads can result in the total loss of one or more buildings. Historically many multi-million pound losses have been marked with the cause 'probably electrical ignition' by Loss Adjusters and Fire Officers. Even if only a small proportion were due to electrical ignition the losses to industry and insurers can't be ignored.

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Risk control for electrical panels

Regulatory requirements in all territories dictate that formal electrical maintenance programmes are in place for electrical panels and equipment. This includes visual and physical maintenance activity carried out by suitably qualified employed or contracted Electrical Engineers. Good examples are fixed wiring inspections, infra-red thermography, portable appliance testing and HV equipment checks.

QBE supports the use of formal electrical maintenance programmes for obvious reasons. They help identify and rectify electrical fault conditions or the potential for faults

to develop and cause equipment failures, fires, explosions or business disruption leading to significant insurable losses for clients.

The justification for fire suppression, though, is not driven by regulatory requirements but by the requirement to protect property and maintain business continuity. The costs of damage and disruption from electrical panels can be significant and minimising the impact of a fire in electrical panels is an important risk control measure.

When is fire suppression needed?

Combustible construction

Fire suppression should be installed for electrical panels located in areas with combustible construction. This is especially the case where construction is predominantly wood (timber floors/joists/mezzanines) or combustible foam insulated composite panels (EPS, PUR, PIR) or other plastic walls/ceilings, irrespective of certified fire ratings.

The following guidance should be applied:

- > Freestanding electrical panels within 3m horizontally of combustible walls or within 5m vertically of combustible ceilings should have automatic fire suppression installed within the electrical panels. Alternatively, the combustible walls and ceilings should be replaced or covered with at least 1-hour fire-rated non-combustible materials.
- > Wall-mounted electrical panels affixed to walls of combustible construction should have automatic fire suppression installed within the electrical panels. Alternatively, the wall behind and ceiling above should be lined with 1-hour fire-rated non-combustible materials for a distance extending 3m horizontally either side and 5m above the electrical panels. In all cases, wall-mounted electrical panels should be stood at least 75mm off the wall using metal fixings and brackets.
- > All openings or penetrations through the walls/ceilings/roofs within 3m horizontally or 5m vertically of the electrical panels should be sealed to an equivalent 1-hour fire rating and inspected regularly to ensure they remain in good condition.

Business criticality:

Fire suppression should be installed for electrical panels that are business critical. A criticality assessment should be conducted to determine the level of criticality of each electrical panel and the parameters for 'Significant' criticality should be determined for each business individually.

The following guidance should be applied:

- > Significant Criticality (QBE Definition): A fire affecting only the electrical panel that could cost >£50k or lead to 10 days or more business disruption should be fitted with automatic fire suppression.
- > Moderate Criticality (QBE Definition): A fire affecting only the electrical panel that could cost £10k-£50k or lead to 3 days or more business disruption should be considered for automatic fire suppression if there are other influencing factors to take into account. Examples could include priority customers, no buffer stock due to 'Just-In-Time' deliveries, unique products etc.

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Limited accessibility:	<p>Fire suppression should be installed for panels in areas of a building that are difficult to access or not visible to operational staff to react to isolate the power. Roof voids and plant rooms are good examples of such areas of limited accessibility.</p> <p>The following guidance should be applied:</p> <ul style="list-style-type: none"> > Electrical panels that are located in roof voids, locked plants rooms or other areas of the building not normally visible to operations staff or not easily accessible to isolate power should have automatic fire suppression installed. > The presence of combustible construction or continuity of combustibles in adjacent areas, or significant business criticality would enhance the justification for fire suppression for difficult to access electrical panels. > Fire suppression is not required if difficult to access electrical panels are in closed non-combustible rooms with limited or no other combustibles, with all penetrations from the room properly sealed and are of low business significance.
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What types of panels is fire suppression needed for?	
Low Voltage (LV) Distribution Boards & Panels	<p>Required if Combustible Construction, Business Criticality or Inaccessibility conditions apply.</p> <p>LV distribution boards/panels are used to transfer power from the incoming LV switchgear panels to key locations around the factory and onwards to the equipment. These panels are usually enclosed in fire-rated rooms or located in the open but enclosed by locked metal cages. Distribution boards/panels are often combined with local area control panels that feed power onwards to equipment control panels.</p>
Motor Control Centres (MCCs)	<p>Required if Combustible Construction, Business Criticality or Inaccessibility conditions apply.</p> <p>Motor Control Centres house high power equipment dedicated to high energy machinery. MCCs are usually located in closed rooms or enclosed by metal caging or fire rated walls and well separated from other equipment for safety reasons.</p>
Equipment Control Panels & IT/Comms Server Racks	<p>Required if Combustible Construction, Business Criticality or Inaccessibility conditions apply.</p> <p>Equipment control panels are often located adjacent to the equipment they control. They feed 'control' voltages to the equipment typically at 48V, 24V, 12V or 5V AC, or 100V or 60V DC, but the panels will also usually contain power supply voltages of 400V, 240V or 110V AC. Although operating at lower voltages, they are sources of higher currents (Amps) so can be more damaging in a fault condition, more harmful to people and propagate fire ignition far more quickly than higher voltage equipment.</p>
Low Voltage (LV) Switchgear Panels	<p>Not required: switchgear panels contain busbars and circuit breakers that feed the HV/MV power into a building from the HV/MV power transformers.</p>
High Voltage (HV) / Medium Voltage (MV) equipment	<p>Not required: HV/MV equipment is usually sealed and is used to transfer the HV power from the power transmission network/grid into the site at LV/MV power levels.</p>

See Page 5 for definitions of HV, MV and LV.

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Types of fire suppression for electrical panels

'Whole room' fire suppression for Information and Communications Technology (ICT) equipment in computer rooms or communications centres has been installed for many years because of the business criticality of such equipment. 'Whole room' fire suppression for critical electrical power supply rooms has also become a common installation in larger companies but is not prevalent throughout industry. There is significant difficulty in keeping rooms and enclosures sealed to prevent escape of the fire suppression medium; also, the cost of conducting annual room integrity testing is often seen as a real burden.

An alternative approach is to install fire suppression directly inside the electrical panels. This approach was used in a limited range of industries in the 1990s and gained popularity in the 2000s across a wide range of industrial sectors. The growth in popularity was partly due to the cost of 'whole building' and 'whole room' fire protection

being out of reach for many companies. However, it was primarily due to the recognition by businesses that they needed to invest to protect their own business continuity at a level they could afford and to directly protect their insurance excess.

Costs associated with 'in-panel' fire suppression can range from £2k to £10k for small to medium sized electrical panels but rises for large electrical panels. This is insignificant when compared to the potential costs of a fire loss even when the annual maintenance contract costs are included.

The cost for equivalent 'whole room' fire suppression systems can be above £25k and this doesn't include the costs to keep the room sealed or the annual room integrity test. As such the higher costs associated with 'whole room' protection systems mean they are often more difficult to justify.

Types of 'in-panel' fire suppression systems

Pressurised tube fire suppression	<p>A pressurised fire extinguisher is attached to the side/top of an electrical panel with a tube run through the panel in multiple loops to pick up potential 'hot-spots'.</p> <p>When a high enough temperature occurs to melt the pressurised tube, the fire suppression agent is released directly into the area where the 'hot-spot' or fire is occurring.</p> <p>These systems don't require a power supply and operate autonomously; however, they can be connected to trigger the site fire alarm.</p>
Fire detection actuated fire suppression	<p>A pressurised fire extinguisher is attached to the side/top of an electrical panel with one or more discharge nozzle piped within the panel enclosure. A heat detection wire is also laid within the panel at the top, often in a single line but it can be laid at more levels depending on the height of the panel or the extent of internal congestion.</p> <p>When a high enough temperature occurs within the electrical panel to activate the heat detection wire, the fire suppression medium is released from the pressurised fire extinguisher via the discharge nozzles throughout the panel.</p> <p>These systems have a control panel and require a power supply. They are usually set up to trigger the site fire alarm on activation.</p>
Fire suppression media	<p>Gaseous/liquid agents used over the years has changed as HCFCs have been banned and new agents have been developed. The most common agents are:</p> <ul style="list-style-type: none">> Novec™ 1230> FM 200™> Water mist> Wet chemical agent.

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The Institute of Engineering and Technology (IET) definitions for UK for electrical systems are as follows

High Voltage	Above 35kV AC	National Grid power distribution network.
Medium Voltage	Above 1kV to 35kV AC	Power transformers, switchgear panels and distribution boards.
Low Voltage	1kV AC and below or 1.5kV DC and below	Most electrical panels seen on industrial and commercial sites.
Extra Low Voltages	50V AC and below or 120V DC and below	Used within Control Panels for specific items of equipment, usually present in the same panels as 400V, 240V or 110V power supplies.

Note that International / North American codes have different definitions. For example, the International Electrotechnical Commission (IEC) that defines International Codes considers High Voltage as 'above 1kV AC' and there is no Medium Voltage category. The Institute of Electrical and Electronics Engineers (IEEE) that defines North American codes considers Low Voltage as 600V AC and below. With regards to fire suppression, it is the purpose, criticality and location of the panel/equipment that determines whether fire suppression is justified and what maintenance programmes are required.

Conclusion

Please contact your QBE Risk Manager or usual QBE contact if you wish to discuss your needs for fire suppression in electrical panels or for help with a criticality assessment.

To find suggested suppliers of fire suppression systems for electrical panels visit QBE's Risk Solutions Panel at qbееurope.com/risk-solutions/fsm-risk-solutions/specialist-service-providers/

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