Branching out: fire-safety enclosures for fuse-protected circuits

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For fire protection in large buildings such as railway stations, branch-level circuits are required to ensure that critical safety systems remain operational even if part of a system fails. However, introducing local fusing increases design complexity and thermal challenges, and the enclosures that protect these junctions require specialist fire-rated testing.

Chris Lloyd, Managing Director at Spelsberg UK, explains.

When it comes to safeguarding large buildings against the risk of fire, electrical circuits often include centralised overcurrent protection upstream. Typically installed with the main distribution equipment, devices like circuit breakers can secure entire groups of outgoing circuits. However, to ensure the safety of concentrations of people in large building complexes, branch-level protection can be required.

In these types of buildings, ranging from railways stations to football stadia, devices like fire alarms, smoke extraction systems, or emergency lighting need segregated branches to prevent a failure in one area of the circuit taking out the power to the whole system. The challenge, though, comes at the fuse; while fuses enable isolation and prevent a break of connection impacting the wider circuit, they can fail prematurely due to heat. In the event of a fire, when the device or system they're connected to is relying on them most, their protection is essential.

Protecting the fuse

Fire-rated systems require the simplest, most stable designs. Fewer components reduce the potential for failure during extreme heat, minimising weak points. Moreover, reducing connections means less complexity in certification and testing. By maintaining circuit breakers and fuses at a centralised point, electrical junctions need only protect straight-through connections. In these situations, while fire-protection enclosures are still required, providing between 30 and 120 minutes' protection in the event of a fire, the housings need to protect only the terminal blocks and cable junctions.

However, when branch-level protection and circuit isolation is required for fire safety design providing between 30 and 90 minutes' protection with devices and systems protected by decentralised fuses, this requires a specially designed enclosure. It's not just that the enclosure needs to have a larger volume, but adding fuses turns a fire-rated enclosure from a passive housing component into an active protection device. During a fire, heat can impact how the fuse reacts, so the enclosure must be able to resist temperatures and ensure conditions that maintain it, as well as protecting the terminal connections from degradation.

Real-world applications

The requirement for branch-level fire protection can apply to any large building that relies on life-safety systems where failure during a fire is unacceptable. Typical settings include football stadia and sporting venues; arenas and entertainment halls; as well as hotels and residential blocks, including prisons. Common requirements also include transport hubs, such as airports, as well as bus, coach and railway stations.

To protect an electrical circuit from fire at a railway station, an enclosure must also provide pressure suction resistance. Spelsberg's WKE 6T fire-protection enclosure, which can also accommodate fuses for branch connections, is pressure and suction-tight according to the Gotthard guideline. Named after the Gotthard Base Tunnel, the world's longest and deepest railway tunnel, the requirements mean equipment must withstand rapid pressure changes caused by events such as passing high-speed trains.

Tunnel-tested

As a result, the WKE 6T enclosure has been tested to ensure that its housing, seals, cable entries and cover remain intact and maintain their protective function when exposed to pressure loads. This prevents the enclosure from drawing in smoke, hot gases, or contaminants, or facing damage caused by pressure fluctuations. This testing is also in addition to the enclosure's IP66 rating, signifying that the housing is dust-tight and can also withstand high-pressure water jets, common during firefighting.

Pressure-testing also makes the enclosure well suited to use in rail, road and pedestrian tunnels, in addition to railway station applications. Alongside the WKE 6T, Spelsberg's Rapidbox enclosure enables the fast installation of cable taps and sockets from an existing power cable in tunnel applications without needing to cut the supply cable. Compared to installing a new cable, this approach saves significant time. Also providing up to 90 minutes' fire protection as part of the WKE range, the Rapidbox enclosure can accommodate heavy-duty cables up to 50 mm².

Fire safety specification

For building managers, as well as electrical designers and installers, navigating the regulations of fire-safety protection in large-scale buildings or tunnel infrastructure is demanding. With a multitude of materials and components to review as part of the overall design, advice from trusted suppliers and manufacturers is vital to clarify and simplify the process.

While enclosures play an essential role in the fire protection of electrical circuits in large-scale buildings, they're also a high-volume item installed throughout an installation. This reliance not only makes enclosures important to the long-term integrity of the overall system, but their selection also impacts the timescale of the project for installation.

As a result, enclosures with design features that enable fast fitting are key. Equally as important, partnering with an enclosure specialist that can advise on best practice in design will not only save time overall, but can also help create more effective fire protection systems.

Image captions:

Image 1: Spelsber's WKE 6T enclosure is tested to maintain complete structural and protective integrity under intense pressure loads.

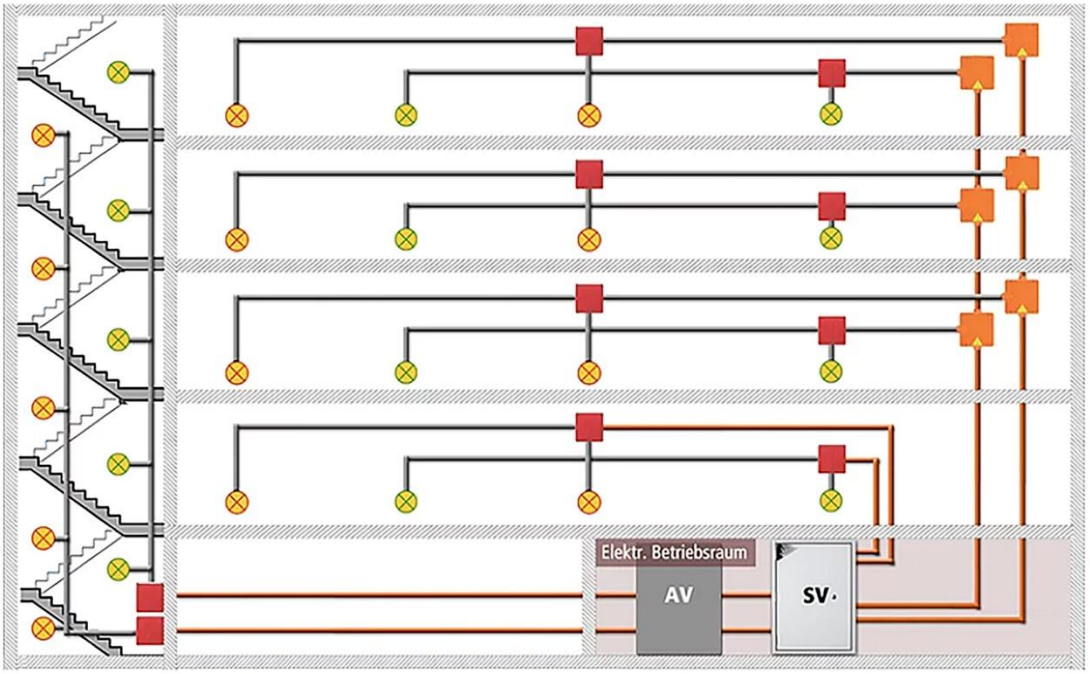

Image 2: AV: General power supply, SV: Safety power supply

About Spelsberg

Spelsberg is one of the largest manufacturers of electrical enclosures in the world. With over 4,000 enclosures available as standard and further customisation possible, it offers solutions for almost any application.

With the largest supply of non-metallic enclosures, ex-stock in the UK, its products are often available for delivery within 24 hours; customisation is possible on any product, including bespoke entries, engraved corporate logos or fitted terminals, within 48 hours. Products can be ordered direct from Spelsberg or from most leading supply specialists including RS, Rapid, Farnell and CPC.

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