



Clarifying Power Supply Requirements for Life Safety Systems & Addressing Common Misconceptions

White Paper
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This white paper is not an authoritative document and the reader should always refer to the British standards to ensure full compliance.

In the event of a building's mains failure, Life Safety equipment such as smoke detectors, fire alarms, building sprinkler systems and emergency evacuation lifts should have a dual power supply. A dual power supply will ensure power continuity, enabling the safe evacuation of personnel from the building.

DUAL SUPPLIES

Is it possible to use two mains supplies in a building, one as the primary and one as a secondary supply and comply with Life Safety requirements?

BS519 states that the secondary supply should preferably be a standby generator, but it does not rule out the possibility of a secondary mains supply; however certain criteria must be met. Firstly, it must be a completely independent High Voltage (HV) supply, not Low Voltage (LV).

Please note: The British standard refers to HV supplies, whereas the CIBSI Guidance BG70 also refers to Medium Voltage (MV) supplies, so for this purpose, we can presume that either HV or MV supplies are acceptable).

Dual supplies must meet BS9999; 2017 requirements as detailed in the following points:

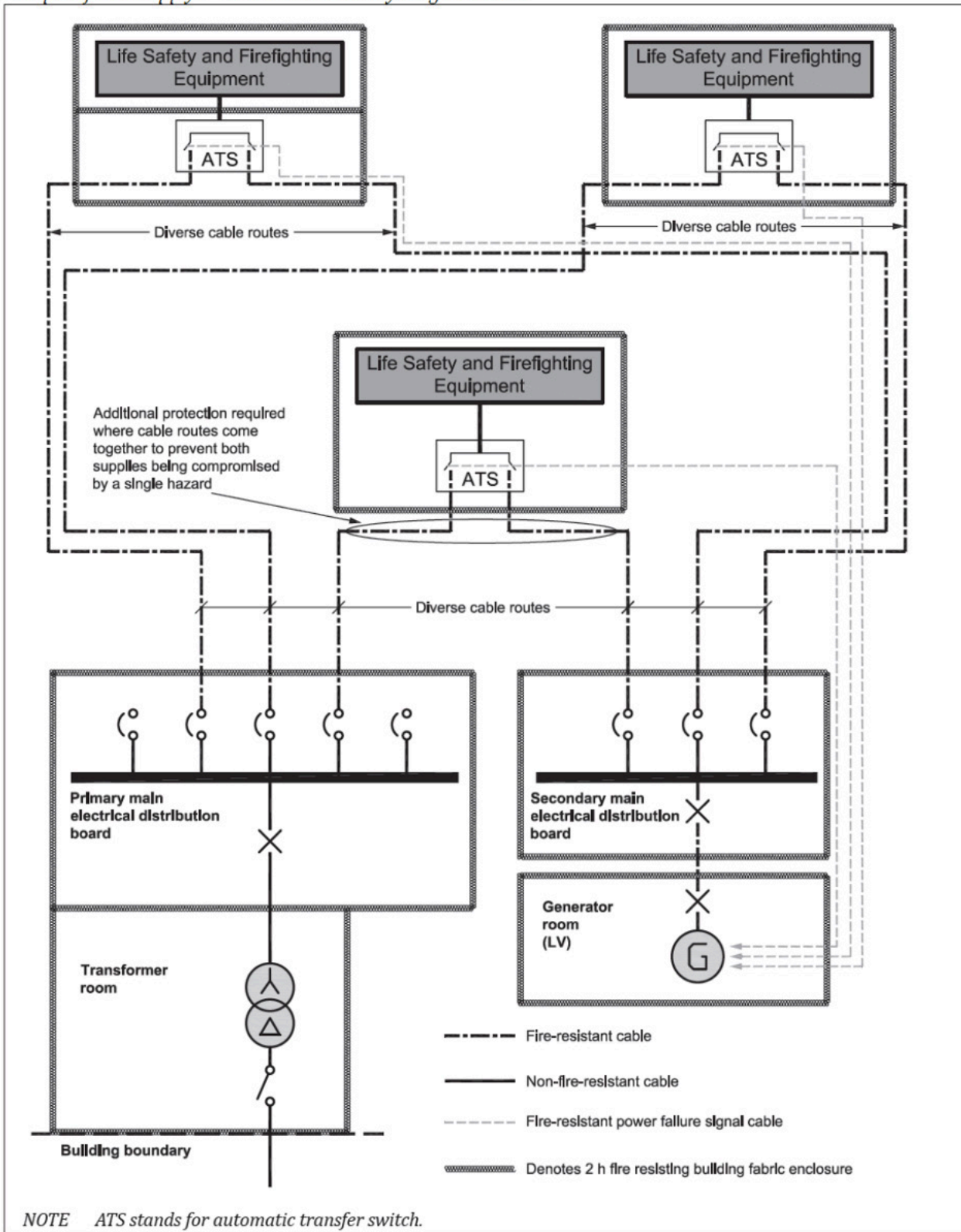
1. The electrical supplies to the two independent substations should be taken from two separate high-voltage supplies and not originate from the same substation.
2. The failure of one substation should not lead to the failure of the other.

3. The two independent substations should be adequately separated. Where the substations are located within the building they serve, the following criteria should be met:
 - Each substation should be enclosed within a fire-resisting structure with a minimum of 120 minutes of fire resistance
 - The two substations should be in two separate parts of the building.
4. Supply cables from the HV substations should enter directly into the HV/LV switch rooms and not pass through the building.
5. The two sets of supply cables should be adequately separated from each other to avoid a single fault affecting both supplies.

Please note: BS8519 also states that this option can only be used if assurance can be obtained that the two independent supplies are unlikely to fail concurrently.

This diagram is an extract from BS8519 and shows the preferred dual supply arrangement, with the building mains supply and the secondary supply from a standby generator.

Example of dual supply — Mains with standby LV generation



GENERATORS

What should I consider when selecting a standby generator as the secondary supply?

Generators selected for Life Safety secondary supplies should be automatically controlled and sized to support the worst-case transient load, fault conditions, and operate to performance class G2. In addition, there is often the requirement for the generator to sustain the locked rotor current of one sprinkler pump whilst also starting another; this needs careful sizing to ensure the correct generator capacity, as set out in BS 8519 section 6.3 and 20.1.

The generator should be sized so that the average variable load should not exceed 70% of its output and should be capable of starting and ready to accept load in 15 seconds.

Where recommended by the Generator specialist, a fuel polishing system should be included to maintain the fuel quality. If the generator is within the building, it should be within a 120-minute fire-resisting building fabric enclosure or room.

Shenton Group PHG550Vo Life Safety Standby Generator



UNINTERRUPTIBLE POWER SUPPLIES (UPS)

Is it acceptable to use a UPS system for the secondary supply in Life Safety systems?

UPS systems can be considered for Life Safety but only in residential buildings BS9991. Designers must consider that most UPS systems are designed for short term backup; when used for Life Safety, the machine must be specifically selected.

The UPS must be sized to deliver the maximum fault current output required. Cooling of the unit must also be considered, bearing in mind that there may not be a generator supporting the air conditioning, and the required run time for the Life Safety equipment could see thermal build-up within the UPS location. Consideration must also be given if the UPS is being used with equipment that can regenerate reverse power such as lifts, whilst a generator can absorb some regenerative load a UPS may not be able to, and additional equipment may be needed to prevent shutdowns or damage to the UPS equipment.

With growing pressure on generator emissions, selecting a UPS for Life Safety does seem an attractive alternative, but this must be considered carefully. BS8519 does state that the secondary supply would preferably be an automatic starting standby generator.



Typical UPS System Installation



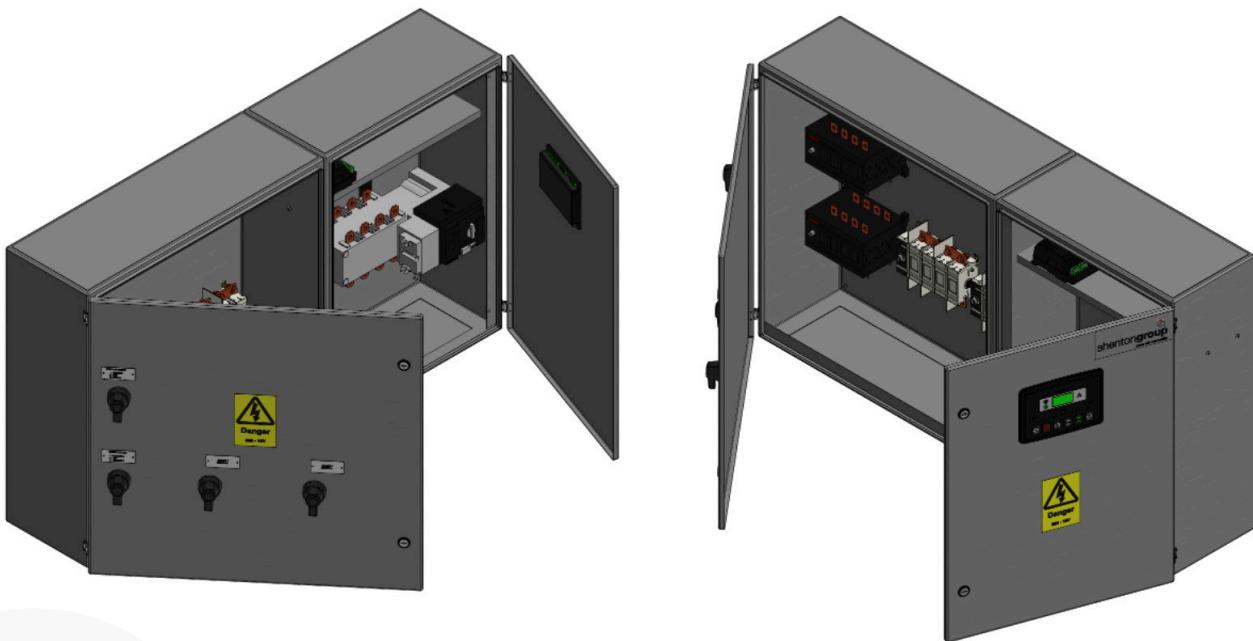
AUTOMATIC TRANSFER SWITCH (ATS)

What are the changes to the ATS panel specifications and requirements in the latest revision of BS8519?

ATS panels are required for Life Safety equipment to facilitate the changeover from the primary to the secondary supply in a primary supply failure. BS8519 now has specific requirements on the type of ATS panel to be used for Life Safety. The panel must conform to the utilization category AC-33A or AC-33B and Classification BS EN 60947-6-1, and you can not use a panel that uses contactors or motorized breakers.

Where occupation of the building is conditional upon the availability of the Life Safety system, single or dual ATS bypass arrangements should be included in the ATS design to facilitate maintenance without loss of supply. A design risk assessment should determine this requirement during building design.

Life Safety ATS panels with Dual Bypass

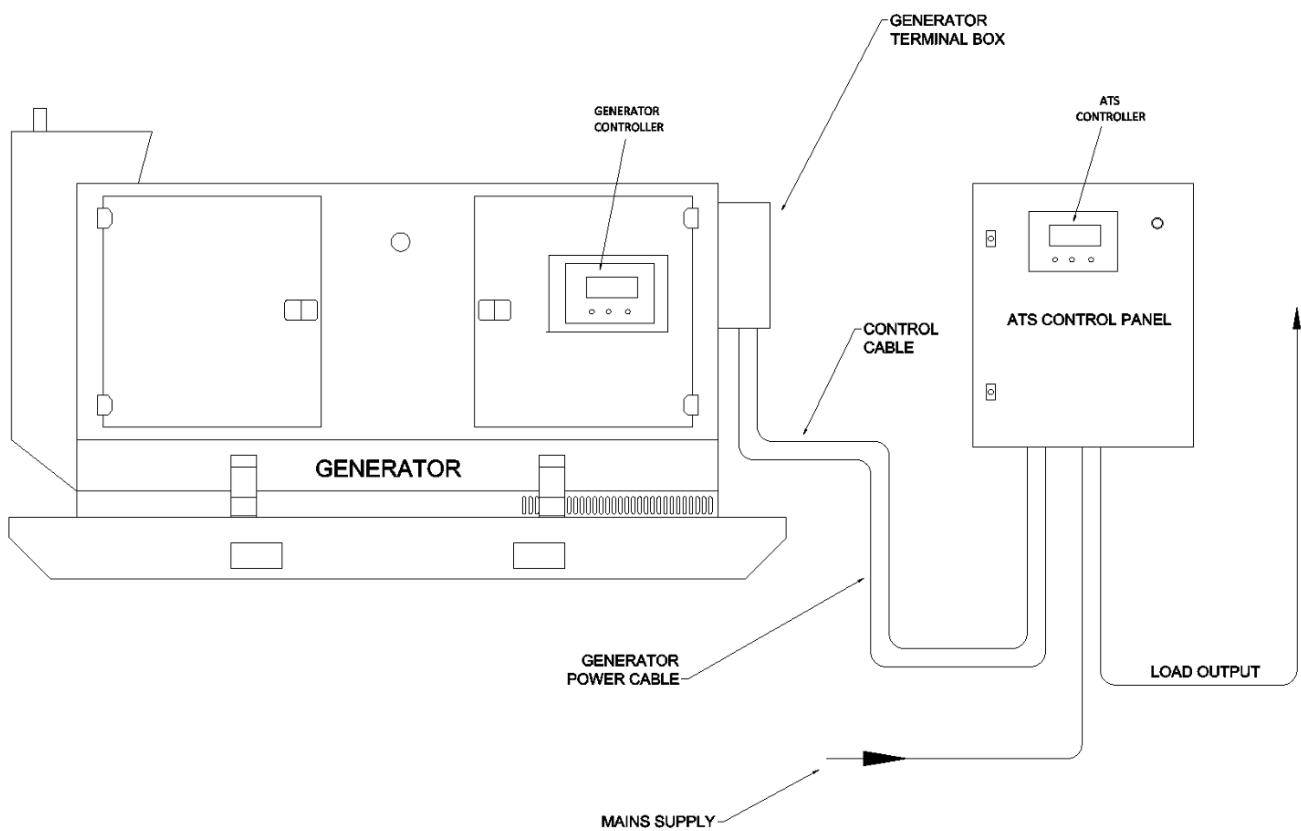


CABLING

Are there any specific things to know about the cabling for Life Safety generator?

Power and control cabling from primary and secondary supply to the ATS panels should be in fire-resistant cable. In areas where mechanical damage to cable is likely, further mechanical protection should be provided; this also applies to where the primary and secondary cable may come together to prevent both cables from being compromised by a single hazard. Where there is more than one ATS panel, each ATS panel must have a dedicated control cable back to the generator.

Typical Generator and ATS Cabling Layout



SUMMARY

This white paper is written as a guide to address common misunderstandings around the use of dual mains, generators, UPS systems, ATS panels and cabling for Life Safety systems. It is not an authoritative document, and the reader must always refer to the British standards to satisfy full compliance. The key takeaway is that there is a requirement to provide a dual supply to critical equipment so that safe evacuation of personnel from the building is possible in the event of a mains failure.

FURTHER READING

Publications relevant the above topic are as follows:

- BS 8519:2020 Selection and installation of fire-resistant power and control cable systems for Life Safety, fire-fighting and other critical applications-Code of practice
- BSRIA Guide BG70/2021 Life Safety and Fire fighting Power Supplies
- BS 9999:2017 Fire safety in the design, management and use of buildings - Code of practice
- BS9991: 2015 Fire safety in the design, management and use of residential buildings –Code of practice





We hope you found our white paper informative!

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