Industry Committee for Emergency Lighting

TECHNICAL STATEMENT

CENTRAL POWER SUPPLY (CPS)

Emergency lighting application and selection guide

This technical statement provides guidance and information relating to the correct selection and application of emergency lighting central power supplies, considering legislative needs, standards and practical necessities.

When considering a central power supply for emergency lighting purposes, consideration must be given to the primary function required and regulatory requirements of the application. There are numerous types of central power supplies available on the market for various applications; including Data Servers, Internet Service Providers (ISPs), telephone PBX servers and, data storage servers each with specific features to meet the needs of the application. All have a specific goal to provide a constant and secure source of power to protect data or everyday business operations.

Emergency lighting central power supplies differ in their requirement with a critical need for providing electrical power to dedicated emergency luminaires in the event of power failure for a determined period of time.

The points below must be considered when selecting a central power supply for **life safety** system.

EN50171

The European Norm (EN) or standard for the design and build of Life safety Central power supplies is EN50171. EN50171 is not specific to Emergency lighting but covers '**Life safety System'**. The standard has many specific requirement including the following most pertinent points.

1) EN50171 details the specific requirement for a Life safety central power supply to include a battery with a life expectancy of not less than 10 years for systems above 500W and 5 year life expectancy below 500W (3Hr) / 1500W (1Hr) (based on a continuous ambient temperature of 20^{o}C). This can and is misinterpreted in many ways and can sometimes be confused with the battery manufacturers life expectancy based on ideal conditions.

EN50171 requires a battery life of 10 years in normal operation of the central power supply considering operational conditions that can significantly impact and reduce the battery life. Some of the factors that can adversely affect battery life include: Continuous cyclic charging/discharging, ambient temperature in battery enclosures, charging ripple current.

2) It is a mandatory requirement of EN50171 for the emergency power source to be capable of supplying a load of 120% in continuous operation i.e. a 10kW central power source must be capable of sourcing 12kW continuously. This will apply in both normal and emergency operation for the stipulated autonomy of the system.

3) The battery shall be calculated to include a 25% over capacity to ensure the central power supply can fulfill a full duration test at the end of the batteries 10 year life expectancy i.e. the battery shall be capable of supporting 100% of the designed load for the full duration / autonomy after 10 years, not 80% after 10 years.

4) Without the aid of the bypass circuit the inverter must be able clear the largest distribution protection device and then recover to full output voltage within 5 seconds.

Dynamic load profile (non-maintained lights on)

Emergency Lighting is often considered as a '**dirty load**' due to the varying types and designs of luminaire affecting inrush current, crest factor and most importantly the power factor of the load. The overall effect of these factors impact the load profile of the Emergency lighting central power supply and place a heavy demand when compared with a typical I.T. load profile. It should be considered that emergency lighting luminaires operate in non-maintained mode with no power demand under normal conditions. In the event of supply failure, the load will energize and present a step change in the load from a low value to full load (see Figure 1).

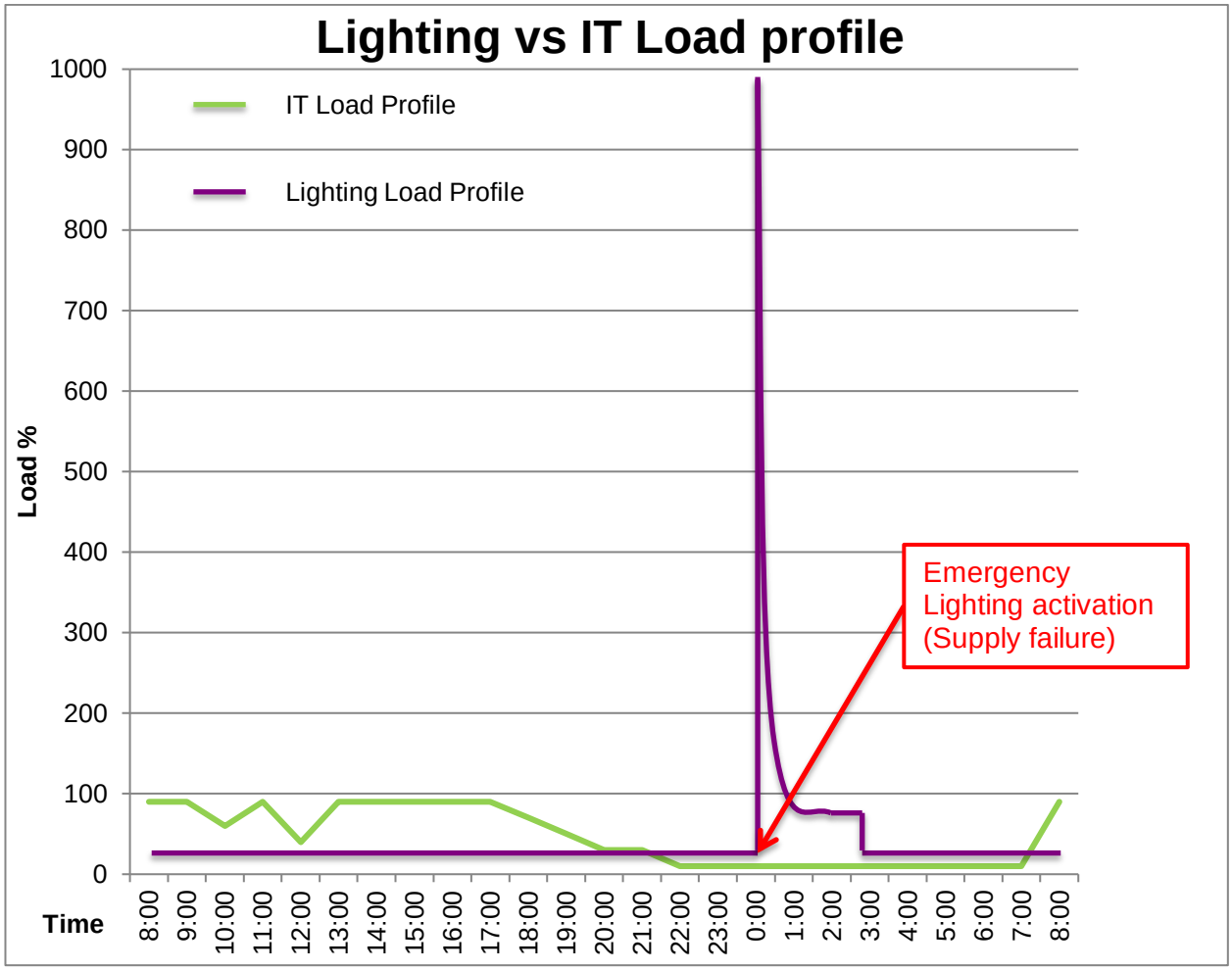

Figure 1: Emergency lighting vs. IT Load profile

This is exacerbated by the high inrush current when powering a luminaire from cold start and can be as much as 10 times the nominal current.

The emergency lighting CPS must be capable of supporting a high inrush load without the aid of a bypass supply. Bearing in mind the bypass supply will not be available in the event of supply failure when the risk to life is highest and the inverter must be capable of supporting the full load or excessive overload/s.

TECHNICAL STATEMENT

Emergency lighting changeover time period

It is a requirement for emergency lighting to operate within 0.5 seconds of a power supply failure. It could be considered that a no break supply has the advantage of no disruption to the luminaire and a better solution. At face value a no-break output facilitates the use of high pressure discharge type lamps (Sodium (SON), High-intensity discharge (HID), etc.). However, discharge lamps should not be used for emergency lighting due to the re-strike time which can be as much as 5-10 minutes and cannot be guaranteed by use of a no-break system. When a CPS system experiences an overload situation the output voltage will either reduce significantly or collapse to zero for the duration of the overload extinguishing any discharge lamps.

NOTE: High pressure discharge lamps are not suitable for emergency lighting purposes

Types of Central Power Supply

There are several types of central power supply commonly used for emergency lighting such as passive stand-by operation and active stand-by operation.

Passive stand-by systems operate in an inhibited mode with the inverter unpowered ready to operate in the event of supply failure. The distinct advantage of passive stand-by is the negligible power consumption and reduced maintenance due to the equipment being in operation only when needed.
Active stand-by systems use a constantly active inverter permanently operational in readiness to support the load. This has the disadvantage of constant quiescent losses.

NOTE: Battery lifetime is significantly reduced by high ambient temperatures so heat gain should be minimised to maximise battery lifetime.

Industry Committee for Emergency Lighting

TECHNICAL STATEMENT

Product certification (CE is not enough)

When considering any type of central power supply system or luminaire for Emergency lighting the product should be **fully conformant to EN50171** and all the relevant standards with the availability of a 'Certificate of Conformance'. A suitable certificate of conformance should provide details of the product proposed, details of all the applicable standards and a signature of the senior member of the business responsible.

A better alternative to a CoC is a **Third Party Certificate** of conformance from an accredited third party test facility. A third party certificate is clear demonstration the relevant test have been conducted and verified by an independent laboratory.