



Are you prepared
for a lightning strike?

Lightning strikes are far more common than many businesses realise and, with the changes in the global climate and changing weather patterns, they are well and truly on the increase. Australia is at particular risk because, according to a joint NASA and National Space Development Agency of Japan study, approximately 70 percent of lightning occurs on land in the tropics, where the majority of thunderstorms occur.

Lightning seems to most often make the headlines when it causes the death or injury of someone tragically unfortunate enough to be the victim of a cloud-to-ground strike. Fortunately, deaths from lightning strikes are comparatively rare – the global figure quoted by most experts is between 40 and 50 a year – but strikes are much more common than these figures suggest.

According to the USA's National Weather Service, there are 100 lightning strikes over the earth every second. That equates to more than 8.6 million strikes every single day. To bring that closer to home, in one night South Australia experienced around 50,000 lightning strikes, the majority occurring in a three-hour period, starting more than 250 fires.

In reality, there is a limited amount that can be done to protect individuals, other than them following

prescribed safety precautions during a thunder storm, and little that can be implemented to protect the countryside from lightning strikes. However, one area where lightning protection can be effective is in the commercial, industrial and public services sectors, safeguarding high-risk, high-value, high-fire-load or business-critical facilities such as: power generating plants; data centres, telecommunications facilities and IT centres; airports; office blocks and leisure centres; sports and entertainment arenas; schools; convention centres; shopping malls; hotels and hospitals.



How Real is the Lightning Challenge?

One factor that every business needs to consider is the impact of a fire. It is the age-old fire safety conundrum – an equation that considers the likelihood of a fire (or lightning strike) against the consequences if one does occur. What however is beyond reasonable dispute is that the cost of prevention is far lower than the cost of the cure. The impact of a lightning strike can be catastrophic. Lightning is an explosive, rapid event that releases huge amounts of energy in just a few milliseconds, with an unpredictable path. A single strike of lightning releases up to 500 million volts and a temperature of around 27,000 degrees C – a staggering three times hotter than the surface of the Sun. Such an explosion can easily cause millions of dollars of damage.

The number of lightning strikes over the earth has been assessed as being 100 every second, which equates to a total of 8.4 million lightning strikes each and every day.

The Northern Territory, for example, is one of the most lightning-prone areas on the planet, but other parts of the country are experiencing an increase in the frequency and severity of lightning storms. A few years ago more than 173,000 lightning strikes hit South Australia's electricity network in a 24-hour period. Elsewhere around the world lightning has resulted in airports being brought to a standstill, television and radio broadcasts going off-air, and commercial operations paralysed, sometimes permanently.



Achieving Effective Protection.

From a practical standpoint, there are three aspects of lightning protection that businesses should consider, depending on the precise nature of the building and the contents being protected. Generally speaking, these can be classified as: lightning protection; grounding / earthing; and surge protection.

Traditionally, lightning rods and what is commonly known as early streamer emission (ESE) technology have been used for lightning protection, but largely for performance reasons, these devices have increasingly been superseded in the past couple of decades by what the industry calls Charge Transfer Technology.

Both lightning rods and ESE technology rely on collecting a lightning strike and, effectively, inviting it into the facility being protected, whereas the most recently developed technology actually deters the strike from forming within the area being protected and so avoids the risk altogether. This technology includes grounding / earthing is critical for personal safety, sustainability and uninterrupted operations; proper grounding serves as the foundation for a complete lightning protection solution, reducing risk and optimising performance. Surge protection safeguards sensitive electronics from lightning that can easily damage or destroy sensitive and often business-critical electronics and IT equipment.



Charge Transfer Technology and Dissipation Array.

Put in its simplest form, lightning is an electric discharge by which nature equalises the voltage between storm clouds and the earth and, in order for lightning to strike, it must connect. The difference in polarity between the bottom of the cloud and the ground is the charge differential. When this charge differential is high, the cloud begins to form downward “leaders”, and objects on the ground begin to form upward “streamers”.

Traditional lightning rods and early streamer emission (ESE) technology rely on collecting a strike and, effectively, inviting it into the facility being protected, whereas the most recent technology actually deters the strike from forming within the area being protected and so avoids the risk altogether.

When a leader then connects with a streamer, the lightning is given the path it needs to exchange the charge between the earth and the cloud. This reduces the charge differential to upward streamers, which reach up from earth-bound objects when the electrical field is strong enough. The latest technology based on Charge Transfer Technology (CTS) is called a Dissipation Array System (DAS), which interrupts the formation of these upward streamers through point discharge, a phenomenon where a well-grounded point exchanges ions between the air and the ground.

Point discharge becomes more efficient when the points are connected to a low-impedance grounding

system, and more ions can be transferred with a greater number of points. DAS technology takes advantage of these principles with an optimal point configuration able to interrupt the formation of upward streamers, thereby preventing direct strikes. Working with grounding and surge suppression to achieve complete protection, a typical system includes: the dissipation array; a low-impedance grounding system using chemically-charged electrodes; a transient voltage surge suppression (TVSS) to protect against transients (short-lived bursts of energy) traveling through data lines and other conductive paths; and modular strike prevention devices to supplement the dissipation array’s area of protection.

To all but specialists in the lightning protection field this can come across as daunting and complicated, and indeed it is, calling for expert guidance.

Dissipation arrays are available in a range of configurations for almost any structure. These include: a hemisphere array for industrial or commercial structures, including poles, buildings, and towers; a parapet array for commercial, healthcare, educational, leisure or industrial flat roof buildings with a parapet around the edge; a conic array for cone-roof and dome-roof petrochemical and flammable storage tanks; and a paragon array for use on transmission and distribution lines. Other designs include arrays for flat roofed buildings, smoke / exhaust stacks, and industrial and commercial structures with guy ropes. Indeed, in reality a dissipation array system can be configured for virtually any shape or size structure.

Significantly, in terms of maintenance regimes and on-going operating costs, these solutions require little regular testing, inspection or maintenance other than visual inspection of all moving parts, the removal of dirt and debris, lubrication of the bearings, and the tightening of all mechanical fixings.

Installations can be undertaken at the new-build stage or retro-fitted to existing structures.

Take Action

In many respects, the only safe mind-set when it comes to the lightning risk is to consider the question as being not if lightning will strike, but when.

Few people today need convincing that the weather in this country, like elsewhere around the globe, is changing. Every part of Australia has experienced warming in the past 50 years and CSIRO, in its State of the Climate report, has gone on record as confirming

its projections that Australia is going to get hotter and dryer, and storms are going to become more frequent and severe – precisely the breeding ground for more destructive lightning.

The debate as to whether these climate changes are cyclical, reversible, naturally occurring or man-made is not the issue here. The issue that facilities managers need to address is that these climate changes are a reality that brings in their wake the prospect of a greater number of more destructive lightning events, and the fact that lightning has the very real potential to cause massive disruption to the business and possibly its complete demise.



About Delta Fire

Delta Fire are Australia's leading specialist in the provision of high hazard fire protection and equipment. Our commercial and industrial fire protection product range includes almost every aspect of fire retardants and suppression from portable fire extinguishers to specialised fire safety solutions.

Clients include numerous airlines, fire and rescue organisations and Australia's top commercial and industrial organisations. Some blue-chip clients we work with are Virgin Blue, Qantas, Thiess Construction,

Shell, Fremantle Ports, BP Petroleum, Neumann Petroleum, and Royal Vopak. We also provide fixed and mobile fire-fighting systems and suppression agents that provide around-the-clock protection in high-hazard petrochemical environments.

As a national fire safety organisation with operations in Brisbane, Sydney and Melbourne and authorised distributors in South Australia and Perth we provide a consistently high level of service across Australia.

