HOUSING
Sustainability in a changing built environment

RISK MANAGEMENT
Waste management
Enterprise risk

LEGAL UPDATE
The *Redress for Survivors Act 2021*

SMART GUIDE
Local government re-organisation

stronger

THE ALARM JOURNAL

April 2021

Electric shock CLAIMS

Electric shocks are the subject of a steady increase in personal injury claims.

AUTHOR: **Mark Cousins**, Partner, Burgoynes.

Electric shock claims are frequent occurrences. Often a claim is made that a person received an electric shock on touching a particular item that was life threatening. Typically, the claimant describes the force and duration of the shock or the outcome of being thrown across a room, as having put them at mortal peril. Although people survive, the reported trauma and physical effects resulting from the alleged shock can lead to large claims for compensation.

Burgoynes' investigates ten to 20 electric shock incidents in the UK each year. Around 25% of these are the result of cable strikes; somebody digging or drilling into a cable. Almost 25% are electric shocks that involve electricians or service engineers undertaking electrical work. On average, around five to ten cases each year involve suspected faults on appliances, either fixed or portable.

A review of cases investigated by Burgoynes since 2016 indicates that while several claims were probably genuine, around 20% of the incidents investigated were positively disproved.

Witness accounts of the incident are often vague, and the incident scene is often altered before any examination can take place. In addition, medical reports are frequently based on what the claimant said, rather than on much (or any) physical evidence.

Except in extreme cases, an electric shock generally does not leave sufficient medical effects to prove it occurred. Often the 'evidence' is only consistent with the explanation of such an event. Indeed, there have been cases where medical practitioners have confused a 'cold burn' (such as that shown in image one) with an 'electrical burn'.

Confusion arose in one case after a patient told a medical practitioner they were working near electrical equipment when the injury was sustained. However, they did not explain they were working with refrigeration equipment that was electrically isolated before any activities were undertaken.

Required criteria

For an electric shock to occur, three conditions are required criteria to qualify as evidence:

- There must be a suitable source of electricity.
- The subject must have come into contact with the source of electricity.
- There must be a complete circuit through which electricity can flow (see diagrams A and B).

If one (or more) of these criteria is not satisfied, an electric shock cannot have occurred.

Examples of required criteria being met

Diagram A

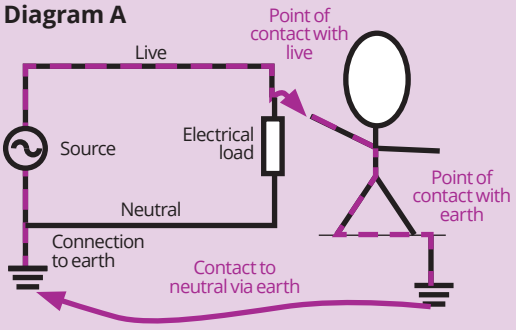
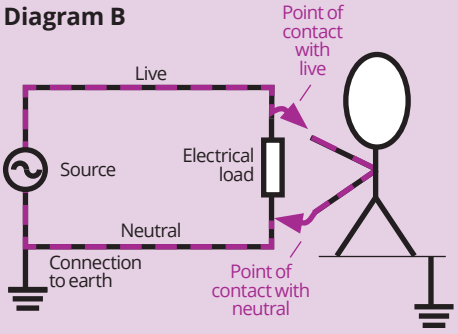


Diagram B



20%

A review of cases investigated by Burgoynes since 2016 indicates that while several claims were probably genuine, around 20% of the incidents investigated were positively disproved.

A forensic electrical engineer can assess whether or not a particular source of electricity may cause a shock. Standard alternating current (AC) mains supplies in the UK and many other parts of the world are nominally 230 Volt (V), which can be dangerous to life, as is a 110V direct current (DC) supply (another standard voltage). With few exceptions, static electricity would not cause a dangerous shock. However, it can lead a person to think they have received a mains voltage electrical shock.

Often it is not the electric shock itself that causes the injury, but the individual's reaction to that shock. Even a static shock or a minor electric shock may result in serious injury, due to an adverse reaction to the shock and the surrounding environment. For instance, it may result in a fall from height or movement into the path of operating machinery or vehicles.

A forensic electrical engineer can assess when circuits are energised and whether they are accessible. This assists in determining whether a subject could have come into contact with a source of electricity with the potential to cause direct injury. In cases where energisation may be transient, it may also be possible to determine the likely duration of any contact. This can then be compared with known criteria for serious or life-threatening electric shock conditions.

A forensic engineer can look at conductors and insulators and determine whether a suitable circuit existed for any shock current to flow. As a minimum, two suitable contact points with the body are needed for electricity to flow through the subject, as shown in diagrams A and B. Also there needs to be consideration of items such as clothing, flooring, and any conductive materials that might form a circuit. If the scene has not changed, testing may be possible, or test results may already exist.

If the electric shock incident involves electricians or others classed as competent to work on electrical equipment, a forensic engineer can assess whether or not the electrician followed safe practice. This would include whether or not there was any justifiable need to work on 'live' electrical equipment.

Often it is not the electric shock itself that causes the injury, but the individual's reaction to that shock.

Case study one - portable lamp

The Claimant purchased a new standard lamp (see image two) from a reputable retailer. After unpacking it she connected it to a mains socket outlet and switched on the socket outlet. She then realised there was no light bulb in the lamp. It was reported that 'as she went to switch the lamp off at the mains socket, she received an electrical shock that threw her approximately four metres across the room'. Her account is that she was around 30cm away from the lamp at the time of receiving the electric shock, so she reported not touching the lamp at the critical time.

An examination of the lamp showed that it had a three-core supply cable, (the metal parts of the lamp being connected to earth by the third conductor). It was found that the supply cable was poorly terminated at the lamp holder, so strands of its live conductor were not fully inserted into the terminal and were hanging out of it. Microscopic examination of the ends of the loose strands indicated that some had a melted appearance and there was evidence of minor electrical arcing activity on an internal earthed part of the lamp holder.

The 3 Ampere (A) plug fuse was found to be electrically intact (it had not 'blown'). The socket circuits to which the lamp was reportedly connected were confirmed to be protected by both a 32A miniature circuit breaker (MCB) and a 30mA residual current

Image two: The standard lamp

device (RCD). There was no evidence (either physical or circumstantial) to indicate whether or not one or both of these devices had operated during the incident.

Having regard to whether an electric shock could have occurred, the circumstantial evidence that she was not touching the lamp at the critical time would, in the first instance, suggest the Claimant could not have received an electric shock from the lamp.

However, the physical evidence showed the live conductor was poorly terminated inside the lamp holder, and evidence of abnormal electrical arcing activity between the loose strands and the lamp holder. It was, therefore, apparent there had been a short circuit fault to earth inside the lamp. As a result, the lamp body would have probably become electrically live for the period in which the circuit protection took to operate.

The circuit protection comprised a 3A plug fuse, a 32A MCB and a 30mA RCD. As the plug fuse had not operated, it follows the RCD probably did so as that device would be expected to act in response to the short circuit fault to earth. That device should have operated within 0.3 seconds, and there was, therefore, only a short time in which a shock might be felt.

While contrary to her account, if the Claimant was touching the lamp at the moment she switched on the socket outlet, she may have felt an electric shock from it. The RCD should have limited

There have been cases where medical practitioners have confused a 'cold burn' with an 'electrical burn'.

Image one: Cold burn received from touching a very cold surface

the severity of the shock so it is unlikely to have thrown her across the room, although she may have instinctively jumped backwards. In this regard, it is not unexpected for the circumstances to be confused in such an incident. Given the evidence of the fault, it was considered possible that she was mistaken about not having been touching the lamp at the critical time.

In summary, the evidence showed there was a manufacturing fault on the lamp that had the potential to result in an electrical shock. As a result, it was considered a credible claim.

Case study two - Fixed cooker

The Claimant was a carer and reported using a cooker and receiving an electric shock from it. She said that only the front left-hand ring was operating at the time of the incident where she was warming sauce in a saucepan. She was stirring the sauce with a metal whisk at the time she received it.

By the time Burgoynes was appointed, the incident cooker had already been disconnected and moved to a garage for storage, and a replacement cooker had been installed. On instruction, we were told that an electrician who attended immediately after the incident had indicated he found a fault. His opinion was quoted as: 'lucky the Claimant had not been killed by the fault'. However, our discussions with this electrician indicated he had made no such comment. He also noted the Claimant had left the premises with her husband before he arrived.

The electrician undertook extensive tests on the evening of the incident and had found no faults to account for the alleged incident. He also confirmed that his tests had

confirmed the cooker was connected correctly (it was earthed). The information on his worksheets completed on the evening of the incident verified this information.

A destructive examination of the cooker showed no defects that might lead to a dangerous condition. It was also noted the cooker had a ceramic hob. Such a hob would have acted as an electrical insulator preventing any potential defect beneath the hob from making the pan(s) on top electrically live. It was also apparent the cooker circuit at the premises was protected by both an MCB and RCD. Testing of those devices, both by the electrician who attended on the evening of the incident, and subsequently by Burgoynes, showed both were working correctly.

The available evidence identified no credible defects to account for an electric shock having been received from the cooker or the pan being heated on it. It was concluded that the claim was not credible.

It was also apparent in this claim that even if an electric shock had occurred, the RCD protection would have limited both the time anyone would have been exposed to danger, and the severity of any possible electric shock. There was, therefore, no evidence to support the proposition that the suggested defect at the cooker could have 'killed' the Claimant as was being suggested; indeed the evidence indicated this was most unlikely.

The information obtained during the inspection also showed a periodic electrical inspection of the fixed installation was undertaken annually. The last inspection was around nine months before the alleged incident. This confirmed the electrical installation was in good condition at that time, which further limited the likelihood of a dangerous defect that went unchecked by the circuit protection.

A forensic electrical engineer can assess when circuits are energised and whether they are accessible. A forensic engineer can look at the presence of conductors and insulators, and from this, determine whether or not a suitable circuit existed for any shock current to flow.

Takeaways

- **Three criteria must be met for a person to experience a mains voltage electric shock:**
  1. There must be a suitable source of electricity
  2. Contact must have occurred with that source
  3. A complete circuit must be created through the body during the incident.

  If one or more of the requirements is not satisfied, an electric shock cannot occur.
- Modern RCD protection, which has been required by the *Wiring Regulations 2018*[1] for many years, should limit the severity of any electrical shock to one that (in itself) should not result in life-threatening injury. Certain underlying health issues can, however, make some people more susceptible to electric shocks than others, so there can be exceptions.
- Modern circuit protection should quickly isolate the supply and remove the risk of a shock from any dangerous defects that develop.
- Periodic testing of an electrical installation provides confidence that the circuit protection remains in good order and is operational. ●

References

[1]The current version of the Wiring Regulations are *BS7671:2018 Requirements for Electrical Installations, IEE Wiring Regulations Eighteenth Edition.*

Mark Cousins (mark.cousins@burgoynes.com) is a Partner in Burgoynes' Melbourne office. Mark's career began with the Ministry of Defence (MoD), and he joined Burgoynes' Cardiff office in 2002, becoming a Partner in 2014. At the beginning of 2019, Mark opened Burgoynes' Melbourne office.

Founded in 1968, Burgoynes is an international partnership providing specialist forensic services to a wide range of clients, including loss adjusters, insurers, reinsurers, law firms and businesses. With more than 60 investigators, Burgoynes investigates around 3,000 incidents a year involving fire, explosion and other engineering failures, which include electrical failures and electrical related incidents. **burgoynes.com**