Shock tactics

About 1,000 accidents at work involving electric shock or burns – of which around 30 prove fatal – are still reported to the HSE annually. Brian Wall investigates procedures that could prevent needless deaths

Virtually every workplace uses electricity as an energy source. All the more reason for engineers and technicians who carry out work with, on or near electrical equipment to be aware of the dangers this poses. Yet theory and practice can be very distant cousins. Each year, about 1,000 accidents at work involving electric shock or burns are reported to the Health and Safety Executive (HSE). Most worryingly, around 30 of these prove fatal.

Following best practice

Always consider the potential hazards in your risk assessments when dealing with electricity. For example:

- Contact with live parts, causing shock and burns (mains voltage, 230 volts ac, can kill)
- Faults that could cause fires
- Fire or explosion where electricity could be the source of ignition in a potentially flammable or explosive atmosphere
- Where and how electricity is used (the risks are generally greatest in harsh conditions).

Additionally, think about mitigating measures, such as:

- Reduce the voltage, carry out preventive maintenance, work safely
- Portable tools can be run from a 110Vs, centre-tapped-to-earth (usually from a transformer)
- Provide a safety device: an RCD (residual current device), for example, detects some (not all) faults in an electrical system and rapidly switches off the supply
- All electrical equipment and installations should be maintained to prevent danger.

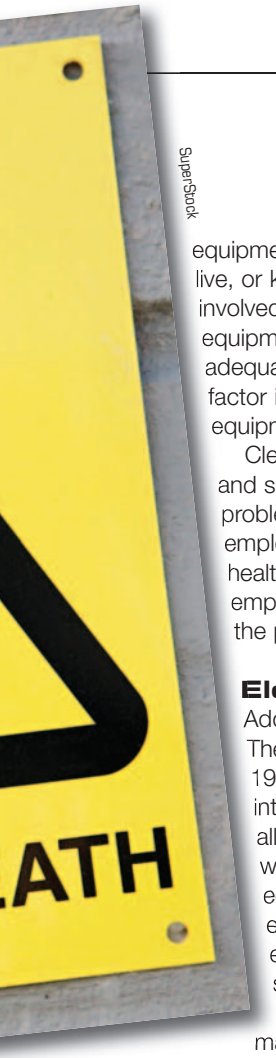
"Shocks from faulty equipment can cause severe and permanent injury, and can also lead to indirect injuries, due to falls from ladders, scaffolds or other work platforms," warns health and safety consultant McCormack Benson Health and Safety (MBHS). "Faulty electrical appliances can also lead to fires that, as well as causing injuries, could cause damage to plant, equipment and property."

Plant engineers and managers will, of course, be equally aware of the harm that can be caused to anyone exposed to live parts that are touched either directly or indirectly, by means of conducting objects or materials. But where does the point of danger first manifest itself? The answer is: 'Much sooner than some in the workplace might suspect'. "Voltages over 50V ac or 120V dc are considered hazardous," advises MBHS. When dealing with electricity, therefore, the message should always be to err wildly on the side of caution.

Who is at risk

So, who is most at risk? Anyone can be exposed to the dangers of electricity while at work. But those most vulnerable include maintenance technicians and indeed anyone working with electrical plant, equipment and machinery – particularly those working in harsh environments.

Most electrical accidents occur, states MBHS, because individuals are either working on (or near)



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equipment thought to be safe, but in fact live, or known to be live, but where those involved lack sufficient training and/or equipment – or have simply not taken adequate precautions. The other main factor is simple misuse of electrical equipment or use of kit known to be faulty.

Clearly, although the risks are simple and should be obvious, the potential for problems remains wide ranging. Hence employers' obligations under general health and safety legislation, which covers employers, employees and members of the public in the workplace.

Electrical regs

Additional requirements are laid out in The Electricity at Work Regulations 1989 (EAW Regulations), which came into force on 1 April 1990 and apply to all aspects of electricity in the workplace, from electrical supplies to equipment. These place a duty on employers, employees and the self-employed to ensure that electrical systems are constructed in a way that prevents danger, and equally to maintain electrical systems accordingly. Under the legislation, employers are obliged to have any work on, use of, or closure of electrical systems carried out in a manner that avoids risk.

Meanwhile, electrical equipment used in aggressive environments (meaning extremes of weather, temperature and/or corrosive conditions) must be constructed or protected to prevent it from becoming dangerous. Further, the regulations also stipulate that only those with adequate knowledge or experience, or who are under proper supervision, should work with or on electrical equipment that could cause danger or injury.

Beyond that, unsurprisingly, all electrical equipment and installations must also be maintained to prevent danger. Making that stick means formalising an appropriate system of visual inspection and, where necessary, testing. And there should be a system for carrying out and recording formal visual inspections, backed up by a system of PAT (portable appliance testing), where appropriate. Incidentally, don't be fooled by the general misconception that PAT testing should be carried out annually: in fact, the legislation requires employers to decide on the frequency of testing, based on their risk assessments.

Furthermore, the Management of Health and Safety at Work Regulations 1999 place a general duty on employers to assess and reduce the risks to as low a level as is reasonably practicable. This applies equally to those risks associated with the use of electricity and electrical equipment at work.

Where incidents do occur, however, the Reporting of Injuries, Diseases and Dangerous Occurrences Regulations 1995 (RIDDOR) requires that managers notify the enforcing authority immediately (by telephone, using the incident reporting line 0845 300 9923 or via the HSE website). Incidents that matter include: injury to staff, due to an electric shock or electrical burn, leading to unconsciousness, a need for resuscitation or admittance to hospital; and electrical short circuit or overload, causing fire or explosion, due to plant or equipment coming into contact with overhead power lines.

More information on electricity can be found at: www.hse.gov.uk/electricity. PE

Tripping the light fantastic

Nuisance tripping of an incoming circuit breaker at HG Timber has been eliminated, following a free on-site power factor correction survey by Eaton's Electrical Sector. The timber pallets and warehouse decking manufacturer also reports that actions taken as a result of the survey have resulted in energy bills down 20% and a 62 tonnes' reduction of CO_2 output.

The problem was on its main 400A incoming circuit breaker and started when HG Timber reached full production capacity, after moving manufacturing to a new site near Buckingham. "Right from the outset, the service and support we received from Eaton put it well ahead of the other company," comments Alistair Theodoulou, managing director of HG Timber. "And, as we had always had good experiences of Eaton products and services, we decided that we would work with them to find a solution to the problem."

Eaton's technicians found that when the plant – which includes a high speed, four-way pallet production line with robotic technology – was operating at full capacity, the load on the incoming circuit breaker was 395A. This was sufficiently close to the breaker's maximum rating to cause the nuisance tripping on its own. The survey also revealed, however, that the load power factor was poor, because of the large number of motor-driven machines on the site.

Eaton suggested power factor correction equipment from its capacitor range, as this automatically adjusts the level of power factor correction to suit the instantaneous load. After fitting the new equipment, the maximum load current reduced to 350A, with a power factor of about 0.95 – easily sufficient to eliminate nuisance tripping. In addition, because of the way the supply tariff at HG Timber is structured, the reduced maximum load and improved power factor cut electricity bills by around 20%.

"The power factor correction equipment is already proving to be an excellent investment," comments Theodoulou, "especially as it achieves savings by eliminating reactive energy that does no useful work."