

Fire Protection Notice No. 9

ELECTRICAL SAFETY

Because electricity is one of the most controllable forms of energy it can also be one of the safest. But, as industry and commerce draw ever more heavily on electricity to power machines and processes, so the number of fires caused by electrical equipment increases. This is because certain vital safety precautions are overlooked or equipment is misused, either deliberately or through ignorance.

To ensure safety, these four golden rules should be followed:

CORRECT Installation
Use
Inspection
Maintenance

These rules apply just as much in the home where, as in industry and commerce, electricity is being more widely used.

If the power that provides light-heat-and drives electric motors is misused, or the equipment is not adequate to carry the load, or is not properly installed and maintained, then it can easily set fire to insulation or other combustible materials. And remember fires KILL!

Electrical equipment should never be designed, installed or maintained by anyone who does not fully understand its requirements. This will usually mean employing properly experienced persons. Should you ever attempt to work on your own electrical installation, in your own interest and also your neighbours', make sure you fully understand the requirements of that equipment or installation. Anyone who does not fully understand what he is doing is literally playing with fire.

Building safety into the circuit

An electrical circuit should be designed to carry the power from the source of supply to the electrical machine, apparatus or appliance in safety. When an installation is set up, ensure that all its parts function properly and that protective gear, such as fuses and circuit breakers, are provided to prevent damage to wiring and apparatus in the event of overloading, short circuits and other faults.

To ensure that this is achieved, it is necessary to check the relevant installation regulations. This will mean referring to the power companies' supply rules which are largely based on the Institution of Electrical Engineers (United Kingdom) Regulations. These cover the more common types of installation and contain information on those requirements which must be fulfilled to comply with local regulations. More detailed information can be obtained from the I.E.E. Regulations.

Dangers of overheating

All electrical equipment is designed to operate at a certain current. If the current is exceeded because of a short circuit, an earth fault, or electrical overloading, the equipment will overheat and fire may result.

Most electrical apparatus requires some cooling or ventilation for safe operation, otherwise it will cause overheating, possibly resulting in fire.

Cables and wiring

Wiring faults account for about one third of all electrical fires. They are by far the most frequent cause of electrical fires in most types of industrial and commercial premises, except for retail and wholesale businesses, where lighting is a still bigger hazard. The engineering and construction industries are most prone to fires resulting from wiring faults. As with all fires, those started by electrical wiring faults result from excessive heat igniting any nearby combustible material. Fires are caused by overheating, arcing or sparking resulting from:

overloading – insulation breakdown – poor connections – broken conductors

Arcing or sparking can occur where conductors develop a short circuit, where live conductors come into accidental contact with other metal work, or due to a break in the wire. Faults of this kind are usually caused by worn or damaged insulation, arising through incorrect installation or deterioration through lack of maintenance over a long period. Overloading of circuits beyond their capacity causes overheating of cables and conductors, and can result in direct fire hazards or, more often, in damage to insulation with the development of arcing or sparking. In the home, a prevalent form of overloading is to plug too many appliances into one socket, using an adaptor. Examples of poor connections include loose terminals, frayed conductors, poorly fitting plugs and sockets, and taped joints.

Cables and wiring should be securely installed, properly supported, and protected against mechanical damage, heat, vibration and the ingress of moisture and corrosive substances. They should not be run in any position where they may accidentally come into contact with any other services. The use of flexible cables should be avoided, except where absolutely necessary. If you suspect a wiring fault, call in an electrician immediately. Never, under any circumstances, allow a person to attempt to repair an electrical circuit unless he knows exactly what he is doing.

Economy in electrical installation is definitely false economy. Use of adequate wiring and good quality electrical fittings will be more than repay any extra cost by ensuring safe operation without fire risks. Inadequate wiring on the other hand will inevitably give rise to fire risk as will poorly engineered fittings. You simply cannot afford to economise where the installation of electricity is concerned.

By far the most common cause of over-heating of electrical wiring is replacing fuse elements incorrectly. If a fuse blows more than once, the cause should be investigated and corrected. Fuse wire beyond the capacity of the fuse holder should never be used (See also section concerning maintenance).

Heating equipment

Most fires started by radiant heaters are not due to faults in the equipment, but to carelessness in use and inadequate guarding resulting in the ignition of any surrounding combustible material. Overheating, and possibly fire, may result unless free circulation of air is permitted around the heater. Some people even drape heaters with clothes, which is asking for trouble. Free standing electric heaters should be fixed in position (screwed or bolted to the floor or wall) so that they can not be knocked over, or moved into dangerous positions. Heating apparatus, such as cookers, or electric fires, should never be left in operation unattended. Nor should pressing irons. Turn off all electrical appliances before going to bed.

Lighting

Lighting tops the list of fires started by electrical apparatus (as opposed to wiring). The temperature of lamp bulbs can easily exceed 200°C in free air, and, if ventilation is restricted, can rise much higher. Fires start when combustible materials (for example, curtains) come into contact with the bulb or even the shade. Combustible items should not be placed close to a light bulb.

Maintenance

The importance of maintenance or regular inspection cannot be over-emphasised. Lack of it is a major contributory factor to so many electrical fires. Maintenance consists largely of:

- Detecting and eliminating overloading;

 - Finding out whether tampering has occurred, especially with settings of protection gear (fuses, circuit breakers, etc);

- Replacing faulty or damaged equipment immediately it is reported-

 - check condition of flexible cords and cables, switches, fuses, plugs, socket outlets, motors, heating elements, light fittings, and any other electrical equipment;

- Tightening loose terminals and connections;

- Replacing sections of wiring where the insulation is perished or damaged;

- Correction of sparking at brushes and motors;

- Preservation of earth connections;

- Checking fuses and indicating lights;

- Maintaining good ventilation of motors and other equipment;

- Checking conditions of bearing, rotor clearance, etc.

Conclusion

With any fire involving electrical equipment, the first step should be to switch off the current to disconnect the supply of electricity. No matter how small a fire may be when discovered, the Fire Services Department should be called at once by dialing 999 or the number of your nearest fire station. If it is safe to do so, the fire should then be fought: you should not tackle the fire BEFORE the Fire Services are called, as the longer the delay in summoning professional help, the greater the damage which may result.

Advice to householders on electrical safety

- Faulty wiring can cause a serious fire - it should be checked periodically by a registered electrician.
- See that all plugs and circuits are correctly fused. Keep spare wire or cartridges handy. If you have fuses of different capacities, keep some replacements of each size.
- Don't dim a table light by covering it: buy a low wattage bulb, or dimmer.
- Don't overload electrical points: the ideal is one appliance, one socket.
- Never let furnishings, clothing or bedding get close to an electric fire.
- Make sure electric heaters have proper ventilation or else overheating might occur.
- Switch off all heaters before you go to bed,
- Never run an iron or other appliances from a light socket.
- Don't leave tea cloths or washing over the cooker to dry.
- Don't allow the flex from an electric kettle or any other appliance to drag over the cooker.
- In the bathroom, the main risk is electric shock (water being a conductor of electricity). There should be no socket outlet, except the kind designed for shavers.
- Never take electrical appliances into a bathroom. They should be out of reach on the wall or ceiling and be operated by a pull switch.
- Switch off electrical appliances not in use. Ensure that your socket outlets are of the switched type wherever possible and use these switches to disconnect appliances not in use. This is preferable to withdrawing the plugs which may lead to loose connections if done repeatedly over a period of time.
- Inspect flex connections especially to irons and the connections to all plugs at regular intervals to ensure that they have not worked loose. If a flex or cable is not long enough, the safest plan is to get a new one.

- But if you have to make a join, use only proper connectors. Be sure none of your flex is worn.
- Don't run flexes under carpets or linoleum. They could become chafed or damaged without being noticed.
- If you re-wire a fuse, check that the rating number on the wire card is the same as the number on the fuse. If the fuse blows again, something is wrong. Call an electrician. Don't use thicker fuse wire than specified.
- Keep flexes as short as possible and replace them when worn.
- Use 3-pin plugs, earthed and fused (unless instructions with an appliance tell you otherwise).
- Don't attempt electrical repairs unless you are expert.
- If you leave your home for more than a day or so, switch off the electricity supply at the mains.
- Wall mounted heaters are best for children's rooms. They should be placed high enough to be out of a child's reach, but not within scorching distance of the ceiling or curtains.
- Shuttered sockets will protect a child's prying fingers and his life.
- All radiant fires should be securely guarded.

Management check list for electrical fire safety	Tick here
1. Are new installations or alterations carried out under the supervision of an electrical engineer?	
2. Are all electrical installations checked for safety by your works electrician?	
3. If any changes of layout or process are introduced in your premises, does someone, with a knowledge of fire, check that no electrical hazards are being introduced?	
4. Are your electrical installations inspected at regular intervals? (Remember that special conditions involving heat, vibration, corrosion or moisture need special attention.)	
5. Are electrical repairs dealt with promptly?	
6. Do you forbid people other than electricians to adjust machines, open fuse boxes or do other electrical work?	

7. Do you avoid the use of temporary wiring in long lengths and, if temporary installations are unavoidable, do you dismantle them as quickly as possible?	
8. Do you take steps to ensure that process waste is cleared regularly from motors and the machines they drive?	
9. Do you have all waste and rubbish cleared from your premises daily?	
10. Have you instituted special precautions for electrical safety in all areas where there are flammable atmospheres arising from vapours, gases, or dusts?	
11. If electrical equipment is used in damp situations, is it of a type which is resistant to the effects of moisture?	
12. Bearing in mind that many fires are started by electrically apparatus which is left switched on while unattended, do you arrange for protective gear to be fitted which will guard against excessive temperature rise?	
13. Is someone responsible for seeing that all non-essential equipment is switched off when premises close down?	
14. Do you avoid the use of portable electric radiant heaters and do you ensure that the air circulation through convector-type heaters is unrestricted?	
15. Do you keep combustible goods well clear of lighting fittings?	
16. Are staff alerted to the dangers of electrical faults and trained to report them?	
17. Do all employees know how to deal with electrical and other fires should they occur?	

To reduce the risk of fire in your building, action should be taken immediately in respect of the above questions where a “No” answer is given. Get it done right away – any delay could prove fatal.