ELECTRICITY AND FIRE

Statistics show that electrical faults are a leading cause of fires throughout the world. Fires are frequently caused by overloaded installations, defective fuses, defective wiring and motors, the use of improper equipment in hazardous areas and the misuse of electrical apparatus.

Cables and wiring

When the insulation on cables and wiring is damaged, a short circuit between conductors or to earth may develop which can result in high temperature arcing at the point of damage, heating of the insulation and a possible fire. The main causes of insulation damage and recommended preventive action are summarised as follows:

Cause of insulation damage	**Precautions**
Mechanical damage	
Occurs in high traffic areas through abrasion, contact with moving machinery, vibration, etc. Flexible extension leads are greatly at risk.	Wiring should be led through conduit, cable tunnels and ducts. Avoid the use of temporary wiring and flexible extension leads.
Damage from the environment	
Heat will break down PVC and rubber insulation.	Use cables resistant to heat **eg** Mineral insulated and fire resistant cables

Corrosive atmospheres may damage rubber insulation.	In corrosive areas use PVC

and mineral insulated wiring.

Oil contamination damages rubber insulation. Oil contamination should be avoided.

PVC insulation resists damage from most oils.

Moisture may damage mineral insulated wiring. PVC insulation resists light moisture

damage.

Damage from overheating

Overloading, improperly made joints and lack com- Use correctly rated cables with
of suitable over-current protection causes patible over-current protection and
overheating and can lead to a breakdown of ensure that joints are properly made
insulation. in joint boxes.

Welding

Heat from welding operations near cables Protect cables by shielding them from
will damage insulation. Welding near heat. Remove any waste
present.
bunched cables is hazardous if there is waste
in the area.

Lighting

Certain normal combustibles have an ignition temperature of approximately 180□C. Some forms of lighting achieve temperatures above 200□C. Lighting therefore, should be seen as a positive ignition source if combustibles are in close proximity to them,

Light type and temperature	**Precautions**
Tungsten filament lamp:	
- ventilated 200□C	Keep well ventilated and keep combustibles clear of lighting or use guards
- unventilated 600□C	
Mercury vapour lamps:	
- ventilated 300□C	Install at a high level above aisleways,
rather than over combustible goods.	Use shielding to prevent broken glass
from falling onto combustibles	
Fluorescent lights	
The tubes do not become hot but faults	Install units which are inherently safe
may occur in the starters or ballasts.	or have thermal protective devices.

If the fault does not activate protective gear the ballast may ignite and drip burning plastics or bitumen onto combustibles below. Fires caused by failure of the starters have occurred but are rare when compared with fires caused by ballast failure. Ballasts on twin tube units allow for either parallel or series connection of the tubes. Where the unit has a ballast connected in parallel, it is possible for one tube to be illuminated when the other has been removed or is flickering.

If this continues, overheating and possible fire in the ballast may result.

With series connected ballasts current flow ceases as soon as one of the tubes shows either a fault or is removed. This type is preferred.

Attend to faulty or flickering tubes promptly before they cause a problem in the ballast or starter. Position lighting units over aisleways and open spaces, not over combustible goods.

Comfort Heating

Most fires started by space heaters are due to carelessness and inadequate guarding rather than by electrical faults.

Radiant heaters:

Secure into fixed position away from combustibles. Use guards around them to protect combustibles from being ignited.

Ban portable radiant heaters from the workplace.

Convection heaters:

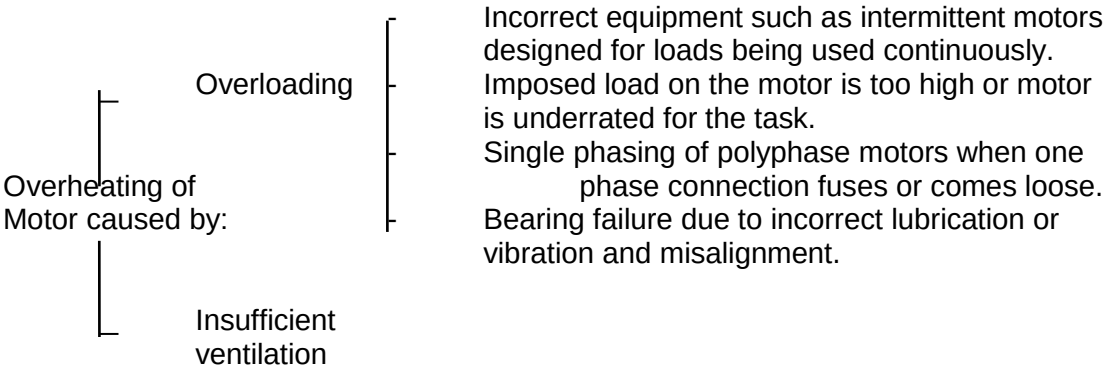
Ensure good ventilation on fan-assisted, panel, or other types. These should be fitted with thermostatic safety switches which will isolate power if they topple over.

Indication lamps should be fitted to all convection heaters to show that the units are in operation.

Motors

Most fires in electrical motors involve a short circuit in the windings which heat wiring insulation to ignition temperature. Breakdown in winding insulation is usually caused by the following factors:

- Ingress of dust, moisture, corrosives or excessive lubrication
- Vibration and misalignment causing rotors to touch casings or physically break down insulation
- Overheating caused by:



Hazardous atmospheres

Areas where quantities of flammable vapours or dusts may be found, represent a hazard through their possible ignition by standard electrical equipment. SABS 0108 *Code of Practice for the classification of hazardous locations and the selection of electrical apparatus for use in such locations* describes suitable equipment for specified areas.

Transformers

Transformers do not often fail but a fire can cause massive disruption and great financial loss. Transformers at or near maximum load should be regularly monitored and well maintained. Transformer fires may be prevented by:

- early warning and protective equipment such as the Bucholz protective gear and fuse or over-current breakers
- checking oil regularly for moisture, contamination and quantity
- the use of non-flammable oils
- the use of dry transformers (up to 750 kVA)

The severity of transformer fires may be reduced by one or any combination of the following:

- separating transformers from one another and valuable plant or structures by distance or fire resistant walls to counter the effects of radiant heat
- bunding transformers to prevent the flow of burning oil to other transformers, plant or structures
- protecting with waterspray or CO_2 systems for rapid extinguishment

Main causes of fire

Lack of awareness -

where incorrect or improper installations, equipment or hazardous situations are seen but not recognised.

Carelessness -

where existing or problem areas are recognised but ignored.

Lack of maintenance -

where no problem areas are apparent and it is felt that the cost of regular maintenance is not justified.

Blatant misuse -

where unsuitable equipment is used or with a total disregard for safety regulations and practices.

Rules for safety

On installation observe the following:

- *Suitable equipment -*

  capable of performing the duties required should be installed. Unattended installations should have supervisory attendance and back-up protective equipment.

- *Special equipment for abnormal conditions -*

  such as dusty, corrosive or moist environments and class 1 explosive areas

- *Qualified installers -*

  especially with equipment for class 1 explosive areas

- *Comply with regulations -*

  such as statutory regulations and Institute of Electrical Engineers regulations

Care and Maintenance

Follow these essential pointers

- *Care with portable equipment -*

  is essential as it is inherently more subject to wear and tear.

- *Regular testing -*

  responsible people must check equipment regularly, before each work shift.

- *Prompt attention to faults -*

  such as flickering fluorescent tubes, loose connections and faulty insulation.

- *Pre-planned maintenance -*

  for all equipment and installations.

- *Switch-off -*

  Ensure that all equipment which is not in use is switched off and where possible unplugged from the outlet. (Where wiring polarity has been reversed ground

faults within the current carrying limits of protective gear can occur, leading to potential fires).

- *Post addition and alteration checks*

  eg: on polarity, are vital as faults frequently occur after installations have been disturbed.

References:

Guide to safety with electrical equipment, FPA (UK)
Protection Projects Inc.

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