

M6-EN.2 ELECTRICAL HAZARDS

M6-EN.2.1 Introduction

M6-EN.2.2 General Safety Precautions

M6-EN.2.3 Electrical Panel

M6-EN.2.4 Overloaded Circuits and Extension Cords

M6-EN.2.1 Introduction

Electricity is one of the main causes of injuries, fatal accidents and fires. Accidents can happen when people touch part of a unit carrying live current. If the insulation becomes faulty, even contact with part of a unit, which does not normally carry live current can lead to serious accidents. Electric current can also cause burns. Again, if the insulation is faulty and there is a short circuit, intense heat can develop, leading to the possibility of a serious fire.

The main **electrical hazards** are:

- contact with live parts causing electric shock and burns (normal mains voltage, 230 volts AC, can cause death)
- faults which could cause fires
- fire or explosion where electricity could be the source of ignition in a potentially flammable or explosive atmosphere, (e.g. in a spray paint booth, during welding, if there is spilt petrol or flammable liquids)

Most incidents related to electricity result in from:

- unsafe work practices
- improper equipment use
- faulty equipment

An electrical system consists of the electrical panel, the electrical circuits and wiring, and the electrical equipment being connected to the system. The following sections provide some general safety precautions against electrical hazards in a workplace, as well as safety tips for the electrical panel, the overloaded circuits and the extension cords that can be found extensively in vehicle repair workshops.

M6-EN.2.2 General Safety Precautions

- Use electrical equipment according to the established safety rules and the manufacturer's instructions
- Report any failure and/or problem of the equipment being used. Require to be repaired by a competent electrician
- Any damaged or suspect electrical cord must be repaired or replaced
- Never use temporal and unsafe electrical connections (**M6.2.1.jpg**)

- Plugs and lamps must have properly connected cables. The cable restraint or grip should effectively fasten the sheath of the cable in order to prevent the cable cores from pulling free of terminal posts
- Install all electrical equipment and wiring properly and with certain circuit protection
- Before using a component, it should be evaluated to determine whether it could tolerate the environment to which it will be exposed. Physical abuse and stress on any component should be minimized by the selection of a safe location and by the use of stress/strain relief devices
- Electrical machine installations should be equipped with relays that trip when the current is too low or when there is a power cut. The relay has to reset before the machine restarts when the current has reached its normal level
- Be aware that sparks from electrical equipment can serve as ignition source for flammable or explosive vapours or combustible materials
- In workshops, all parts of the fixed electrical installation should be at least one metre above floor level (**M6.2.2.jpg, M6.2.3.jpg**) to remove the risk of igniting spilt petrol or flammable liquids
- Portable 240-volt tools and hand lamps and their plugs, sockets and flexible leads are often sources of electric shock and burn accidents, some of which are fatal. Therefore, air-operated hand tools are recommended

Employers are required to:

- Arrange the inspection, testing and maintenance of wiring and all electrical equipment by a competent person, periodically. Fixed electrical installations is recommended to be tested every five years by a qualified electrician
- Keep a record of all inspections, testing and maintenance work carried out
- Arrange inspection of portable and flexible leads and connected plugs as often as once a week by a competent person
- Ensure that the safety system of all machines and tools is performing correctly

Good practices

- Consider the use of air tools or cordless or low-voltage (110 or 50 V) equipment when possible, since poorly maintained portable 240-volts electrical equipment and hand lamps are of major concern in motor vehicle repair
- Install a Residual Current Device (RCD) protection for each electrical socket

M6-EN.2.3 Electrical Panel

Electrical panel (or breaker box) is an insulated panel on which electrical wires are mounted. It consists of a) the Main Breaker, on which the maximum amperage that a service panel may deliver at one time is marked, and b) the Branch Circuit Breakers, that control individual areas / devices. (**M6.2.4.jpg, M6.2.5.jpg**)

Circuit breakers are protective devices controlling the power going to a particular route of wiring. A circuit breaker should be a switch that must be tripped automatically by a failure in the electrical system, usually an overload that could cause the wires to heat up or even

catch fire. According to the regulations, the maximum amperage that a **circuit breaker** is allowed to deliver is set to be **30 mA**.

Safety Recommendations

- Do not disconnect or tape circuit switches, in order to keep a breaker from tripping
- If a fuse, blows or circuit breaker trips repeatedly while in normal use (not overloaded), a check is essential for shorts and other faults in the line or devices. Its use must not be resumed until the trouble is identified and fixed by competent personnel
- Breaker circuits must have accurate labels within the panel box, indicating what equipment or power source they control
- Panel box must have doors attached with secure. Only authorized personnel should have access to it
- Never block panel boxes. There should be a clear space around it at all times to permit ready and safe operation and maintenance
- Employees must know the location of electrical panels in order to disconnect switches in or near their work area so that power can be quickly shut down in the event of a fire or electrical accident. To enhance safety, it is better to post the location of the electrical panel on the equipment it services
- Electrical panels must have warning labels, as the following:



M6-EN.2.4 Overloaded Circuits and Extension Cords

Overloading circuits by hooking on more electrical devices than they were designed to handle is a common problem. Overloading the electrical circuits by using extension cords and multi-plug outlets is hazardous. Some symptoms of an overloaded circuit can be dimmed lights, reduced output from heaters, poor monitor pictures, or even overheating of electrical equipment and possible fire hazard. In order to avoid overloading, employers must take care to provide a generous number of socket outlets on pillars and walls above bench level to reduce the number and length of trailing leads. The total load at any time must be kept safely below maximum capacity.

Safety Precautions

- Do not create an ‘octopus’ by inserting several plugs into a multi-plug outlet connected to a single wall outlet (**M6.2.6.jpg**, **M6.2.7.jpg**)
- Use extension cords only when necessary and only on a temporary basis. Improper use could result in a fire or shock hazard.

If an extension cord has to be used then:

- Select the size of the cord in order to be large enough for carrying the electricity necessary to operate the tool or appliance

- Use polarized extension cords with polarized appliances
- Make sure that extensions cords in use do not hang down from the counter or table tops where they can be pulled down or tripped over
- Replace cracked or worn extension cords with new
- With cords lacking safety closures, cover any unused outlets with electrical tape or with plastic caps to prevent the chance of making contact with the live circuit.
- Insert plugs fully so that no parts of prongs are exposed when using the extension cord
- When disconnecting cords, pull the plug rather than the cord itself
- Use only three-wire extension cords for appliances with three-prong plugs. Never remove the third (round or U-shaped) prong, which is a safety feature designed to reduce the risk of shock and electrocution
- Check the plug and the body of the extension cord while the cord is in use. Noticeable warming of these plastic parts is expected when cords are being used at their maximum rating, however, if the cord feels hot or if there is a softening of the plastic, this is a warning that the plug wires or connections are failing and that the extension cord should be discarded and replaced
- Never use an extension cord while it is coiled or looped. Never cover any part of an extension cord with newspapers, clothing, rugs, or any objects while you use it
- Never place an extension cord where it is likely to be damaged by heavy equipment or foot traffic (**M6.2.8.jpg**)
- Avoid placing extension cords along walkways and corridors
- Do not use staples or nails to attach extension cords to a baseboard or to another surface. This could damage the cord and present a shock or fire hazard
- Do not overload extension cords by plugging in appliances that draw a total of more watts than the rating of the cord. Overloading causes them to overheat creating a fire hazard
- Use special, heavy-duty extension cords for high wattage appliances
- When using outdoors tools and appliances, use only extension cords labelled for outdoor use