201: Health and safety in building services engineering

Handout 2: Hazards

Learning outcome

The learner will:

4. understand the requirements for identifying and dealing with hazards in the work environment.

Assessment Criteria

The learner can:

4.2 define what is meant by the term hazard in relation to Health and Safety legislation in the workplace

4.3 identify **specific hazards** associated with the installation and maintenance of electrical systems and equipment.

Range

Specific hazards: electric shock (direct and indirect contact), burns, fires, explosions

Hazards

When we refer to hazards in relation to occupational safety and health the most commonly used definition is:

a potential source of harm or adverse health effect on a person or persons.

When we talk about a 'hazard' we also refer to the term 'risk'; the most commonly used definition of risk is:

the likelihood that a person may be harmed or suffer adverse health effects if exposed to a hazard.

What is the difference? If there was a spill of water in a room then that water would present a slipping hazard to persons passing through it. If access to that area was prevented by a physical barrier then the hazard would remain though the risk would be minimised. We will deal specifically with risk assessments in a later unit.

Specific hazards that operatives associated with the installation and maintenance of electrical systems and equipment face include the following:

- electric shock (direct and indirect contact)
- burns
- fires
- explosions.

Electric shock (direct and indirect contact)

An electric shock can be defined as:

the physiological reaction, sensation or injury caused by electric current passing through the (human) body.

The direct danger is the damage that the power itself can do to the human body, such as stoppage of breathing or regular heartbeats, or burns. The indirect dangers of electricity include the damage that can result to the human body as a result of secondary events (those events caused by the electric shock, not the electricity itself), such as a fall, an explosion or a fire.

Electricity at any voltage can be dangerous and should always be approached with caution. An electric shock can occur upon contact of a human or animal body with any source of voltage high enough to cause sufficient current flow through the muscles or nerves.

The minimum current a human can feel is thought to be about 1 milliampere (mA). As little as 80 milliamperes can seize the heart muscle. The current may cause tissue damage or heart fibrillation if it is sufficiently high. A fatal electric shock is referred to as electrocution.

Shocks can be caused by direct or indirect contact. Contact with live parts is referred to as direct contact. When an electric shock is received from conductive parts that should not normally be live it is referred to as indirect contact, occurring when there is a fault; for example exposed conductive parts and extraneous conductive parts. The International Electrotechnical Commission (IEC) requires certain degrees of ingress protection against direct contact. Indirect contact protection can be achieved by earthed equipotential bonding and automatic disconnection of supply by using Residual Current Devices (RCDs).

Burns

Being exposed to electric shock not only has an effect on the nervous system and muscles of the body, but can also result in burns; many people receiving burns as a result of an electric shock often die from the effects of these burns. What makes electrical burns even more dangerous is that they may not necessarily be visible on the surface of the body. Often there is a small mark where the electric current passed into and out of the body. However, there may be very serious burning of internal tissues and organs and it is often this damage that ultimately causes death.

Fires

If a short circuit occurs in an electrical circuit, due usually to a fault, resulting sparks could ignite flammable materials and gases in the vicinity. To this end, the electrical regulations, BS 7671, contain a chapter entitled *Protection Against Fire*. Protection against fire resulting from the electrical installation and the use of the electrical installation has been necessary ever since electricity was introduced into buildings.

Explosions

If the installation has a potentially explosive atmosphere sparks produced by the electrical installation, whether as a result of a fault or during normal operation (eg a spark when the contact carrying current opens), could ignite this explosive atmosphere. An explosive atmosphere can be defined as a mixture of dangerous substances with air, under atmospheric conditions, in the form of gases, vapours, mist or dust in which, after ignition has occurred, combustion spreads to the entire unburned mixture.

When installing or maintaining electrical equipment in areas containing an explosive atmosphere, special care must be taken to ensure that any sparks produced by the electrical installation cannot ignite the explosive atmosphere. This is referred to as intrinsically safe. This can be defined as follows.

> Intrinsically safe equipment and wiring shall not be capable of releasing sufficient electrical or thermal energy under normal or abnormal conditions to cause ignition of a flammable or combustible atmospheric mixture in its most easily ignitable concentration.