

Electrical Safety Testing

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Introduction



- § Why is electrical safety important?
- § What am I required to do by law?
- § How do I demonstrate compliance?
- § What do I test?
- § How do I test it?
- § How often do I test it?
- § Who can perform testing?

Perception

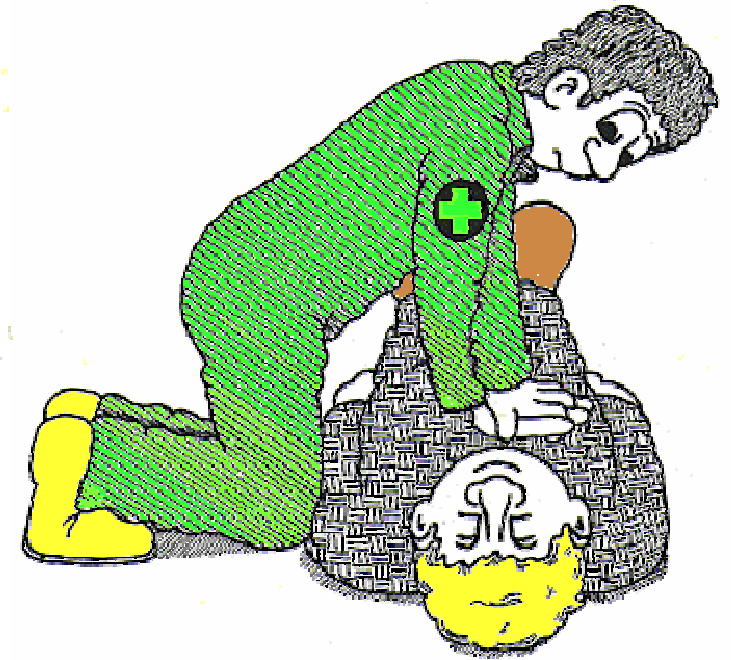


Reality

Physiological effect	50Hz AC
Generally not perceptible	0.5mA
Threshold of perception, tingling sensation	1mA
Maximum “let go” current	5mA
Painful, can’t let go	10-20mA
Severe pain, muscular contraction, difficulty breathing	30mA
Possible Ventricular Fibrillation after 3 s, death possible	0.1A
Skeletal muscle damage – death likely	1.5A

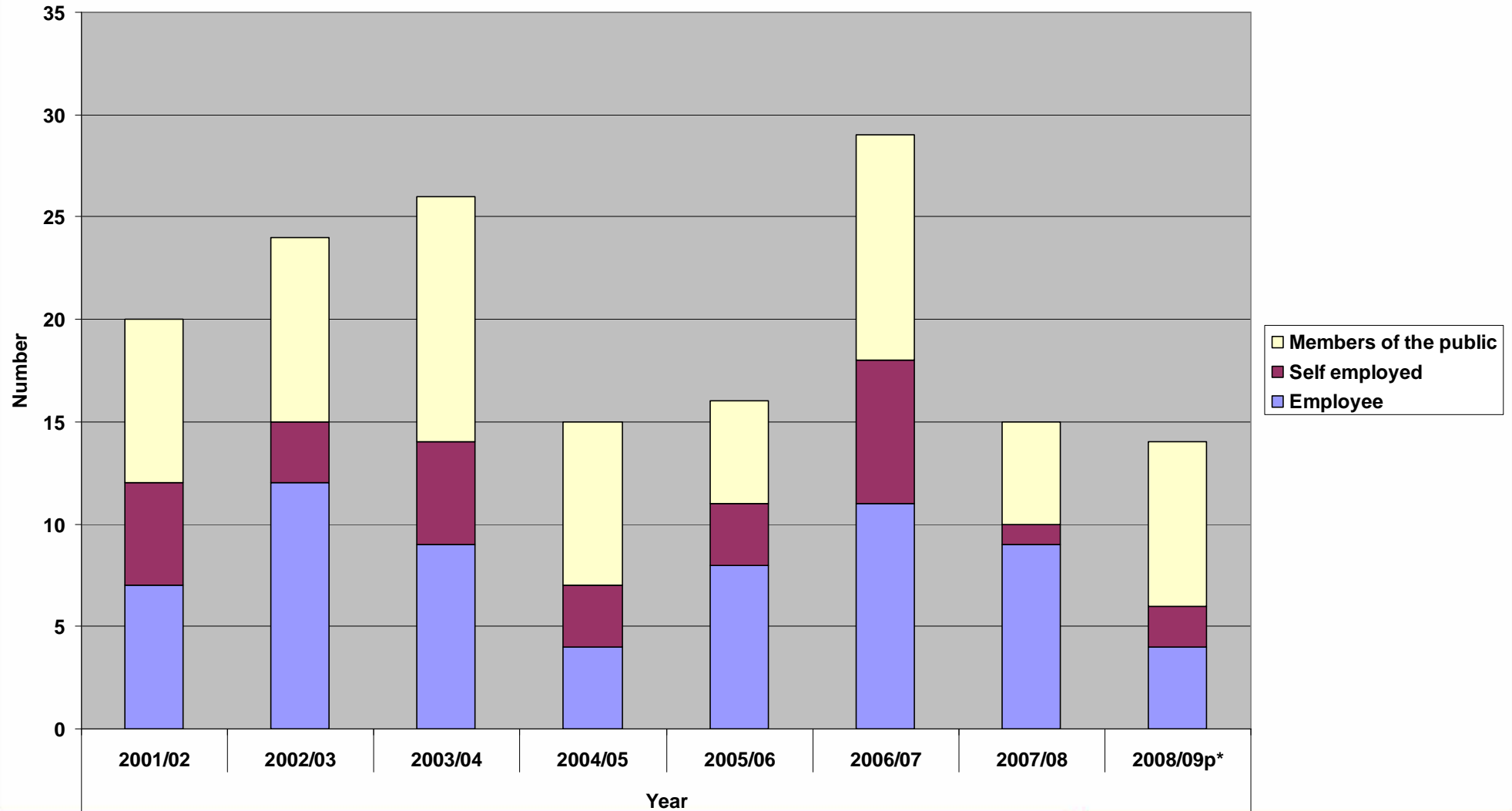
Reality

Electrical Burns & Exit Wounds

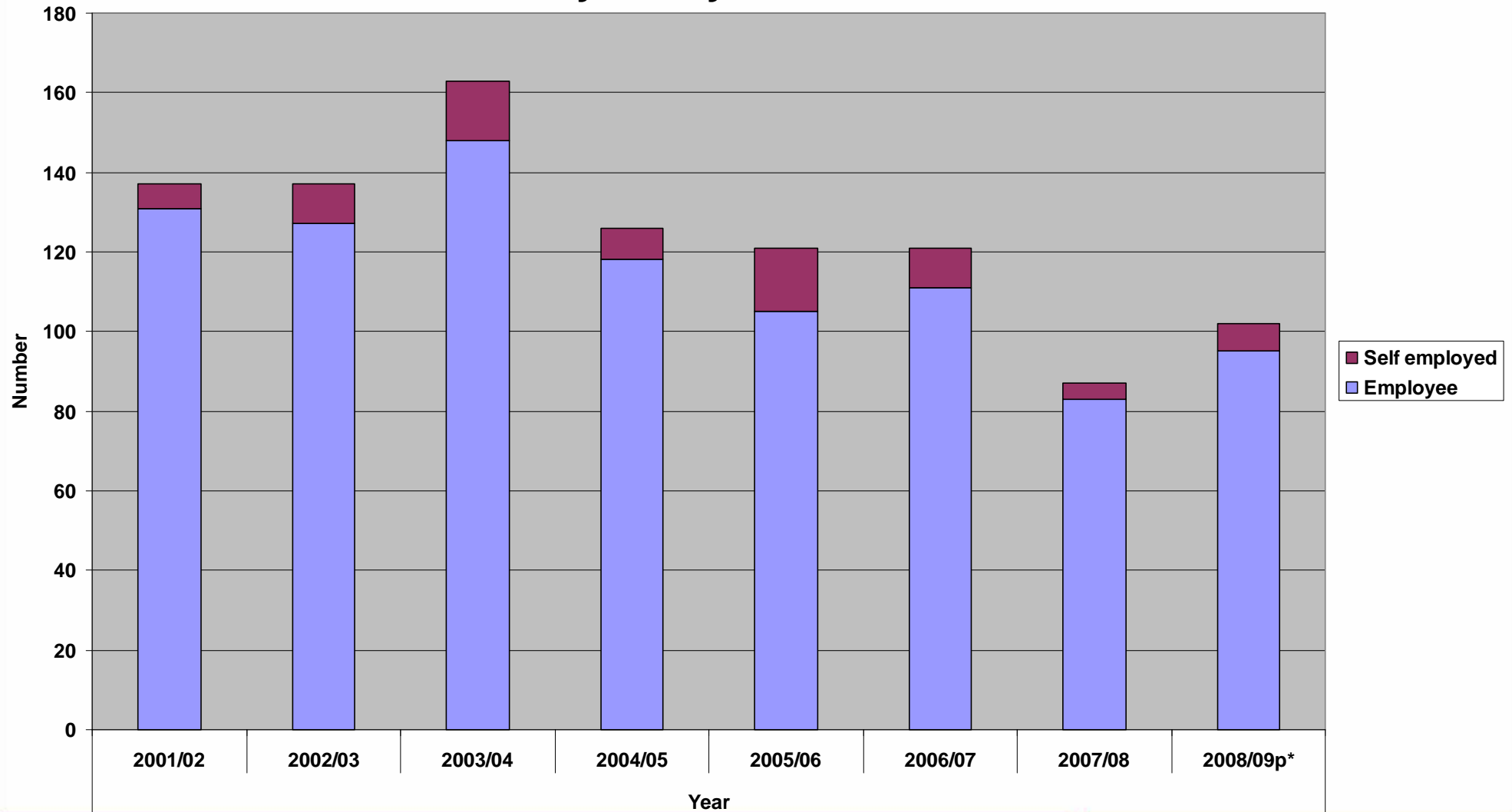


H.S.E. RIDDOR figures

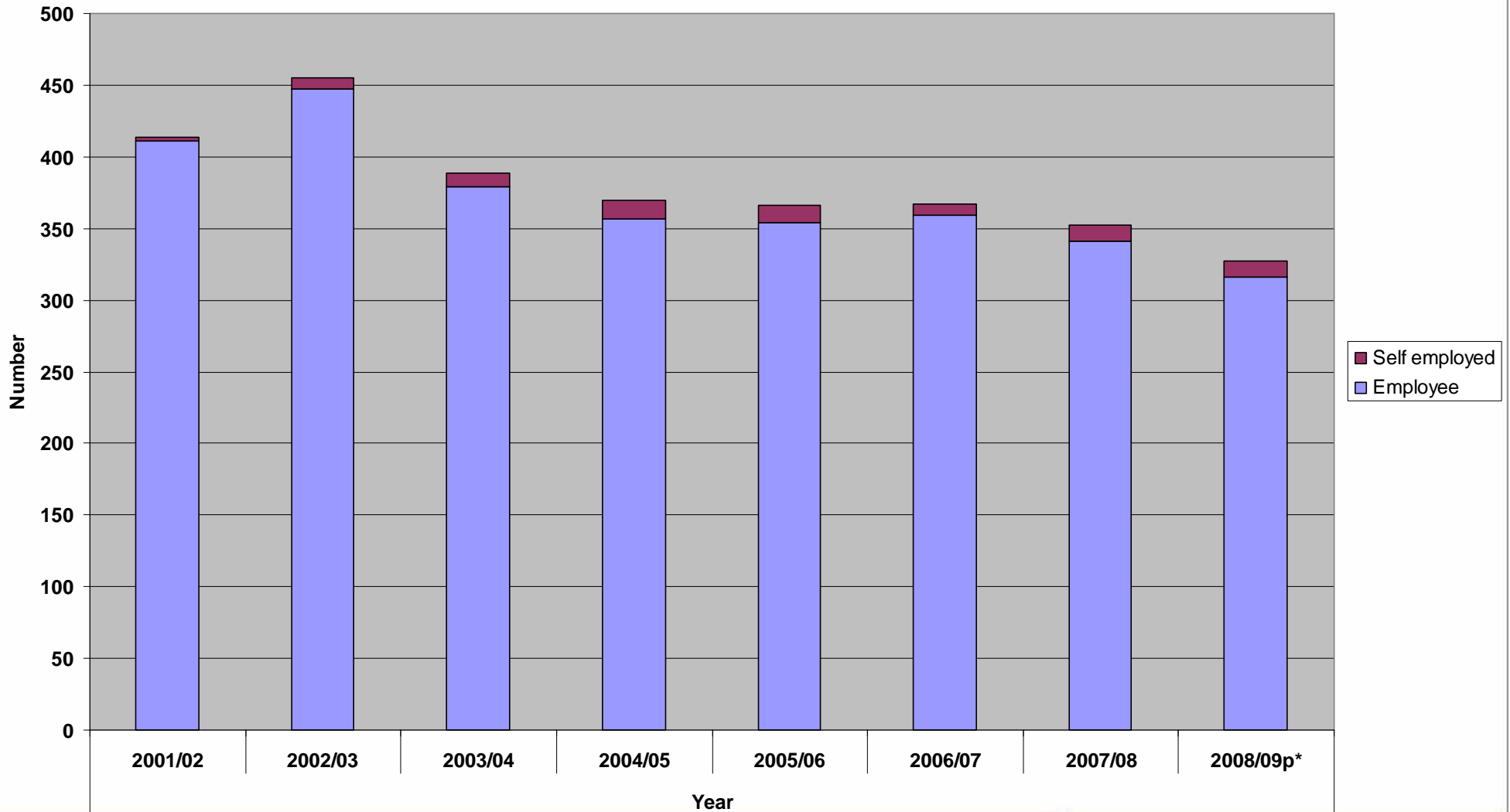
Fatal injuries



H.S.E. RIDDOR figures Non-fatal major injuries



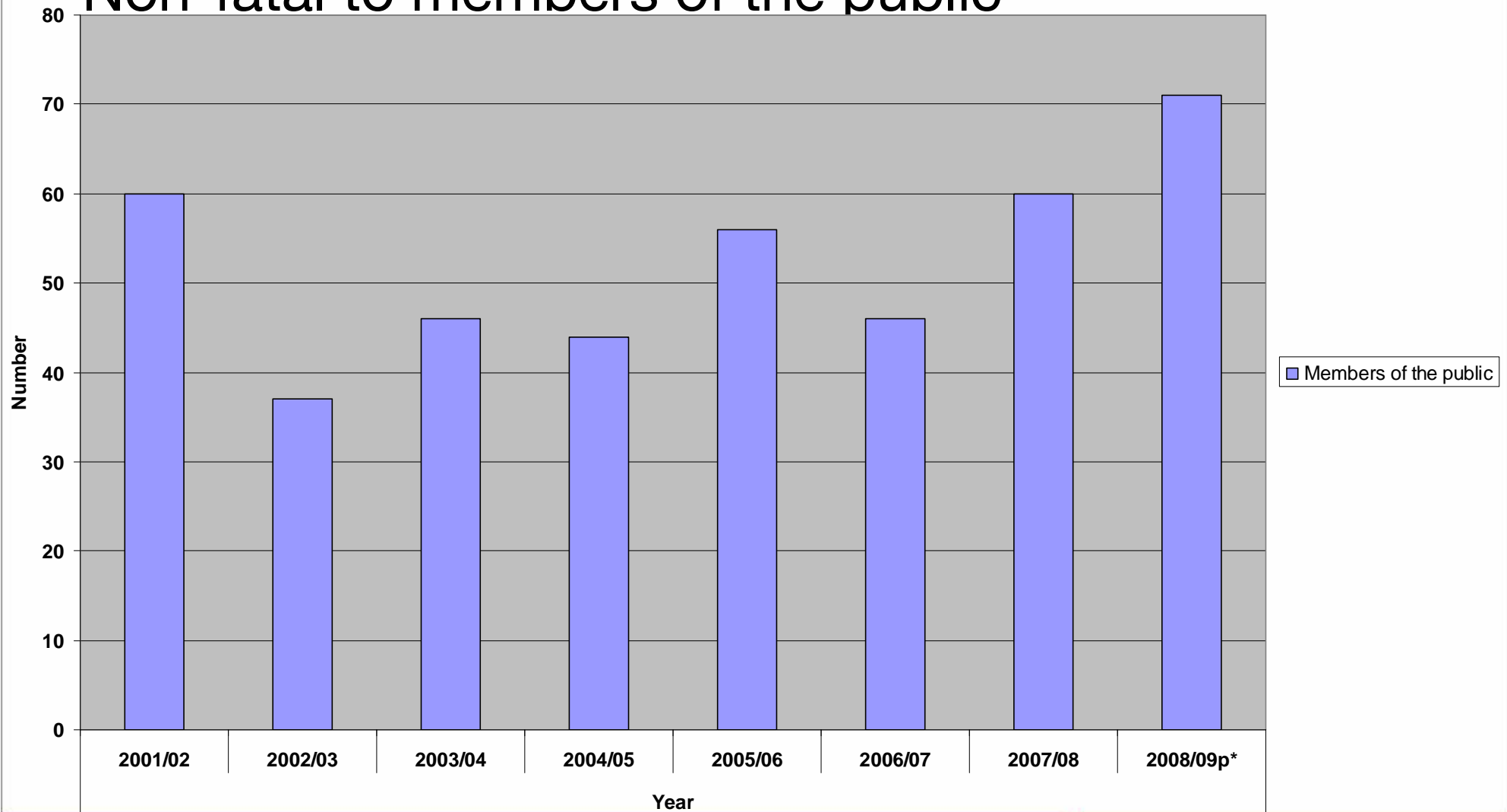
H.S.E. RIDDOR figures Over 3 day injuries



H.S.E. RIDDOR figures



Non-fatal to members of the public



Seaward test and measurement companies include:

CLARE
INDUSTRIAL SAFETY INSTRUMENTS

RIGEL
MEDICAL

CROPICO
PRECISION INSTRUMENTS

SEAWARD
PORTABLE ELECTRICAL SAFETY INSTRUMENTS

Relevant legislation



- § The Health and Safety at Work Act (1974)
- § The Management of Health and Safety at Work Regulations (1999)
- § The Provision and Use of Work Equipment Regulations (1998)
- § The Electricity at Work Regulations (1989)

Summary of legal requirements



§ The Health and Safety at Work Act (1974)

- Duty of care to ensure the safety of all persons using the premises.

§ The Management of Health and Safety at Work Regulations (1999)

- Every employer shall make suitable and sufficient assessment of:
 - The risks to the health and safety of his employees, and
 - The risks to the health and safety of persons in connection with the conduct by him of his undertaking

Summary of legal requirements



§ The Provision and Use of Work Equipment Regulations (1998)

- Every employer shall ensure that work equipment is suitable for the purpose for which it is used or provided

§ The Electricity at Work Regulations (1989)

- As may be necessary to prevent danger, all systems shall be maintained so as to prevent, so far as is reasonably practicable, such danger



Memorandum of guidance on the Electricity at Work Regulations 1989



GUIDANCE ON REGULATIONS

Liability and accountability



§ Someone gets hurt = someone is liable

The responsible person must:

- Provide a safe environment
- ***Demonstrate*** a duty of care
- ***Demonstrate*** that they have taken steps “***to prevent, so far as is reasonably practicable any danger***”



*Electricity at Work Regulation (1989)

Understanding Risk



§ Risk

- combination of the probability of occurrence of harm and the severity of that harm

§ Risk Analysis

- systematic use of available information to identify hazards and to estimate the risk

§ Risk Management

- systematic application of management policies, procedures and practices to the tasks of analyzing, evaluating and controlling risk

Managing the Risk



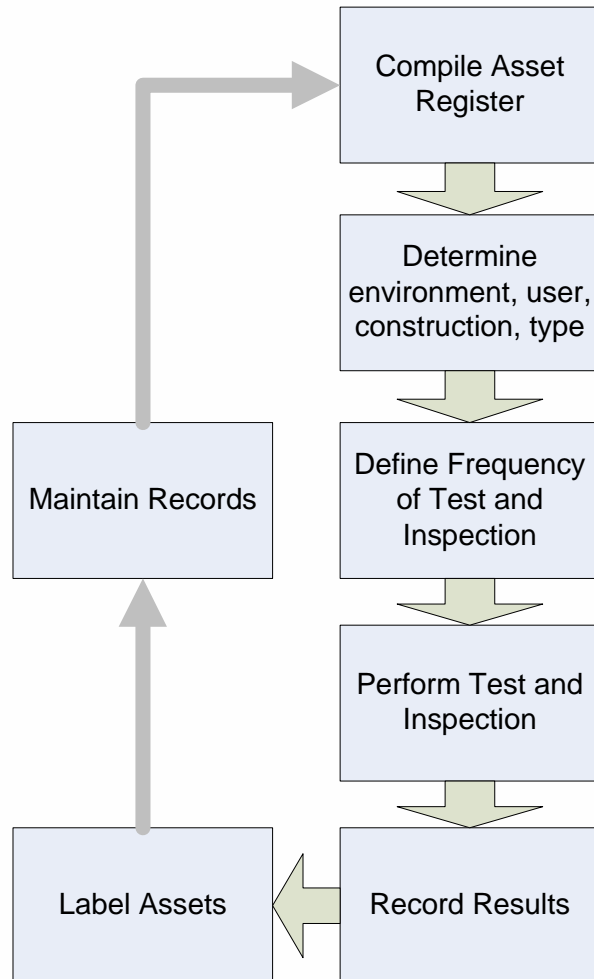
§ *“Nothing ever fails so I don’t need to do any testing”* does not constitute a Risk Analysis

§ Risk Analysis should take into account

- Environment
- The user e.g. are they likely to abuse equipment or report damage
- The equipment construction e.g. Class I or Class II
- The equipment type e.g. hand held equipment can be dropped

§ When the Risk has been assessed and understood, it can be managed.

Demonstrating Compliance



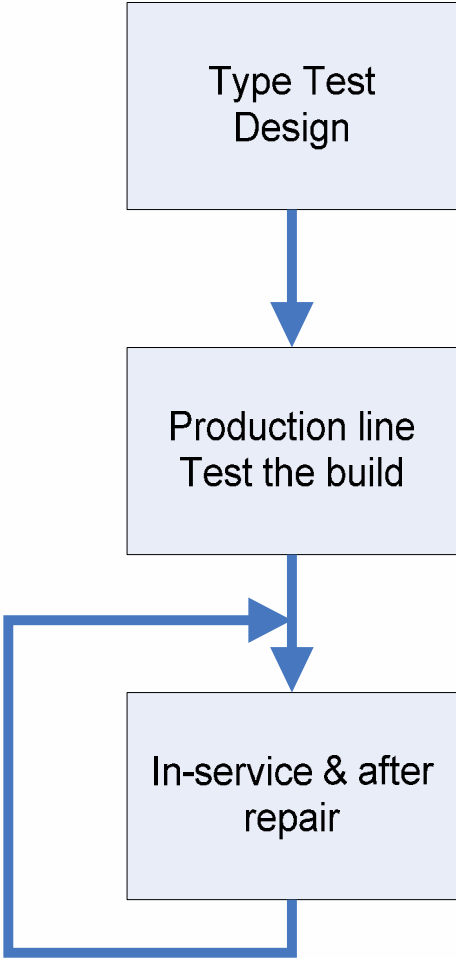
What electrical equipment is on site?

What is the risk and how is it best managed?

IEE Code of Practice for In-service Inspection and Testing of Electrical Equipment

HSE Memorandum of Guidance on the Electricity at Work Regulations HSR25 advises that records of tests should be kept throughout the working life of equipment

Electrical appliance safety



§ Product is safe by design

§ Each product is safe

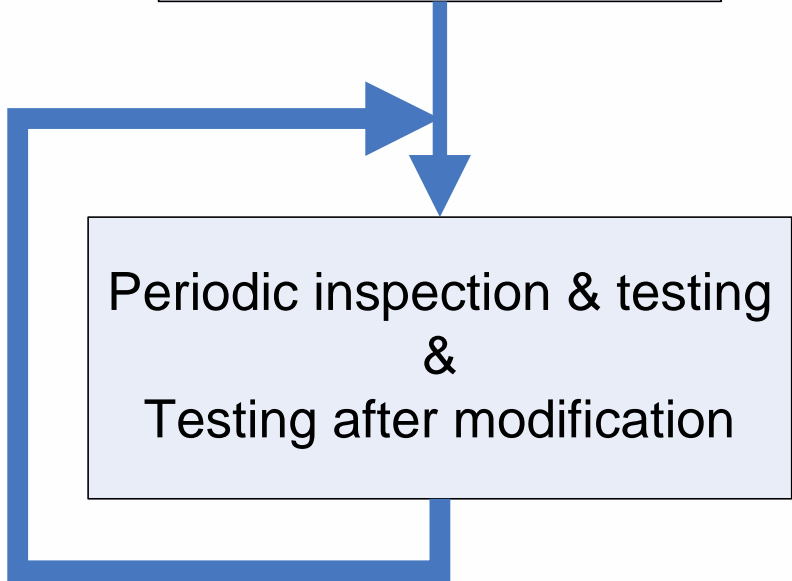
§ Product remains safe

Electrical installation safety



Commission testing

§ Installation is safe by design



Periodic inspection & testing
&
Testing after modification

§ Installation remains safe

Who can test?



- § A person possessing sufficient technical knowledge or experience to be capable of ensuring that injury is prevented. Technical knowledge or experience may include:
 - § adequate knowledge of electricity
 - § adequate experience of electrical work
 - § adequate understanding of the system to be worked on and practical experience of that class of system
 - § understanding of the hazards which may arise during the work and the precautions which need to be taken
 - § ability to recognise at all times whether it is safe for work to continue

Frequency of inspection and test



§ The environment

§ E.g. office, construction site, school etc

§ The users

§ Are they likely to report damage when it occurs?

§ The equipment construction

§ Class I or Class II

§ The equipment type

§ E.g. handheld, portable, IT, moveable, stationary

IEE recommended intervals for combined inspection and test



Type of Premises	Type of Equipment	Class I	Class II
Construction Sites 110V Equipment	All	3months	3months
Industrial inc Commercial Kitchens	S / IT / M P / H	12 months 6 months	12 months 6 months
Equipment used by public	S / IT M / P / H	12 months 6 months	12 months 12 months
Schools	All	12 months	48months
Hotels	S / IT M / P H	48months 24months 12months	None None None
Offices and shops	S / IT M / P H	48months 24months 12months	None None None None

S – stationary, M – moveable, P – portable, H - handheld



What needs to be tested?

§ All equipment in an installation, whether permanently connected or connected via a plug

§ All equipment supplied at voltages up to 1000V a.c. or 1500V d.c. including single & 3-phase supplied at 400V, 230V and 110V e.g.

§ Appliances

§ Detachable mains cords

§ Extension leads

§ Multi-way adaptors

§ Portable RCDs



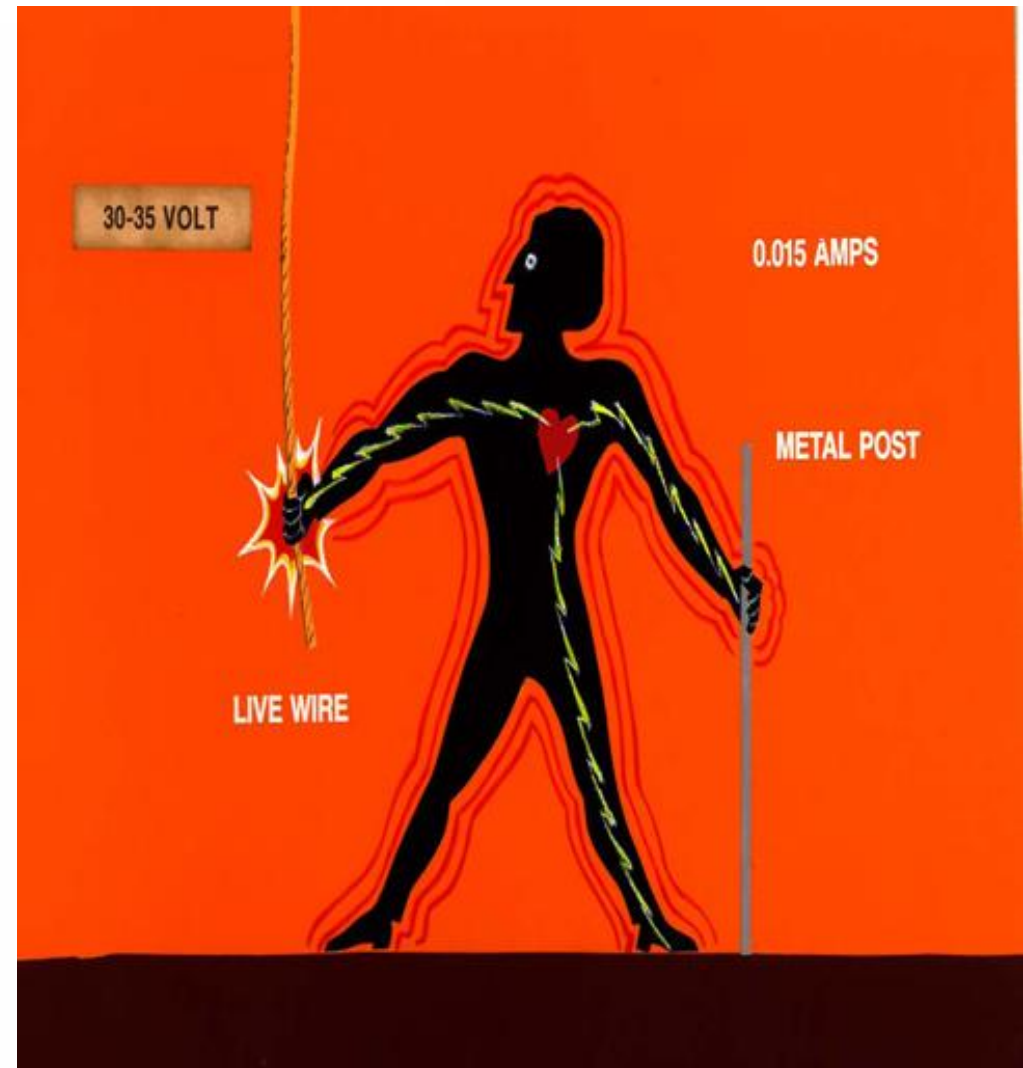
Current through the body

Severity depends upon

§ Current level

§ Path

§ Duration



Protecting against electric shock



§ Reduce current through the body

§ Insulation

§ Eliminate the current path through the body

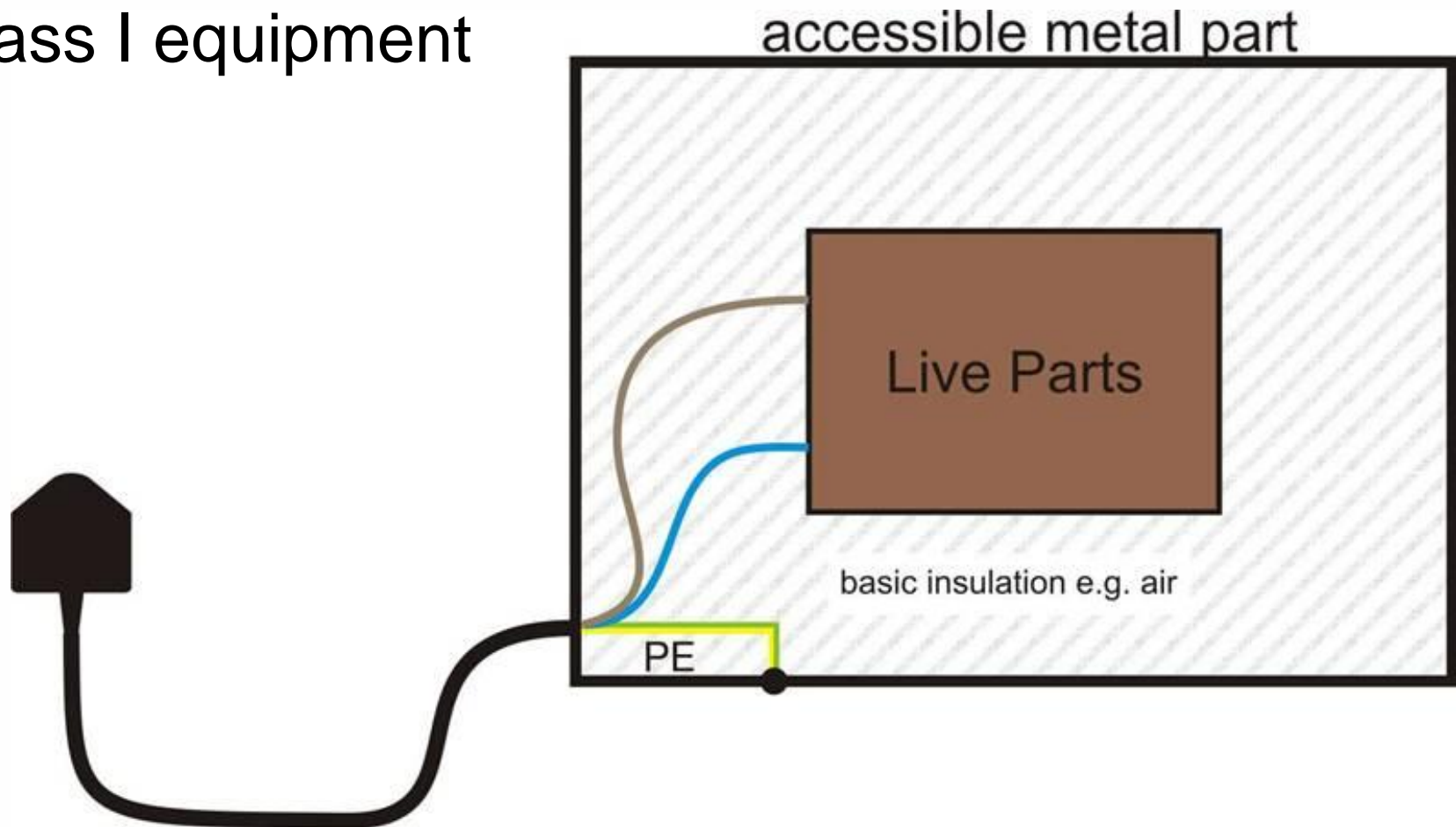
§ Protective earthing

§ Reduce duration

§ RCD, RCBO or other protective devices

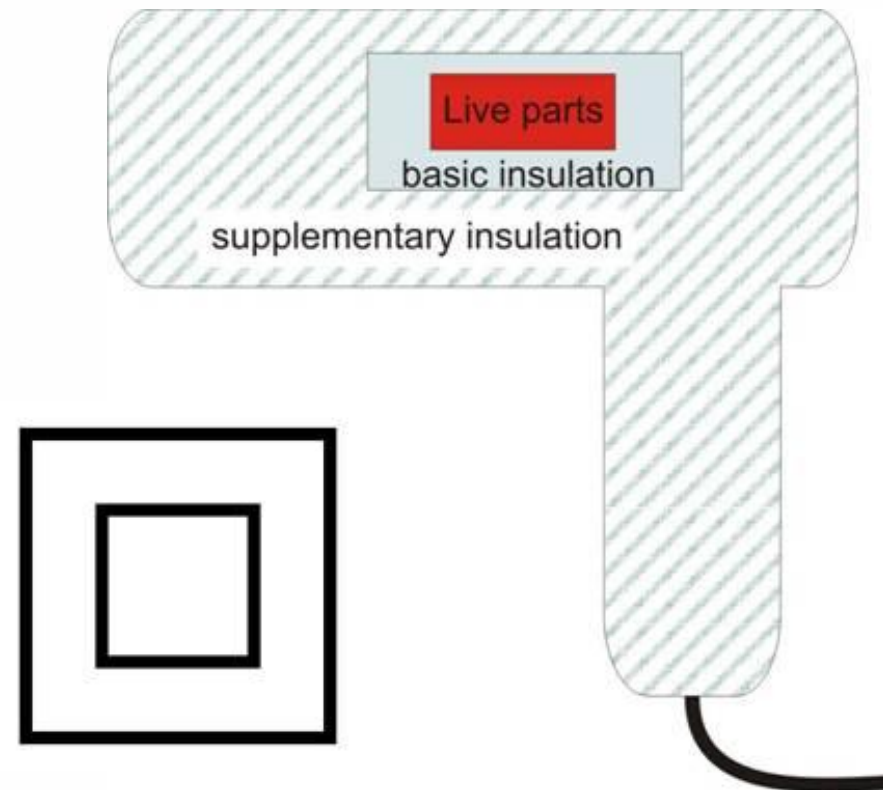
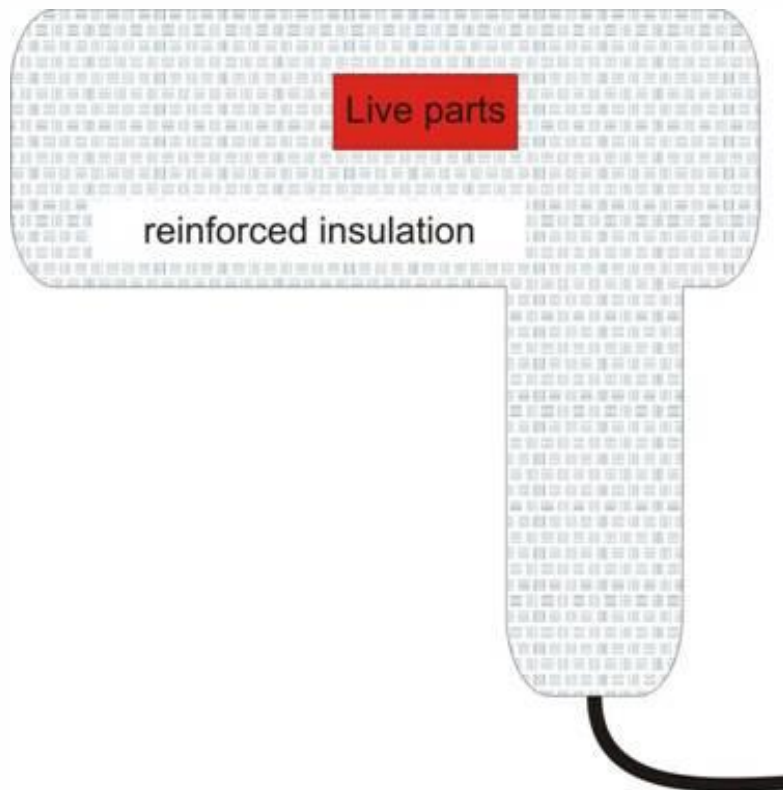
Types of construction

§ Class I equipment



Types of construction

§ Class II equipment



Appliance testing



- § Carry out periodic inspection and testing
 - § Earth continuity & insulation resistance for Class I
 - § Insulation Resistance for Class II

- § Label items to indicate test status

- § Maintain records of inspection and testing

Installation testing



- § Carry out periodic inspection and testing
 - § Visual inspection
 - § Earth continuity & insulation resistance, polarity
 - § Earth loop impedance
 - § RCD tests
- § Label to indicate test status
- § Maintain records of inspection and testing

Formal visual inspection



§ Enclosure

- § Signs of damage e.g. cracks, exposed mains parts

§ Mains plug

- § Wiring

- § Signs of overheating

- § Fuse rating

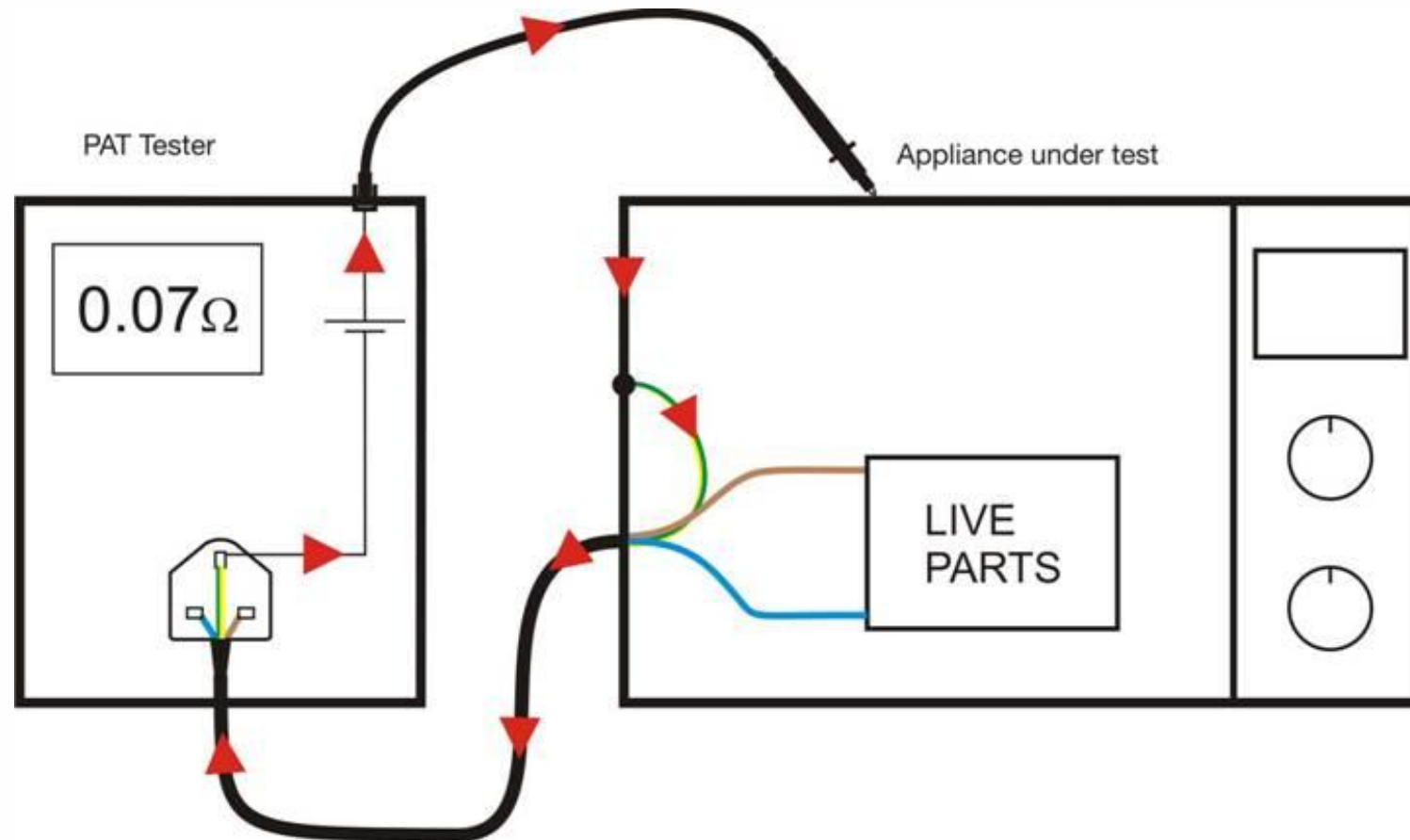
§ Mains cable

- § Signs of damage

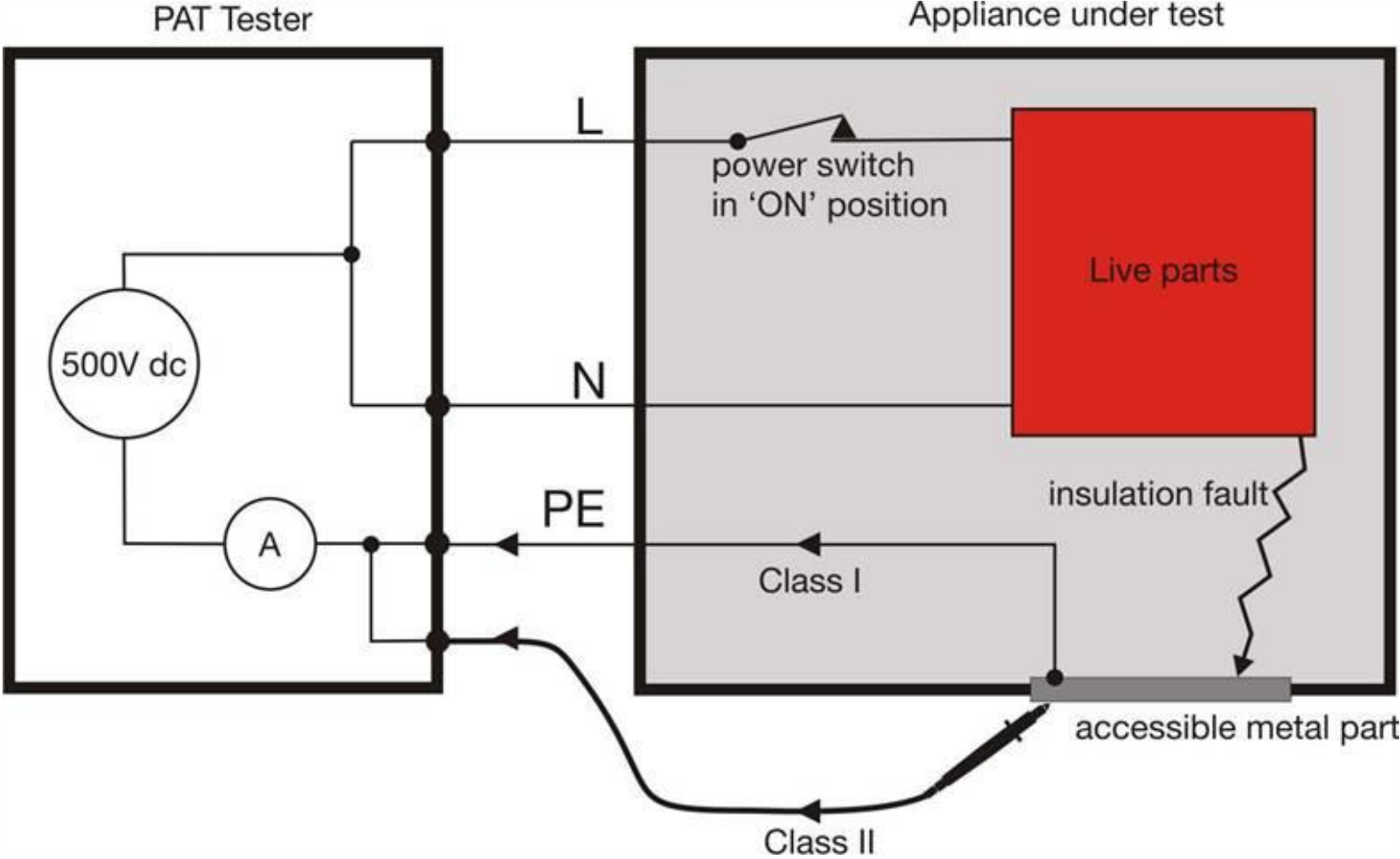
- § Signed of overheating

- § Correct size/rating

Earth continuity



Insulation testing



Examples of test equipment



Seward test and measurement companies include:

CLARE
INDUSTRIAL SAFETY INSTRUMENTS

RIGEL
MEDICAL

CROPICO
PRECISION INSTRUMENTS

SEAWARD
PORTABLE ELECTRICAL SAFETY INSTRUMENTS

Summary



- § The law says we have a duty of care
- § Faulty electrical appliances can cause serious injury
- § Electrical faults cause fires
- § A program of regular maintenance is recommended
- § Routine inspection & testing can reduce the risk of electric shock or fires
- § Routine inspection and testing can demonstrate legislative compliance
- § Frequency of inspection and testing depends on environment, user, equipment construction and type
- § Inspection and testing should be performed by a competent person

Thank you for listening

Any questions.....