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**WHITE PAPER**  
**BEST PRACTICE(S) IN REGULATING ELECTRICAL**  
**SAFETY IN THE HOME**

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## INTRODUCTION

Electricity is essential in our lives and in our homes and its use is continuously increasing. As the saying goes, the future is electric. Our society depends to a large extent on a safe electricity supply.

But, electricity is a potentially dangerous phenomenon. It is sometimes called the silent killer because it cannot be seen or heard or smelled or tasted. It can cause injury and/or death to persons through electric shock, burns, internal injuries or simply electrocution.

The second major hazard is fire. Loss of human life and damage to properties can occur because of fires and even explosions caused by misuse or by a bad electrical installation.

Fire is considered to be the main hazard. An investigation in the UK showed that 79% of the accidental primary fires were caused by faults in the electrical system.

There needs to be a correct approach by all the parties involved to achieve the all- important goal of a safe electrical installation in every home. That will help safeguard the lives of citizens and avoid fires.

## GENERAL APPROACH

We need to have the right approach for new electrical installations, but equally important, for existing electrical installations as well. The problem posed by existing installations is even greater, because many old installations were not made up to standards. Many homes have never undergone any renovation of their electrical installation, while, at the same time, the use of electricity in homes has steadily been increasing.

Maintenance on a home electrical installation is almost never carried out, but every installation deteriorates with use and with time. One must therefore ensure that the safety of users is not put at risk and that the installation is in a safe and serviceable condition.

The risk of fire damage to buildings from aged wiring and switchboards grows ever higher with their age.

There is a need for a well worked-out approach to achieve the goal of maintaining the installation in a safe state.

Who are the different actors and what are the different steps that can be taken to achieve the above-mentioned goals, that is, starting off with a perfectly safe electrical installation in the house, and maintaining it throughout its lifetime, thereby safeguarding the lives of its occupants and securing protection against fire.

## THE TECHNICAL ASPECTS OF THE ELECTRICAL INSTALLATION ITSELF

It is obvious that the equipment and material used in an installation should be safe. This means that they should be in accordance with the relevant standards and that they will not endanger the safety of persons and the conservation of property, when they are installed and maintained in a non-defective condition and when they are used in accordance with their intended purpose.

Electrical equipment must also be selected and installed according to the limitations and the local environmental conditions to which it can be subjected.

Because of its hazards and its complexity, rules for the erection of an electrical installation have been set up and published in national and international standards. Following these rules will help protect persons and property during the installation, the operation, maintenance, and usage of the electrical installation.

Standards are documents that are established by consensus and give the best practices for a process or a product. They are based on the consolidated results of science, technology, and experience and are approved by recognized bodies.

Many countries have their own national standards, but they are almost always based on the international standard IEC 60364 series.

It is imperative that the electrical installation is properly designed. The best practice therefore is following the rules laid down in the national or international standards.

The following points, among others, are laid down in the standards:

- Only safe electrical material should be used (cables, protective devices, switches, socket outlets, light fixtures, etc.)
- The correct protective devices must be used for protection against electric shock
- The correct measures must be taken for protection against thermal effects (fire, arcs, explosion)
- Protection against overcurrent, overvoltages, and voltage reductions

The use of RCDs should be encouraged, even in the case of the supply being a TN-S system. A 30 mA RCD should protect all the socket outlet circuits; this also constitutes an additional protection against direct contact in the event of failure of other protective measures against direct contact or in the event of an imprudent act by the user.

A third party should approve the plans, diagrams, and calculation notes of the installation before any installation work is carried out.

## THE ELECTRICAL CONTRACTOR OR INSTALLER

The person carrying out the installation should be well qualified to do so. Persons who are not competent should not be allowed to carry out any electrical work.

This qualification should be documented and the installer should have a proven experience in the work of carrying out electrical installations and a proven knowledge of the rules and regulations of the applicable standard.

Follow-up training should be provided to make sure that the installers maintain their skills.

If a homeowner is allowed to undertake the wiring of the electrical installation of their own home, a third party such as an Authority or the Network Distributor should test to ensure that they have sufficient knowledge to do so.

## THE INSPECTION

### INITIAL VERIFICATION

When a new installation is finished there should be an inspection to verify that all of the requirements of the standards have been met.

It is important that a full inspection of the complete installation is carried out. This is to confirm that the electrical equipment and materials:

- Are in compliance with the safety requirements of the relevant equipment standards
- Have been correctly selected and erected according to the relevant rules and regulations and to the manufacturer's instructions, in order that performance is not adversely affected
- Are not visibly damaged so as to impair safety
- Are suitable for the prevailing environmental conditions

The inspector should also check that the schematic diagrams and the as installed drawings are available.

During inspection, the following **tests** shall be carried out:

- Continuity of conductors
- Insulation resistance of the electrical installation
- Protection by SELV, PELV, or by electrical separation
- Automatic disconnection of supply
- Measurement of the resistance of the earth electrode
- Measurement of the fault loop impedance
- Polarity, functional, and operational tests
- Voltage drop

### PERIODIC INSPECTIONS

Every existing electrical installation, even if it has been initially inspected, should be regularly reinspected.

Although it is true that electrical installations do not deteriorate quickly, and therefore do not require much maintenance, they do not however retain their original condition. Damage, corrosion, degradation of material, degradation of the insulation (the insulation hardens and can crack), connections that become loose, excessive electrical loading, ageing, environmental influences, normal wear and tear, are all of concern. Apart from deterioration over the years, the functionality of the electrical installations seldom if ever follows the ever-changing needs of its occupants.

Periodic inspections should comprise a detailed examination of the installation. They can be carried out without dismantling, or with partial dismantling the electrical installation.

A periodic inspection will reveal if any of the electrical circuits are overloaded (and thus that more circuits should be provided) and will reveal other potential electrical shock risks and fire hazards in the electrical installation.

It is recommended that electrical installations in homes be thoroughly inspected at least every 10 years. A lighter inspection could be carried out every 5 years and if it is not possible to inspect all parts of the installation, a sampling should be carried out.

When a property is going to be let or sold, the owner should be able to provide an inspection certificate from the last 10 years.

## INSPECTION REPORT

At the end of an inspection, a report should be issued. This report can be considered as a certificate of the electrical installation, stating that the installation is safe for use, or a good report can be a *conditio sine qua non* before a certificate of conformity can be issued. This certificate should have time limits.

The report should give a record of the testing and verifications carried out. It should be clear to what extent the installation has been inspected: were garages and other buildings that form part of the installation included? The whole installation should be included.

The report should also give a clear indication of the condition of the electrical installation. Damage, defects, deteriorations of the equipment should be listed in detail.

The report should state clearly if the (existing) installation is still safe to use and what needs to be done to remedy any and all defects and to bring it back to a safe condition.

If any dangerous situations are discovered, the customer should be immediately warned so that they can take the necessary remedial actions to make the installation safe. This warning should be in writing, highlighting the severity of the situation and stressing the need for an urgent action.

The report should be kept with the installation. It can be used later when the next inspection takes place, either after for instance 10 years, or when the installation is extended, altered, renewed, or when the house is being sold or rented to someone new.

## THE INSPECTOR

It is obvious that the person carrying out an inspection of an electrical installation must be competent to do so. Apart from having a thorough knowledge of the applicable standards, the inspector should have a detailed understanding of safety in electrical installations. They must know how to carry out the appropriate tests and be able to work in a safe way with the testing equipment. They must avoid injury to themselves and to others.

They must have all the pertinent information about the electrical installation to be able to carry out the inspection in a safe manner. They must be in possession of the plans, diagrams, and calculation notes of the installation they are to inspect so as to be able to work in a safe manner.

They must continuously educate themselves to stay ahead of changing technology.

## THE ELECTRICAL UTILITIES OR NETWORK DISTRIBUTOR

The network distributor can play an important role in obtaining our goal of a safe domestic electrical installation. They can help implement the inspection schemes, put in place by the authorities, by requiring that a positive report or a certificate of the installation be issued before connecting the installation to the public network.

They can refuse to connect an electrical installation to the network as long as there is no such proof of a safe installation (report or certificate) stating that the installation is fully compliant with the applicable standards.

They can carry out random inspections on their customer's electrical installations and if they come discover unsafe installations, they can disconnect them from the public network.

## THE OWNER OR USER OF THE ELECTRICAL INSTALLATION

All the citizens should be educated about the correct behaviour to avoid the dangers of electricity. They must realize that electricity must be treated with the respect it deserves. They should realize that living with an unsafe electrical installation and using unsafe electrical equipment can result in an electrical accident

Home users should be encouraged to take responsibility for the maintenance of their electrical systems.

The need for inspecting the electrical installation should not be considered as a burden, but as something obviously related to one's personal safety.

The owner should understand that an electrical installation does not remain safe on its own and that a good earthing does not necessarily remain in a good or safe condition.

In some countries, special teams visit the households to create awareness on preventive measures against the hazards of electricity.

The owner/user should take every opportunity to have the electrical installation assessed for safety.

## AUTHORITIES

The authorities play a huge role in the safety of its citizens. School programmes should be set up to educate young people about the hazards of electricity and the electrical installation.

The authorities should draw up legislation, requiring inspection of all new and existing electrical installations and enforcing sanctions if the rules are not followed.

The authorities can guarantee the qualification of the installer and the inspector.

On its own, or in association with private organizations, the authorities can help to raise the awareness of the need for safe electrical installations among homeowners. Setting up and supporting various programmes that promote the safety of electrical installations can change attitudes among home users.

## THE IDEAL SITUATION

In conclusion, in an ideal world, the following practice can be considered the best practices for obtaining our goal of safe domestic electrical installations, including no more loss of properties through fires with an electrical origin, no more loss of lives through fires or electric shock, no more injuries from unsafe electrical installations, or the use of unsafe electrical equipment and electric tools.

- The installation is properly designed and put in place with safe material, according to the latest detailed standards.
- All the prescribed protective measures are implemented.
- The necessary plans, diagrams, and descriptions are kept at the disposal of any person working, testing, or supervising the installation and that they cover the entire electrical installation.
- An experienced contractor, who is qualified for this type of work, and who is fully aware of the importance of the safety of the electrical installation, carries out the installation.
- An experienced inspector does a verification of the installation by carrying out a visual inspection and testing.
- A certificate is issued, based on a positive report.
- The network distributor checks the validity of the certificate before connecting the electrical household installation to the public grid. They should never connect an installation if there is no valid certificate.
- The owner/user of the electrical installation understands the hazardous aspects of electricity. They understand that electricity is often the cause of fires in the homes and therefore finds it normal and logical that the electrical installation is well maintained and regularly inspected. They will only use safe electrical equipment, and not misuse it. They accept the fact that the installation needs to be regularly inspected to see if it still in a safe condition.
- The authorities support and supervise the whole chain:
  - (i) the education at school level: dangers of electricity and the importance of having safe electrical installations and having regular inspections of these installations
  - (ii) the qualification and/or licensing of installers
  - (iii) the system of certificates before connection to the public grid is possible
  - (iv) the position of the network utilities in only connecting safe electrical installations to the public network

When all parties involved play their role well, a safe electrical installation will become the standard and the regular inspections will be widely accepted by the population as a means of avoiding fires, injuries and deaths caused by the electrical installation.