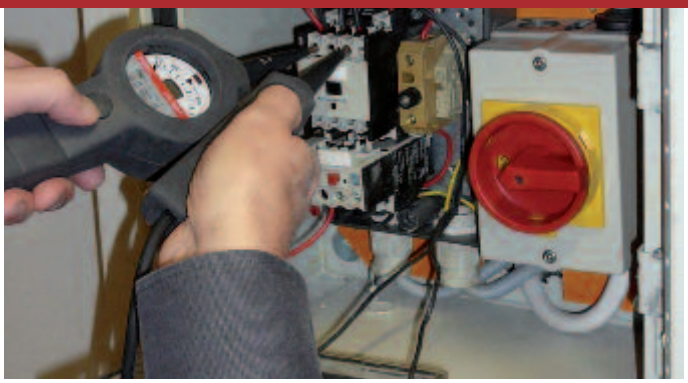
Guide for Risk Assessment
in Small and Medium Enterprises

9 Hazards arising from Electricity

Identification and Evaluation of Hazards; Taking Measures



issa | INTERNATIONAL SOCIAL SECURITY ASSOCIATION

Section for Electricity
Section for Iron and Metal
Section for Machine and System Safety

Guide for Risk Assessment in Small and Medium Enterprises

9

Hazards arising from Electricity

Identification and Evaluation of Hazards; Taking Measures

issa | INTERNATIONAL SOCIAL SECURITY ASSOCIATION

Section for Electricity
Section for Iron and Metal
Section for Machine and System Safety

Imprint

Authors: Dipl.-Ing. Wolfgang Pechoc,
Berufsgenossenschaft Energie Textil Elektro Medienerzeugnisse, Germany

Mag. Irena Dimitrova, Dipl. Eng. Panayot Panayotov,
General Labour Inspectorate Executive Agency, Bulgaria

Dr.-Ing. Jelena Nagel,
Bundesanstalt für Arbeitsschutz und Arbeitsmedizin, Germany

Production: Verlag Technik & Information e.K.,
Wohlfahrtstrasse 153, 44799 Bochum, Germany
Phone +49(0)234-94349-0, Fax +49(0)234-94349-21

Printed in Germany · September 2010

ISBN 978-3-941441-65-1

Introductory Note

This brochure has been designed to satisfy the demand for assessing the risks of people, working with electricity and/or exposed to electrical hazards.

This brochure provides basic information in regard to

- electrical hazards
- the usage of devices and tools
- the design of electrical installation

The information is divided into the following chapters:

1. **Basic Information**
2. **Risk Assessment**
3. **Examples for 'acceptable' and 'unacceptable' condition**
4. **Risk Reduction**
5. **Annex 1 and 2**

Note:

This brochure is dealing exclusively with the European aspects as laid down in the directive for protection of workers at work (89/391/EEC and single directives). For specific national aspects, please look up the respective legal transpositions (see "National Aspects").

The present series of brochures is not intended to deal with the documentation of evaluated risks, since the pertinent rules and regulations differ widely in the individual member states.

Other topics treated in the series of brochures organized along the same lines and already published or being prepared are:

- **Noise**
- **Hazards arising from machinery and other work equipment**
- **Chemical hazards**
- **Slipping and Falling from a height**
- **Hazards arising from explosions**
- **Hazards arising from whole-body/hand-arm vibrations**
- **Manual handling of loads**
- **Mental workload**

1. Basic Information

1.1 | Basic information on electricity and electrical hazards

In our modern times hardly any individual lives without contact with the phenomenon of electricity. The term phenomenon accentuates the dual nature of electricity – both vital and deadly. The daily use of electricity has dulled men's sense of risk. Thus this brochure is addressed to the layman who switches on and off electrical systems and tools and who is lacking a skilled person's specific knowledge and training in regard to the hazards of repair and maintenance work on electrical equipment.

The effect of some hazards listed below depends on numerous factors, whose classification and quantitative evaluation is not easy. However, the basic safety rules for avoiding risks arising from the use of electrical systems and tools can be classified in three main groups as follows:

- The electrical systems and tools shall be designed and manufactured for safe operation;
- The electrical systems and tools shall be used in a safe manner. Periodic checks shall be made to guarantee the safe condition of the electrical equipment according to the legal provisions;
- The electrical systems and tools shall be repaired safely and for safe further operation.

Although this brochure is addressed to unskilled personnel with no special training, some basic theoretical information will be useful for the purposes of this guide.

The hazards of electricity depend on the current flow which occurs when a person has contact with live parts of damaged electrical equipment or in a fault circuit. The level of the electric current which flows through the human body is defined by "Ohm's Law" which defines the relationship between voltage, current and resistance. This means the higher the voltage and or the lower the resistance, the higher the current level.

Each current flow, exceeding the threshold of perception in combination with a resulting electric shock or secondary accident can be critical (but generally not life-threatening). Also a contact with voltage far below the limit value of 50 V ac or 120 V dc can cause accidents. Contact voltages which lead to a current passing through, above the release limit of approx. 10 mA, should be considered critically. If there are no particular critical work area conditions (e. g. confined spaces with the risk that the human body may have contact with conductive parts), in general, no life threatening flow of electric current through the human body must be expected up to approximately 50 V. In the above mentioned critical work areas it may be necessary to limit the voltage lower than 24 V ac or 60 V dc.

Fatality is to be expected at values above 50 V as a result of the flow through the human body. This electro physiologically caused limit value is also proved by accident statistics.

Most of accidents happen at usual consumer voltages of 230 V ac (against earth) and 400 V ac (between two external conductors) – equivalent to the frequency of existence of low-voltage distribution installations and the frequency of electrical consumer goods, e. g. machinery, devices and apparatus.

Voltage is classified into “low” and “high”. Low voltage is in general ac voltage value between 0 and 1000 V. Normative ac voltage values exceeding 1000 V are described as high voltages.

Low voltage does not mean low hazard!

All electrical devices and tools are intended for use with definite voltage and in specific environments like dust, humid or explosive atmosphere. Information about the environmental conditions, in which your device is intended to use, you can get from the label of the device or operating instructions.

1.2 | Hazards caused by electricity

In general, the hazards caused by electricity can be divided into two main groups: **primary** and **secondary**.

A. Primary hazards

They result in injuries directly caused by electricity. Most common are the following:

- **flowing of current through the human body**

It can cause electric shock with a harmful effect on the internal organs and their proper function. Most vulnerable are cardiac activity and the breathing. The extent of injury reflects the impact of a series of factors:

- amperage;
- frequency of current;
- path of current;
- ambient conditions (e. g. humidity, temperature);
- length of contact time.

Under the same circumstances, alternating current (50 - 60 Hz – the frequency used in everyday life) is more dangerous than direct current. The human body is very sensitive to the amount of current. The current that may cause an injury is about 1/10th of the current flowing through a light bulb. Weak current mostly causes functional disorders, while heavy current cause tissue burn especially if the current goes in and out of the body.

- **contact with hot and harmful substances resulting from the electrical arc and its products**

The electrical arc is a discharge of electricity through a combination of ionized air and vaporized conductor material[1]). It is accompanied by high temperature, intense light, pressure and sound

[1]) see ISSA publication “Guideline for the selection of personal protective clothing when exposed to the thermal effects of an electric arc”

waves, metal vapours, and shrapnels of broken equipment. An industrial application of a controlled electrical arc can be seen in arc welding and cutting.

The blinding flash of an electrical arc can cause temporary or permanent eye damage. The emitted thermal radiation is capable of maiming or killing a human being. The hot air and the metal vapours can cause severe burns. Inhaling hot electrical arc products can seriously damage the respiratory system by burning the lungs and the throat, or it can result in poisoning.

The electrical arc is most commonly caused by a short circuit (accidental or provoked by wrong operation), or erroneous switching on and off of electrical devices. The extent of the injury depends on the time of exposure, the power of the arc (amperage), the distance to man, the existence of a shield and the availability of personal protective equipment.

- **impact of a strong electromagnetic field**

As a rule, the impact of electromagnetic fields is cumulative and the harmful effects are delayed in time. However, a strong high-frequency field can produce tissue and organ damage, acting like a microwave oven. Most vulnerable are the eyes.

Any work activity done near a powerful antenna of a mobile operator can produce these effects within the zone of emitting.

B. Secondary hazards

Electricity may trigger other hazards, principally divided into two main groups:

- **sources of fire and/or explosion**

Three elements are needed for a fire or an explosion to occur:

- ignitable material;
- oxidizer (air);
- source of ignition.

Electric sparks, electrical arc and heated parts of electrical installations and equipment represent the sources of ignition of the above mentioned elements. Electric sparks are formed not only under unusual conditions such as short circuits, but also during routine work of some electrical devices. All switch devices produce sparks of different energy at common use. Therefore (That's way) it is essential that electrical equipment suits the work environment (see illustration of the label).

Static electricity forms a special kind of sparks. A static charge occurs when at least one of the mechanically interacting materials has a high resistance to electrical flow (an electrical insulator). In effect, objects may be charged up to tens of thousands volts. That charge cannot induce the flow of dangerous current through the human body, but it has sufficient energy to initiate an electric spark, powerful enough to ignite explosive atmosphere.

Electricity heats all parts of the circuit it flows through. The contact points of wires lead to especially strongly warm ups. Most dangerous in everyday life are sockets and plugs, especially when overloaded. Overloading may cause excessive heating of the entire installation. To avoid that it is essential to use properly rated maximum over current protection.

- **sources of other secondary effects**

The flow of current through the human body or an electrostatic discharge from/to man may provoke uncontrolled movement or a muscle reaction that leads to tripping, slipping, falling and the like.

1.3 | Fundamentals of electrical safety

The safety requirements of electrical installations are of utmost importance. They are designed to protect the user from hazards due to electrical equipment.

Compliance with Technical Standard IEC 60364, or equivalent, will ensure that the installation is of the highest standard. Each country has specific regulations or legislation to meet the basic requirements of electrical safety.

It is of good practice to have special rules for

- maintenance
- testing

Maintenance means a combination of all technical and administrative actions intended to retain an item in a state in which it can perform a required function.

Testing is the implementation of measures on electrical equipment by means of which its effectiveness is proved. It includes ascertaining values by means of appropriate measuring instruments, said values not being detectable by inspection.

If an enterprise does not have a competent person for these working activities it should make a contract with an external person.

Requirement and frequency for testing depends on risk exposure and on risk assessment of the hazards associated with the environment in which the equipment is used; e.g. equipment used in environments safe from accidental damage or environmental strain, need not to be tested. If testing is deemed necessary due to risk assessment, it shall be carried out by a competent person.

Reasons for testing:

- As a result of inspections carried out before use
- If required by manufacturer's instructions
- After repairs
- After a prolonged period of non-use
- If the previous history involves accidents or near misses
- If the equipment is second-hand and previous history is unknown
- Use of equipment in a hazardous environment:
  - In case of the risk of mechanical damage or heavy wear and tear
  - Risk of bad weather conditions
  - Extremes of temperature/pressure
  - Presence of moisture, dust
  - Use in explosive atmosphere

For example:

- An **User Inspection** may be sufficient in the following situation:
  - Use in a low risk environment
  - totally insulated equipment
- **Periodic Testing** may be appropriate in the following situation:
  - Equipment is intended for use on 230 V
  - Equipment is used in a hazardous environment
  - Equipment is handheld
    - Therefore is more likely to become damaged
    - There is greater risk of fatal shock to the user

2. Risk Assessment

The basis for risk assessment is the national legislation. In case of incompliance with the national legislation unacceptable risks will arise. The employer may determine the requirements higher than national legislation but not lower than these.

The table below may be used to assess the risk and to evaluate the measures as follows:

In the left column you find statements. The possible answers are illustrated in three columns.

You can give only one answer to each statement. If the answer is YES the risk is acceptable. If the answer is NO the risk is unacceptable. If the answer is I DON'T KNOW an electrically competent person shall be consulted to give the right answers YES or NO.

national legislation or minimal requirement

unacceptable risk	**acceptable risk**

Field of work: _____ Control Number: _____

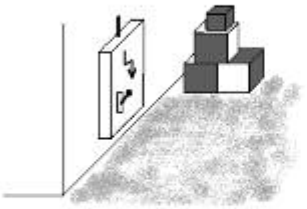
Assessment made by: _____ Date: _____

Construction of the electrical installations, equipment and devices	Yes	I don't know	No	Comments
The electrical installation, equipment and device have been safe for the whole period of operation:				
The electrical installation, equipment and device are used in compliance with the requirements of the national legislation.				
Records and results of inspection and testing are available to verify the safety of the electrical installation, equipment and device.				
The used electrical machinery and hand-held tools have at least a CE or national mark.				
The used electrical machinery and hand-held tools are suitable for the working environment.				
Work in hazardous environment is done with Class II (symbol "double rectangle") hand-held electrical tools or tools operating at safety extra low voltage (< 25 V AC or 60 V DC) from a safe source.				
The temporary electrical installation and/or the electrical machinery and the tool which is used in a specific environment (outdoor installations, humid areas) is protected with a residual current device (RCD):				
RCDs for the protection of individuals have a nominal leakage current of not more than 30 milliamps (mA).				
Energy supply can be easily cut off in the case of emergency.				
The used electrical installation, equipment and hand-held tool is in good condition:				
• no missing parts				
• no removed or broken covers, protecting live parts				
• no damaged casing/cable/plugs etc. and live conductors				
• sockets and switches are firmly fixed; no indication for overloading				
• extension leads are far from sharp or heated parts or objects that can damage them				
• extension leads create no tripping hazard				
• the ends of flexible cables have their outer sheath firmly clamped to prevent the wires' pulling out of the terminals				
Use and service of electrical systems, equipment and devices				
Tasks to be performed by competent persons are specified.				
The tasks to be performed by competent persons are clearly described by procedures.				
The staff working with the electrical equipment and the hand-held electrical tool has undergone training and instructions.				
The instructions to use the electrical equipment and the hand-held electrical tool safely are readily available.				
The staff is trained and instructed to carry out the suitable inspections according to their competence.				
The staff is trained and able to recognize hazards and hazardous operation of electrical equipment and tools, as well as to react adequately to them.				
The electrical installation and equipment is tested periodically by a competent person.				
The staff is trained and skilled to take adequate action in an emergency case, such as fire, explosion and in first aid.				
First Aid				
First aid is available at any moment:				
The first aid procedure is defined.				
First aid equipment is available.				
Treatment by a medical specialist is available.				
Other				

3. Examples for ‘acceptable’ and ‘unacceptable’ condition

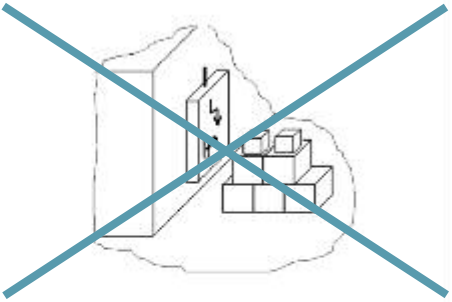
(See also ISSA-brochure “Ten golden Rules for electrotechnical laymen”)

Energy supply can be easily cut off in a case of emergency.



acceptable

the switch is easily accessible



unacceptable

the boxes will block the access to the power switch in case of emergency

the ends of flexible cables have their insulating sheath firmly clamped to prevent the wires pulling out of the terminals

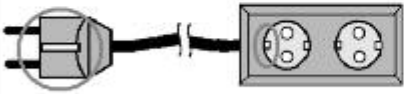
acceptable

cables are ok

unacceptable

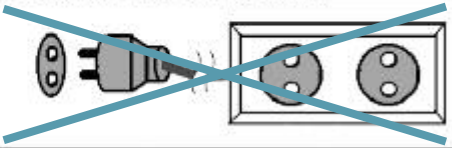
the cable is not firmly clamped in the sockets

the electrical installations, equipment and devices are put into operation in compliance with the national legislation.



acceptable

grounding terminals are ok



unacceptable

protective terminals for grounding are missing

Safe use of electrical equipment

- Use it in the intended manner as per manufacturer's instructions, in its intended environment and never overload it.
- It should be maintained only by competent personnel and in accordance with the manufacturer's instructions.
- Transport it in a secure manner (so that it is not subject to unnecessary shocks or vibrations).
- Keep the power cord away from heat, oil, sharp edges and moving parts.
- Assess all risks of the equipment as damage source to nearby electrical cables (including supply cables to the equipment) and water pipes.
- Never use in rain or in wet conditions (refer to the IP rating).
- Only use in explosive atmosphere if rated for such conditions (refer to the Ex Rating).
- When in use be aware of the following danger signs:
  - Dim or flickering lights
  - Arcs/sparks
  - Sizzling / buzzing sounds
  - Odours that smell of burning material, e. g. plastic, rubber
  - Frequent tripping of circuit breakers/fuses
- Use rated protective device correctly and never by-pass the device.
- Store it in a careful manner when not in use.

4. Risk Reduction

The measures for risk reduction correspond to the hierarchy of measures as established in the Framework Directive 89/391/EEC[2]) (see annex 1).

They are aimed at two aspects:

- structure and safe condition of the electrical system, equipment and device
- staff behaviour during use and repair work

A. Structure and safe condition of the electrical system, equipment and device.

It is secured in the following manner:

- design and construction are in compliance with the national legislation and conditions of the environment in which they are used;

  Note: Only skilled persons can design electrical systems and equipment.

- use of hand-held equipment, powered by safety extra low voltage or another kind of energy (pneumatic and hydraulic tools);

- use of additional devices guaranteeing a higher level of safety, for example residual current devices (RCD).

  Note: In general, the installation of Residual Current (Protective) Devices (RCDs) [also called: GFCI: Ground Fault Circuit Interrupters] provides protection against electrical hazards to users of the device.

  The RCD controls a possible fault and switches off in case of danger due to poor insulation. These RCDs should trip in 0.3 sec or less on currents not exceeding 30mA and provide the necessary protection from the danger of a life threatening electric shock to the user.

  However the RCD shall be tested periodically. A test shall be conducted once a month by an unskilled person using the dedicated push-button, trip and re-set. Periodically it shall be tested more thoroughly by a competent person to ensure safe operation. The frequency of testing depends on the national legislation and on the manufacturer's instructions.

- put into operation only safe electrical installation and equipment[3]). Prior to every operation carry out the necessary inspections, measuring and testing in compliance with the national law[4]);

- during the use of the installation or equipment the same level of safety shall be observed through periodic testing. The frequency of testing as well as specifications in regard to the environment are determined in the national legislation. Records, results and conclusions shall be kept.

---

[2]) Council Directive 89/391/EEC of 12 June 1989 on the introduction of measures to encourage improvements in the safety and health of workers at work

[3]) For the european market electrical machinery, devices and tools must have at least a CE mark.

[4]) Appendix: A list of the minimum requirements for checking, measuring and testing according to the national law.

Note: In case maintenance works of the electrical installation and equipment are assigned to external bodies, make sure that they issue a document describing the work performed and verifying the safe condition of the installation and equipment.

- staff training to develop skills in regard to the identification of common violations against the safety requirements which may result in hazards, and for immediate reaction accordingly:
  - switches and outlets out of order, with broken or missing elements and/or indication of overloading (overheating);
  - cables and wires with visibly broken insulation;
  - defective, broken or missing elements of the casings of electrical machinery, devices and hand-held equipment;
  - lighting fixtures with broken or missing glass cover and/or decorative elements (diffusers, grids);

    Note: elements of the lighting fixtures have safety functions besides their aesthetic value!
  - power cables not fixed to the portable electrical machinery and hand-held equipment;
  - clear marking, indicating of the pertinence of the switch and the device for maximum current protection to the respective electrical machinery and/or elements of the electrical installation;
  - installed safety signs (including ones incorporating words), warning about electricity hazards or the general and specific behaviour to be adopted.

B. Measures related to the behaviour of the staff during the use and maintenance of electrical systems and devices.

The following two categories of staff use electrical systems and devices:

- skilled (competent) persons
- unskilled (instructed) persons

According to the legislation in regard to electrical systems and devices they shall be repaired only by electrically skilled persons[5]). The measures for risk minimization are specified in detail in the legislation of the EU member states and are beyond the scope of this brochure.

Only electrically skilled persons have the competence to erect/install electrical installation.

The major aspect for this regulation is the protection of the personnel against electric shock due to fault conditions in line with the switching-off conditions. The operation of electrical installations and equipment under specific environmental conditions can result in an increased electrical risk. These specific conditions (e. g. building sites, farming, and refinery) require supplementary safety measures to be determined by the responsible electrically skilled person. Additionally to the basic training, electrically skilled persons require comprehensive knowledge of specific

[5]) The legislation of each EU member state sets special requirements to the skilled persons. For further information, please, refer to the "Guideline for Assessing the Competence of Electrically Skilled Persons" at: http://www.issa.int/aiss/Resources/Resources2/Guideline-for-Assessing-the-Competence-of-Electrically-Skilled-Persons

provisions regarding permissible and necessary safety measures in these areas.

The unskilled personnel is responsible for safe and adequate application. This includes:

- switching on and off of the electrical machinery and tools;
- input of materials and/or consumables;
- performance of different types of work using electrical machinery and tools and monitoring their condition;
- performance of different work activities in the vicinity of overhead lines or underground supply cables;
- action to eliminate dangerous or abnormal regimes and/or give first aid to a victim

Unskilled persons may be instructed for inspection of electrical systems, equipment and devices to prove the safe condition (see last item of indent A: **Structure and safe condition of the electrical system, equipment and device)**.

The basic rule to avoid dangerous behaviour is:

- **Never start to work if you are not skilled and/or instructed for the work activity or the work has not been assigned to you!**

Below you will find the basic measures:

- instructing the staff for operating the respective equipment;
- instructions for work activities with the equipment including instructions of the manufacturer (supplier);
- training of the staff how to act in case of emergency and to provide first aid to a victim of an accident caused by electricity.

Using electrical devices, machinery and hand-held tools the staff shall comply with the following basic rules:

- Start work only with sufficient knowledge of the (manufacturer's) instructions for operation.
- Before using an electrical machine (tool), check that it is in safe condition.
- Turn on and off the electrical machinery and tools using the switches.
- In case of a sudden break of power supply, pull the plug from the socket to disconnect the hand-held electrical equipment.
- Work activities with heavy mechanization in the vicinity of overhead lines only if the safe distance requirements are met. The same applies to work activities on scaffolds, ladders, aerial work platforms and the like.
- To perform excavation work in the vicinity of underground supply cables, first make sure about their location. Never excavate with machinery in the vicinity of cables.
- In case of fault probability or occurrence of the electrical equipment (abnormal noise, sparkling, smell of burning insulation, a tingling sensation at touching the equipment, etc.) immediately switch off the supply and/or remove the plug.

- To move the machinery, make sure it is disconnected from the socket outlet (electrical board).
- To change light sources of lighting fixtures switch off the supply.
- Avoid any kind of temporary repair of defective cords or cables. Never use materials at hand for insulation.
- Never operate hand-held electrical equipment with wet hands or feet or in zones of sprinkling or dripping water unless it is specially designed for such environment.
- Stop any outdoor work in case of rain, snowfall or thunderstorm and disconnect the hand-held electrical equipment from the socket outlets.

Annex 1

Hierarchy of measures for risk reduction:

1. avoiding risks
2. evaluating the risks which cannot be avoided
3. combating the risks at source
4. adapting the work to the individual, especially as regards the design of work places, the choice of work equipment and the choice of working and production methods, with a view, in particular, to alleviating monotonous work and work at a predetermined work-rate and to reducing their effect on health
5. adapting to technical progress
6. replacing the dangerous by the non-dangerous or the less dangerous
7. developing a coherent overall prevention policy which covers technology, organization of work, working conditions, social relationships and the influence of factors related to the working environment
8. giving collective protective measures priority over individual protective measures giving appropriate instructions to the workers.

Annex 2

A. Key Points of the Document[6]) for Outsourcing the Servicing of Electrical Installations and Equipment

The document for servicing electrical installations and equipment shall cover at least the following:

1. Data about the parties to the agreement

2. Scope of the agreement

Specification of the installations and the equipment to be serviced. The names of all individual machines and the margins, within which the installation is to be serviced, shall be clearly set[7]).

3. Obligations of the parties

3.1 *Obligations of the contractor*

These shall cover at least the following:

- Scope and frequency of the maintenance checks and measurements to be made according to the law and/or technical specification of the individual machine.
- Periodic checks according to the contract, aimed at monitoring the proper operation and condition of the installation and the equipment[8]).
- Initial instruction and training provided to the client concerning steps to be taken in case of emergency.
- Elimination of identified faults and malfunctions, or of incompliance with the legal provisions.
- Quick response[9]) to a client's signal for an identified fault or malfunction.
- To keep record of each check, repair and/or measurement made (see Annex 2), stating clearly and unequivocally whether the equipment/installation is or is not fit for operation.
- To keep informed about amendments to the legislation and to inform the client accordingly. To take due steps so that the electrical installation/ equipment is operating in compliance with the legislative amendments.
- To be involved in risk assessment as regards electrical safety.

6) If not stipulated otherwise by law, there must be a written contract.

7) These margins depend on the national legislation, setting the limits for the power supply company for serving the electrical installations. The outlining shall be very precise, for instance output clamp of a circuit breaker. In case of machines, served by an authorized body according to the law (for instance, a lift), the margins for general and specialized service shall be clearly differentiated whenever different bodies are in charge of it.

8) The best practice shows that the frequency of these checks shall be at least once a month.

9) The best practice is to react within the range of 15 minutes to 1 hour upon alert.

3.2 *Obligations of the client*

- To provide to the contractor access to all electrical installations and equipment covered by the contract.
- To place at contractor's disposal any available information about the electrical installations and equipment covered by the contract (electrical schemes and accompanying documentation to the equipment).
- To appoint persons to be instructed and trained by the contractor for steps to be taken in case of emergency.
- To alert in due time the contractor about any identified or suspected fault or malfunction of the electrical installations/ equipment.
- To notify the contractor about any new equipment in place, or any changes in the electrical installations made out of the contract.
- To use the electrical installations/equipment only according to the rules for laymen (for example, turning on or off with the switch). To make no repairs or changes in the electrical installations/equipment.

B. Example of a Record Following a Contractor's Action

Having made a maintenance check, repair, measurement, change in the installation, fitting of new equipment, etc., the contractor's representative shall certify with a special document the following:

1. Date/period of the operation.
2. Name of the equipment/installation and, if appropriate, its location, serial number, etc.
3. Description of the operation.
4. Statement about the condition of the equipment or installation after the operation and the compliance or incompliance with the legislation in force.
5. Conclusions such as: 'The equipment/installation is safe and can be used', or 'The equipment/ installation is not safe and shall not be used'.

The document shall be dated and undersigned by both the contractor and the client.

The table below is an example.

Date	Name of the equipment/ installation	Description of the operation	Cause[1])	Findings[2])	Conclusions[3])	Name and signature of the contractor's representative	Name and signature of the client's representative

[1]) For example: 'Legal requirement (quote details)'. 'Signal for a fault/malfunction', 'A fault/malfunction identified during the check', 'An operation agreed under the contract'.

[2]) In case of measurement, the number/s of the report/s shall be quoted. The report/s shall be attached. If no measurement is made, the compliance or incompliance with the legislation in force is reported in this column.

[3]) For example: 'The equipment/installation is safe and can be used', or 'The equipment/installation is not safe and shall not be used'.

Germany

GPSG:

"Geräte- und Produktsicherheitsgesetz"

"Equipment and Product Safety Act"

BetrSichV:

"Verordnung zur Rechtsvereinfachung im Bereich der Sicherheit und des Gesundheitsschutzes bei der Bereitstellung von Arbeitsmitteln und deren Benutzung bei der Arbeit, der Sicherheit beim Betrieb überwachungsbedürftiger Anlagen und der Organisation des betrieblichen Arbeitsschutzes (Betriebssicherheitsverordnung – BetrSichV)"

"Ordinance concerning the protection of safety and health in the provision of work equipment and its use at work, concerning safety when operating installations subject to monitoring and concerning the organization of industrial safety and health at work (Betriebssicherheitsverordnung – Ordinance on Industrial Safety and Health – BetrSichV)"

TRBS 2131:

"Technische Regeln für Betriebssicherheit – Elektrische Gefährdungen"

"Technical guideline for occupational safety – Electrical Hazards"

BGV A 3:

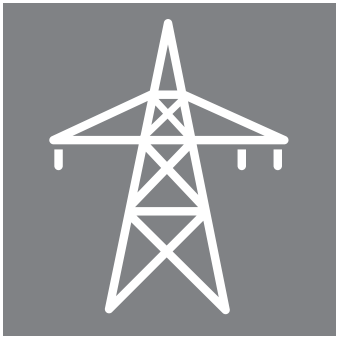
"Elektrische Anlagen und Betriebsmittel"

"Electrical installations and equipment"

The following ISSA International Sections on Prevention elaborated the brochure. They are also available for further information:

ISSA Section for Iron and Metal

c/o Allgemeine Unfallversicherungsanstalt
Office for International Relations
Adalbert-Stifter-Strasse 65
1200 Vienna · Austria
Fon: +43 (0) 1-33 111-558
Fax: +43 (0) 1-33 111-469
E-Mail: issa-metal@auva.at



ISSA Section for Electricity

c/o Berufsgenossenschaft Energie Textil Elektro Medienerzeugnisse
Gustav-Heinemann-Ufer 130
50968 Köln · Germany
Fon: +49 (0) 221 - 3778 - 6007
Fax: +49 (0) 221 - 3778 - 196007
E-Mail: electricity@bgetem.de

ISSA Section for Machine and System Safety

Dynamostrasse 7-11
68165 Mannheim · Germany
Fon: +49 (0) 621-4456-2213
Fax: +49 (0) 621-4456-2190
E-Mail: info@ivss.org

www.issa.int

Click on **"Prevention Sections"** under **"Quick Links"**

ISBN 978-3-941441-65-1