



2013

Technical Guideline for Electrical Contracting Companies in the EU

Association Européenne de l'Installation Electricque
European Association of Electrical Contractors
Europäische Vereinigung der Unternehmungen für Elektrische Anlagen

Provisional publication of 14 countries*- [click to go]:

Austria, Belgium, Denmark, England, Finland, Latvia, Netherlands, Norway, Portugal, Scotland, Slovenia, Spain, Sweden, Switzerland.

(*) This technical survey is a 'living document' that has been started many years ago by the technical task force and that we wish to update since the last version dated of 2005.

The results of the 14 countries are sent to the Chairman of the technical task force Terje Hansen and will be assembled – by the end of 2013 – into a publication.

For now, you can find the corrected (English language) versions of each country that replied to the AIE secretariat.

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1. AUSTRIA

1.1 General Rules for Establishing A Business

Federal Law ("Gewerbeordnung" - regulation of trades and crafts)

Additionally, regional laws, which are derived from Federal Law, may apply, e.g. "clean air act", "inspection of heating systems", etc.

Furthermore, the membership of any company doing electrical contractors works in the Federal Association of Electrical Contractors ("Bundesinnung") is mandatory and regulated by the Law for the Economic Chamber ("Wirtschaftskammer-Gesetz")

To obtain a license for electrical contractors work, one can do a so-called "Befähigungsprüfung", an exam, where the abilities of a candidate are tested according to a rule, called "Befähigungsprüfungs-Ordnung" (Regulation for the examination to obtain a licence for a certain craft). This regulation is elaborated and published by the Federal Association, but has the character of Federal Law.

Other ways for obtaining a license for electrical contractors work are regulated by a "regulation for access to the electrical contractors craft" ("Zugangs-Verordnung", issued by the Federal Ministry of Economy, Family and Youth), where several possibilities of getting a licence are listed. These may be a combination of a university degree or a technical college degree with some practical experience, or a successful examination for being a skilled worker in combination with practical experience, etc... There is also a possibility of obtaining a licence by estimating the individual skills and experience of a candidate, a so-called "individual licence", which is issued by the local authorities responsible for the supervision of crafts. In this case, the Federal (or Regional) Association of Electrical Contractors often is asked for advice.

These Rules are given by

- Federal Law
- Regional Law
- Economic Chamber/Federal Association
- EU

Records of trade and industry
See below!

Professional certificate as electrical contractor

- Gewerbeschein (License permitting establishing a business)

Registration

- Gewerbebehörde (Authority regulating business)
- Mitgliederdatenbank (Austrian Economic Chamber Member data base)

Qualification of enterprises

To obtain a license for electrical contractors' work one can do a so-called "Befähigungsprüfung", an exam, where the abilities of a candidate are tested according to a rule, called "Befähigungsprüfungs-Ordnung" (Regulation for the examination to obtain a licence for a certain craft). This regulation is elaborated and published by the Federal Association, but has the character of Federal Law.

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Other qualification of enterprises (PV, Heat Pumps, ...) is mostly based on a voluntary way, with some exemptions e.g.: According to the EU-Regulation on Fluorinated Greenhouse Gases used in airconditioning and heat pump systems it is required to have certifications, both companies and working personnel, to perform certain tasks in airconditioning and heat pump systems. This is Federal Law. The Federal Association of Electrical Contractors is responsible for issuing certificates to the personnel, the Federal Ministry of Environment is responsible to grant certificates for companies.

1.2 Requirements Relating to Electrical Contracting Personnel

For skilled electrical installation workers there is a federal regulation for qualification ("Ausbildungsordnung"). A minimum 3 ½ yrs. apprenticeship is required followed by a final examination to obtain a certificate to be a skilled worker. The qualification scheme has a modular set-up. A 2yrs. Basic module is followed by a module focusing on a certain field (1 ½ yrs.). A specific module (1/2 yr.) may be added according to specific wishes or appointments between the employing company and the apprentice.

1.3 Technical Standards

In the Federal Law of "Law ensuring general electrical Safety" Elektrotechnikverordnung ETV 2002 is the list of the norms called SNT, which are legally to use. The Austrian norms are the ÖVE/ÖNORMs in general the HD-Document with many special Austrian requirements.

The most important norms are:

- For the safety measures the ÖVE/ÖNORM E 8001-1
- For emergency lightning ÖVE/ÖNORM E 8002
- For electric installations in medical use ÖVE/ÖNORM E 8007

- For erecting of earthing installation ÖVE/ÖNORM E 8014
- For inspection after repair of electric appliances ÖVE/ÖNORM E 8701
- For operation of electric installations ÖVE/ÖNORM EN 50110
- For protection against lightning ÖVE/ÖNORM EN 62305

1.4 Inspection of Installations

The “Law ensuring general electrical Safety” Elektrotechnikverordnung ETV 2002 and the ”Regulation regarding electrical safety on the working place” Elektroschutzverordnung ESV 2013 inform on the inspection rules.

A report is legally obligated for every new installation on the ÖVE/ÖNORM E 8001-6-1. For companies it is periodic from 1 year until 10 years, which depends on the type of the company according to the ÖVE/ÖNORM E 8001-6-2 and ÖVE/ÖNORM E 8001-6-3. In case of new letting of an apartment it is for the renter legally obligated to give the hirer a report according to the ÖVE/ÖNORM E 8001-6-2.

1.5 Health and Safety

- Arbeitnehmerschutzgesetz (Law ensuring safety of workers)
- Arbeitsstättenverordnung (Law regulating working places regarding to safety)
- Arbeitsmittelverordnung (Law ensuring safety of working tools and equipment)
- Bauarbeitenkoordinationsgesetz (Law ensuring co-ordination between different crafts in the building sector to ensure safety)
- Elektroschutzverordnung (Regulation regarding electrical safety on the working place)
- Elektrotechnikverordnung (Law ensuring general electrical Safety)
- Gewerbeordnung (regulation of trades and crafts)

1.6 Contractual and Commercial Matters

Kollektivvertrag für Arbeiter/Angestellte im Metallgewerbe (collective agreement on tariffs for salary and wages of blue/white collar workers in the metal processing craft and industry sector)

1.7 Practical Shortcut on Common Used Electrical Connections

Common electrical connections/technical characteristics for residential and office buildings:

1. Which current rating and phasing (1-phase/3-phase) is used? ~50Hz
2. How much ‘voltage drop’ is involved? According to the EN 50160:2010
3. Which earthing type is being used? Normally TN-system, but also TT with RCD
4. What are the common meter types? Normally the type Ferraris

2. BELGIUM

2.1 General Rules for Establishing a Business

Records of trade and industry

To establish a business in trade or industry, one has to file with the records of trade and industry (“*handelsregister*” or “*registre du commerce*” *) through one of the privately operated enterprise counters (“*ondernemingsloket*” or “*guichet d’entreprise*”). Without (correct) registration, one theoretically risks high fines and even prison sentences. More importantly, any legal claim for a non-registered activity can be declared inadmissible by the judge.

For some activities, the professional capacities of the enterprise first must be certified. Therefore, a company can only ask to be registered for activities for which it has this certificate, or for activities which don’t require a certificate. Companies with 50 employees or more never need this certificate.

Professional certificate as electrical contractor

The enterprise counter delivers the certificate when the enterprise has proven to meet with all the requirements.

These requirements concern technical matters as well as managerial capacities (including price calculation and bookkeeping). They can be met by two different persons.

Both can be proven by diplomas or experience (3 to 5 years in the 10 years before the application), or by a special exam before a central jury with the Ministry of Economic Affairs. Applicants younger than 30 years also have to go through a apprenticeship of 2 years (usually this is included in the schooling).

This certificate is necessary for all electrotechnical activities (“installing, modifying, repairing high-voltage installations, i.e. driven with more than 50 and less than 500 volts”), as well as the assembly of electric or electronic appliances, and the installation of (indoor) telephony and signalling, electrical heating, fire and intrusion detection systems (royal decree of 6 December 1968, modified repeatedly).

Without the necessary certificate, not only criminal prosecution is possible, but also closure by the authorities or by competitors. Contracts may prove to be legally unenforceable.

Registration

To combat social and/or fiscal moonlighting, all enterprises active in construction are strictly controlled, and are registered by provincial commissions that observe their behaviour in paying and respecting all social and fiscal duties. This registration is also linked to certain activities (there are 28 categories, of which category 26 is usually used for electrical contractors, and categories 27 and 28 for more specific activities in the sector).

Clients are prompted to only make an appeal on registered companies. Concluding a contract with a non registered company automatically makes the client jointly liable for the company’s

social debts (up to 50% of the total amount of the contract) and fiscal debts (up to 35% of the total amount of the contract). Usually, the possibility to reclaim debts paid for such a non registered company, is pure theory. Further, when paying a non registered company, the client must retain 30% of the amount, and pay half of this sum to the social security agency ("*Rijksdienst voor sociale zekerheid (R.S.Z.)*" or "*Office national de la sécurité sociale (O.N.S.S.)*"), and the other half to the treasury. These payments will be deducted of the liabilities the client would have incurred. Clients that do not respect this duty, may incur additional penalties (up to 30% and 15% of the total amount).

Enterprises that do not respect their social and fiscal duties, can lose their registration. From that moment on, clients (having contracted with them when they still were registered) will have to retain 30% and pay this sum to the social security agency and the treasury (but they do not incur any joint liabilities).

For activities belonging to the construction sector (excluding electrotechnical contracting, but including airconditioning), executed by subcontractors, an even harsher system applies. Every client of a subcontractor has to report the contract to his client (the general contractor has to report his contract to the aforementioned *Rijksdienst voor sociale zekerheid*). When this agency certifies the subcontractor is not registered, or has social debts, the client must retain with every payment 50%, of which 35% has to be paid directly to the RSZ-ONSS, and 15% to the treasury. Otherwise, joint liabilities will be incurred, as well as certain social and fiscal penalties.

Qualification of enterprises

Qualification for intrusion detection and fire detection: enterprises that conceive and install burglar alarm systems and fire detection systems have to be qualified to do so by the Ministry of Internal Affairs. They have to meet requirements in training, in permanent accessibility, the protection of client files, the reliability of the employees. Failure to (continue to) respect these requirements may lead to administrative fines, criminal prosecution and closure of the activity.

Qualification for public contracts: enterprises desiring to bid for public contracts, should ask for qualification with the Ministry of Communications ("*Erkenningscommissie*" or "*Commission de l'agr ation*"). This permits them not to have to prove their capacities and professional guarantees with every different contract they bid for. In practice, for contracts of more than 135.000 EUR (without VAT) any bidder has to prove a minimal amount of capital, sufficient turnover, certain references of work well executed, and a sufficient number of employees.

There are several voluntary private certification schemes in the sector:

Intrusion detection: INCERT-certification scheme (managed by the Belgian normalisation institute for the electrotechnical sector: "*Belgisch elektrotechnisch comit  (B.E.C.)*" or "*Comit   lectrotechnique belge (C.E.B.)*"); insurers may require this certification for a theft insurance (www.incert.be)

Fire safety: BOSEC-certification scheme; sometimes required by fire services and insurers (www.bosec.be)

2.2 Requirements relating to Electrical Contracting Personnel

No particular qualifications are legally required to work in electrical contracting in Belgium. However, the knowledge and experience required are specified in detail in the royal decree of 2 May 1972 “establishing conditions under which electrical contractors may operate in small and medium-sized commercial firms and firms engaged in skilled trades”.

In practice, most employees have the following certificates:

- manager: engineer (from an engineering school or university)
- technician: technical college diploma
- operative: lower secondary school.

However, employees without proper qualifications still can work as electrician when properly guided.

In fact, the general rules concerning electrical installations (*“Algemeen reglement voor de elektrische installaties (A.R.E.I.)”* or *“Règlement général des installation électriques (R.G.I.E.)”*) require (in their art. 47) that persons operating an electrical installation are certified for the BA4-level (alerted persons, conscious of the danger), and those working on it for the BA5-level (competent persons, knowing how to minimise risks when working). BA5-certified employees can work “under tension”. BA4-certifies employees, in that case, have to be assisted by a BA5-certified employee.

Auto-certification (by the employer) is possible (no specific security training is proscribed), but advised against, in view of possible liabilities. In any case, a certificate must be kept in the employee’s file.

In some sensitive sectors, VCA-certification is required from the company (VCA indicates a checklist for safety, health and environment issues). Alternatively, Besacc-certification is possible (*“Belgian safety criteria for contractors”*) (www.besacc.be).

2.3 Technical Standards/Specifications

- T 014 : General Requirements for Tests on alarm systems
- T 014A : General Requirements for Tests on alarm systems that use high frequency connections
- T 015 Part 1: General Requirements for Installers of alarm systems
- T 015 Part 2: General Requirements for burglar alarm systems
- T 013 : Guidelines for the safe installation and safe use of medical equipment

Incert-certified installers have to comply with T 015 Part 1 and their installations have to comply with T 015 Part 2. They only may install systems that comply with T 014(A)

Installations in medically used rooms mostly have to comply with T 013. T 013 is in accordance with the European HD 60364-7-710: Low-voltage electrical installations: Requirements for special installations or locations: medical locations.

2.4 Inspection of installations

Every new low-voltage installation, whoever has installed it, has to undergo a conformity assessment before it can be put in use (art. 270 AREI-RGIE). The conformity assessment has to be done by a independent recognized control organism accredited by BELAC. If the installation does not meet the AREI-RGIE requirements, connection to the electricity grid can be refused. This assessment is also necessary after every significant extension or alteration of an existing installation, or after any reinforcement of the connection.

After a certain period, control visits are necessary, to verify if the AREI-RGIE is still observed. Residential installations have to be controlled every 25 years, fairground attractions every 13 months, and all other installations every 5 years (art. 271 AREI-RGIE).

The Ministry of Economic Affairs regulates the safety of electrical installations and appoints the independent control organisms on the basis of the criteria defined in the royal decree of 10 August 2005 (article 275 in the AREI-RGIE).

The organism is freely chosen and paid for by the individual client.

(more info in Dutch and French via Tecnolec website)

<http://nl.tecnolec.be/diensten/reglementering-en-normalisatie/toelichting>

2. 5 Health and Safety

No information received.

2. 6 Contractual and Commercial Matters

No information received.

Contact information:

FOD Binnenlandse Zaken (Federal Authority Internal Affairs):

http://www.belgium.be/en/contactinfo_en_sites/
and sitemap: <http://www.belgium.be/en/sitemap/>

FOD Economie, KMO, Middenstand en Energie
(Federal Public Service Economy, SMEs, Self-employed and Energy)
City Atrium Vooruitgangstraat 50 1210 Brussel
Telephone: 02-277 51 11
Fax 02-277 50 21
<http://economie.fgov.be>

http://www.belgium.be/en/economy/how_to_create_a_company/

BEC - CEB: <http://www.ceb-bec.be>

INCERT: <http://www.incert.be>

BOSEC: <http://www.anpi.be/html/NED/BRAND/Certificatie/BOSEC.cfm>

Technical info on norms and standardisation and more:

VEI has become TECNOLEC since 01.01.2013: <http://nl.technolec.be> (Only in French/Dutch)
<http://nl.technolec.be/diensten/technisch-advies/toelichting>

Address:

bâtiment-VOLTA-gebouw
Marlylaan 15/8 b3 Avenue du Marly
Brussel 1120 Bruxelles
www.technolec.be

2.7 Practical Shortcut on Common Used Electrical Connections

Common electrical connections/technical characteristics for residential and office buildings:

1. Which current rating and phasing (1-phase/3-phase) is used?

1-phase : 230 Vac

3-phase : 3 x 230 Vac

3-phase + N : 400/230 Vac + N

2. How much 'voltage drop' is involved?

+/- 10% complying the European standards

3. Which earthing type is being used?

In residual always TT, in office buildings TT or TN-S

4. What are the common meter types?

KWh meters based on the Ferraris principle

3. DENMARK

The legislation relating to authorisation specify that authorisation must be granted both to a company and to one named person employed by that company.

The requirement for company authorisation has been introduced in order to enable the imposition of certain company-specific requirements, primarily the establishment of an SKS system (SikkerhedsKvalitetsStyringsystem, Safety Quality Control System a kind of ISO 9001 for electrical installers), and to ensure that the authorised company possesses the statutory managerial powers it requires to exercise its duties in relation to personal authorisation.

The company's responsibility for the construction and functioning of the SKS system is a central element of the company authorisation.

The standard required of a company's SKS system depends upon the complexity of the company in question: the more complex the company, the greater the requirements that must be fulfilled by the system. Similarly, the documentation required to demonstrate that the SKS requirements have been fulfilled vary according to the size of the company, with limited documentation required of small companies with few employees, and more comprehensive documentation required of larger companies.

The SKS system as well as the company has to be audited every second year by an external auditing company

3.1 General Rules for Establishing a Business

To set up a company in Denmark, the business must be registered with the Register of Companies as either:

- Public Limited Liability Company - app. minimum capital requirement EURO 66.000
- Private Limited Liability Company - app. minimum capital requirement EURO 16.500

Foreign companies can set up branches in Denmark, and all companies must register with the Inland Revenue authorities.

The requirements to be laid down in the SKS system, all of which relate to matters of electrical safety, are described in detail in “Retningslinier for SikkerhedsKvalitetsStyringsystemet” (“Guidelines for Safety Quality Control Systems”) published by the Danish Electricity Council. If the company has an ISO 9001 quality management system, this may be used in connection with the preparation of an SKS system. The company must prove/document that its SKS has been accepted by an third party auditing company before it can being authorized. <http://www.sik.dk/Professionelle/El/Vejledninger-inden-for-el/Retningslinjer-for-SKS-system-vejledning>

Authorisation is issued for a 2-year period, after which it shall be renewed. In connection with the renewal of its authorisation, a company must prove/document that the company has been audited by an external (third part) auditor according to the implemented SKS System.

Authorisation entitles the company to carry out both low-voltage and high-voltage installations, excluding however the installation of lifts or x-ray equipment. Foreign companies carrying out work in Denmark are also required to establish an SKS system.

Unless the foreign company concerned establishes a subsidiary in Denmark, the requirement to establish an SKS system will apply exclusively to the company's activities in Denmark.

A subject from another EU member nation may be issued with a Danish authorisation without having to pass the statutory examination, provided that the person concerned has, during the last 10 years, worked as an electrical contractor in other EU member nations in one of the following ways:

- Six uninterrupted years of working experience as a self-employed electrical contractor or managing director
- Three uninterrupted years of working experience as a self-employed electrical contractor or managing director, provided that the applicant can establish proof of prior training in the relevant profession of at least three year's duration, as confirmed by a state-recognised certificate or recognised by a competent professional organisation
- Three uninterrupted years of working experience as a self-employed electrical contractor, provided that the applicant can document at least five years of working experience within the relevant profession in a non-self-employed position, or:
- Five uninterrupted years of working experience in a managerial position, including at least three years of working experience with technical tasks, and with responsibility for at least a department within the relevant company, provided that the applicant can document prior training within the relevant profession of at least three years' duration, as confirmed by a state-recognised certificate or recognised by a competent professional organisation.

The Danish Safety Technology Authority (Sikkerhedsstyrelsen) issues authorisation:

Sikkerhedsstyrelsen
Nørregade 63
6700 Esbjerg
Denmark

<http://www.sik.dk/>

No charge is made for the issuing of authorisation.

3.2 Requirements relating to Electrical Contracting Personnel

When establishing an SKS system, companies must determine the specific procedures and/or instructions necessary for the performance of these tasks, as well as general working procedures. The SKS system must thus ensure high-quality work in order to achieve optimum electrical safety.

The authorized person, who must satisfy specific educational requirements and be principally employed by the company, possesses the overall responsibility for electrical safety, including responsibility for issuing safety instructions and supervising work carried out by the company's staff.

The authorized person may delegate responsibility for instruction and supervision - and thereby also a portion of the legal responsibility - to one or several qualified members of staff in relation to the level of complexity or type of task in question, or in relation to the organizational divisions within the company.

It is the responsibility of the authorized person to ensure that such delegation is exclusively given to persons who possess a number of specific professional and personal qualifications. The company's SKS system must contain a statement by the authorized person of the reasons why responsibility should be delegated to a named person, as well as documentation of the fact that such delegation has taken place, and its extent.

It must be emphasized that the authorized person cannot delegate away all responsibility, as he or she will always be responsible for ensuring that such delegation is carried out properly..

3.3 Technical Standards

The Danish regulations relating to electrical installations are published by the Danish Safety Technology Authority under the title *Stærkstrømsbekendtgørelsen afsnit 6 Elektriske installationer* (Danish Heavy Current Regulation, Section 6, Electrical Installations)

The regulations laid down in parts 1 to 7 of this Current Regulation are based on international standards, mainly deriving from publications in the IEC 364 series and harmonization documents in the CENELEC HD 384 series. In addition, the Current Regulation also contains some specifically Danish additions, alterations and explanations.

There are also a number of additional provisions from the local electricity supply company, which primarily deal with branch circuit connections and how these are to be linked to the national grid, as well as matters relating to meters.

> <http://www.danskenergi.dk>

>http://www.danskenergi.dk/AndreSider/~//link.aspx?_id=48F3633E5E9D42B79B3BCD384D75FBC7&_z=z

> <http://www.danishenergyassociation.com/>

3.4 Inspection of Installations

The Danish Safety Technology Authority will each year run a number of campaign where they is examining of a number of specific types of installation, e.g. commercial kitchens, open air entertainments, solar photo voltaic installations etc.

Such inspections are carried out either by the Danish Safety Technology Authority itself, or by consortia to whom the Electricity Council has transferred the task within specific geographical areas of Denmark.

Persons carrying out inspections for the Electricity Council must satisfy a number of requirements, which primarily relate to their professional competence and qualifications.

The persons concerned must be qualified electrical contractors.

Apart from this, no other official inspections of electrical installations are carried out. With the exemption of installations under the Machine Directive that is organized under another part of the Danish Public Authority.

> <http://arbejdstilsynet.dk/da/>

The responsibility for ensuring that installation work is carried out in accordance with the relevant regulations rests exclusively with the authorized electrical contractor, for which reason companies providing consultancy and planning services in the area of electrical installations are not subject to specific requirements for authorization or special certification.

3.5 Health and Safety

Materials for use in electrical installations

The provisions of the Low Voltage Directive (LVD), cover materials for use in electrical installations.

Materials encompassed by the Low Voltage Directive must satisfy the safety requirements specified by this directive. These might, for example, require that the materials comply with the relevant European standards, harmonization documents (EN or HD), international standards (IEC), or national standards.

Materials not covered by the Low Voltage Directive must comply with the materials chapter of the Danish Heavy Current Regulation, or the relevant standards.

If no useable standards exist, the materials may be selected by arrangement between the installer and the user/planner.

The work of standardization in Denmark is carried out by:

Dansk Standard

Kollegievej 6

DK-2920 Charlottenlund

Denmark

www.ds.dk

The TEKNIQ is represented on the relevant Danish standardization committees.

3.6 Contractual and Commercial Matters

No information received.

Contact information:

TEKNIQ

Installatørernes Organisation

Paul Bergsøes Vej 6

2600 Glostrup

Telefon 4343 6000

Telefax 4343 2103

The Danish Safety Technology Authority

Sikkerhedsstyrelsen

Nørregade 63

6700 Esbjerg

Denmark

www.sik.dk

3.7 Practical Shortcut on Common Used Electrical Connections

Common electrical connections/technical characteristics for residential and office buildings:

1. Which current rating and phasing (1-phase/3-phase) is used?

Basically all Danish Installations are 3 phase system both for residential and office buildings.

Typical Current ratings for residential and office buildings are 10 Amp and 16 Amp.

2. How much 'voltage drop' is involved?

The supply Voltage in Denmark shall be 400/230 V AC +10/-6% % and the voltage and power quality shall be according to EN 50160.

3. Which earthing type is being used?

The most used earthing type in dwellings in Denmark are the TT system.

4. What are the common meter types?

Traditionelle has the Danish meters been of the Ferraris type, but as Denmark are preparing their metering system to be remotely read (smart meters) this type is now being altered to electronic meters. According to the electrical utility company's specification. The meter is normally delivered by the electrical utility company.

4. ENGLAND [UNITED KINGDOM]

Electrical Contractors in the UK are expected to work to the requirements of the IET Wiring Regulations (British Standard BS7671) and to ensure that the work is carried out by suitably competent operatives to the highest standard.

- There is no compulsory registration requirement for electrical contractors and an electrical contractor is not obliged to possess any particular qualifications to carry out electrical installation work.
- There is a requirement for the operative who carries out the electrical installation to be competent under the UK's Electricity At Work Regulations in commercial and industrial premises and to comply with Part P electrical safety in dwellings of the Building Regulations for England and Wales.
- Many UK employers only employ operatives qualified to the requirements of the UK Electrotechnical Certification Scheme (ECS) managed by the JIB for England, Wales and Northern Ireland and the SJIB for Scotland.
- To be recognised as an Electrician in the UK the industry recognised level 3 National Vocational Qualification (NVQ) in England, Wales and Northern Ireland or Scottish Vocational Qualification (SVQ) in Scotland is required. Operatives that are trained outside the UK need to demonstrate that their qualification meets the same technical theory requirements with the practical and competency assessment as the UK qualifications, they also must demonstrate the full requirements of the UK wiring regulations.
- The UK's technical standards are not statutory in England, Wales and Northern Ireland, however, they are statutory in Scotland. In England, Wales and Northern Ireland there is a legal requirement to notify building control of some significant electrical installation work carried out in dwellings.
- The majority of electrical contracting in the UK is undertaken by firms whose trade association membership, or enrolment with national consumer protection body, allows them to self-certify that their installations comply with technical standards.
- These arrangements for self-certification would be open to suitably competent non-national firms, or they could have their compliance with technical standards validated by a firm accepted for self-certification.
- Under tax arrangements for the construction trades all contractors are required to register with the Inland Revenue's Construction Industry Scheme (CIS).

4.1 General Rules for Establishing a Business

The most usual forms of business entity in the UK are public and private limited liability companies, branches of foreign companies, and partnerships, but other forms exist including

unlimited companies. Branches of foreign companies can be set up without difficulty and operate in the same way as a resident UK company.

Companies are formed under the Companies Act, and any new company, including the UK branch of a foreign company, must register with the Registrars of Companies who issue a Certificate of Incorporation. This involves lodging documents in respect of the formation of the company or branch with the Registrar. A public company cannot commence business until the authorized minimum share capital - currently £50,000 - has been invested. A private company may commence business immediately after incorporation without minimum capital required.

The Registrars, run by the Department of Trade and Industry or its Northern Ireland equivalent, are located in Cardiff, Edinburgh and Belfast.

Partnerships are formed under the Partnership Act of 1890 and the Limited Liability Partnership Act of 2000, implemented in April 2001.

All new businesses, whatever their form, must notify their formation to the local tax office, for tax and social security purposes, and, except for small or exempt businesses, they must register with the local Customs and Excise office for VAT purposes.

Self-employed status is subject to recognition by the tax authorities, not by the Registrar of Companies. Single person companies are not a legally recognised form of business entity in the UK.

Licenses to trade are not required in the UK except for some specific activities such as banking and insurance. Businesses are not required by law to join a chamber of commerce or trade association.

Other EC nationals may enter the UK freely to work or carry on any economic activity on the same terms as UK citizens, subject only to a few exceptions and to conditions of residence comparable to those in most other Member States.

Requirements for Registration as an Electrical Contractor

In the UK, anyone can set up as an electrical contractor or call themselves an electrical operative. A company or other form of business entity has to do no more than undergo the general registration requirements outlined above.

There are a substantial number of self-employed individuals working, with or without employees, in electrical contracting.

All contractors, including self-employed individuals, in electrical contracting, and other construction trades are required to obtain a CIS certificate issued by the tax authorities. Under this system, the certificate holder, rather than the employer who engages him, is directly responsible for payment of direct taxation and National Insurance contributions

All electrical contractors are required to have public liability insurance and comply with the requirements of the IET Wiring Regulations - BS7671.

For telecommunications there are conditions imposed upon firms connecting to the public telephone network and the regulatory body OFTEL/OFCOM deals with these. The European Telecommunications Services Association (ETSA) has developed an assessment scheme for firms operating in the Datacomms sector known as Qualif'Com. This scheme is being revised under the aegis of an EOTC RAG with the intention of offering a harmonized assessment scheme to firms working in Europe. It is currently available in the UK through the ECA and is being promoted to clients as a means of establishing that firms certificated against the Qualif'Com criteria are competent. Quality assurance and other registration requirements may exist in the nuclear industry, offshore work and petrochemicals.

4.2 Requirements Relating to Electrical Contracting Personnel

No formal qualifications are required for an individual to set up or manage an electrical contracting business or to work as an operative in electrical contracting in the UK, however, they do have to demonstrate that they are “competent” or have a person that is responsible for all the electrical work carried out. This is most easily done by being able to demonstrate that the operatives carrying out the work are suitably qualified.

In the absence of formal regulations or regulatory bodies, a large part of the industry supports a well-established voluntary scheme of self-regulation whereby they undertake only to employ operatives who are registered and graded by the Joint Industry Board (JIB) in England, Wales and Northern Ireland and the Scottish Joint Industry Board (SJIB) in Scotland. Giving this undertaking is a condition of membership of the Electrical Contractors' Association (ECA) and the Electrical Contractors' Association of Scotland (SELECT). While there is no mechanism to ensure that non-members do follow this practice, some do so in their own self-interest.

The training levels recognised by the Joint Industry Boards are as follows:

Qualified electrician - the standard operative. The Level 3 NVQ Diploma in Installing Electrotechnical systems and equipment (buildings, structures and the environment).

Approved electrician. Open to qualified electricians who have at least two years' experience and are at least 22 years old. They must also have demonstrated competence and obtained a suitable inspection and testing qualification in Initial verification and periodic inspection.

Technician - supervisory grade. Open to those who are at least 27 years old and have at least five years' experience as a foreman/charge hand or approved electrician, or to approved electricians who have exceptional skill and experience.

The Electrotechnical Certification Scheme (ECS) offers an enhanced identification card showing the level of competence and achievement in health and safety standards for the holder. Without this card it will not be possible to gain access to the larger construction sites in the UK. Full details for the ECS card scheme are available from the website ecscard.org.uk

The JIB's advice to the public and other clients of the industry is that they should check that a valid ECS Card is held by the proprietor of the firm or the operative actually carrying out the work.

Building Regulations (Electrical Installation Working Dwellings)

Electrical installation work carried out in dwellings in England and Wales is subject to Part P (Electrical Safety in Dwellings) of the Building Regulations. Part P imposes the requirement that: “Reasonable provision shall be made in the design, installation, inspection and testing of electrical installations in order to protect persons from fire or injury.”

THESE REQUIREMENTS APPLY TO ALL ELECTRICAL INSTALLATION WORK CARRIED OUT IN DWELLINGS IN ENGLAND AND WALES. FAILURE TO MEET THESE REQUIREMENTS IS A CRIMINAL OFFENCE.

Electrical installation work in dwellings in England and Wales will count as “building work” as defined in the Building Regulations, and hence should be notified to a Building Control Body before the work commences, unless:-

- 1) the proposed work is to be undertaken by a Competent Person (an individual or a company authorised to self-certify compliance on completion of the work): or
- 2) the proposed work is of a minor nature.

Competent Person schemes are formally recognised by the Government as schemes whose members are adjudged sufficiently competent to self-certify that their work has been carried out in compliance with the Building Regulations.

Note: In this situation the term “competent” applies to the organisation and not the individual.

A firm wishing to join a Competent Person scheme is vetted to ensure it meets the respective scheme conditions including the relevant levels of competence. If it meets these conditions, it is classified as a “Competent Person” and its work is then not subject to inspection by Building Control bodies.

4.3 Technical Standards

Electrical installation work, unlike building work, is not subject to specific statutory regulation in the UK other than in Scotland. The basic position is that a British Standard, BS7671 - Requirements for Electrical Installations, sets standards to which ECA members operate systems of self-certification. These regulations are commonly known as the Wiring Regulations. In Scotland, BS7671 is referred to in the Building Standards (Scotland) Regulations. SELECT members work to BS7671 voluntary standards in any case.

The UK electricity supply industry is required to work to The Electricity Supply Continuity and Quality Regulations but, as far as installations involving the provision of an electricity supply by a supplier are concerned, compliance with BS7671 is accepted under these Regulations.

Outside the mainstream of electrical installations, there is a widening range of systems work not covered by the wiring regulations or other technical standards, and self-regulation to voluntary standards or codes of practice remains the key to sustaining standards in those areas. This also applies, of course, to the 60 to 70% of work that is accounted for by the repair, maintenance and adaptation of existing installations.

4.4 Inspection of Installations

Although the electricity supply authorities have a right to inspect installations, which entail a new connection to the public supply, the vast majority of installations are left to self-certification by the installer, who verifies that the installation complies with the IET Wiring Regulations - BS7671.

The capacity of firms in membership of the ECA and SELECT to undertake self-certification is accepted by suppliers. Firms, or individuals not covered by membership of the associations can have their installations verified by firms that are members.

Another option is for firms to become enrolled with the consumer protection body, the National Inspection Council for Electrical Installation and Contracting (NICEIC). A small sample of an enrolled firm's work is inspected annually by an NICEIC inspector. Self-certification by contractors on the NICEIC roll is also accepted by the supply authorities.

In Scotland, although technical regulations are statutory, much of the verification of compliance with them is a matter of self-certifications by the contractor rather than by direct inspection by local authorities.

These various arrangements are concerned principally with technical performance aspects of installations. In addition, under health and safety legislation, installations are also open to inspection either by Health and Safety Executive, or by local authorities, according to the type of premises involved.

Inspection of Installation Designs

There are no statutory requirements that designs should be subject to inspection or that particular technical qualifications should be held by individuals undertaking design work.

4.5 Health and Safety

Electrical installations have not been subject to specific health and safety legislation but to general legislation known as the Health and Safety at Work etc. Act of 1974. In 1989, the Electricity at Work Regulations 1989 were introduced. These acknowledge that many aspects of their requirements are likely to be met through compliance with the Wiring Regulations but they do not make the Wiring Regulations statutory.

4.6 Contracting and commercial matters

Consumers, domestic and householder customers may need contracts that comply with either the requirements of the UK legislation and/or Trade Association codes of fair practice. Contractors or Commercial and Industrial companies may use a variety of pre-printed Industry standard contracts or may choose to use their own conditions.

ECA Registered members' work is backed by three Association schemes. The Guarantee of Work Scheme, the Warranty and the Bond.

The Guarantee of Work Scheme

The Scheme guarantees, to customers of the ECA Registered Members, that if electrical installation work fails to comply with the relevant British Standards, it will be rectified, to comply with those standards, at no cost to the customer. The contract value must not exceed £50,000 with VAT.

The ECA Warranty

Alternatively, when the value exceeds £50,000, ECA Registered Members may issue a Warranty to customers. If the electrical installation work fails to comply with the relevant British Standards, then it will be rectified to comply with those standards, at no cost to the customer. The Warranty has a value limit; this is printed on each Warranty Certificate.

The ECA Bond

ECA Registered Members may issue an ECA Bond Certificate. The Bond indemnifies the holder for the additional cost of completion, if the member generally fails to complete or becomes insolvent before completion. The limit of the Bond is printed on each certificate. The Bond is a form of a conditional performance bond and as such, it may not be suitable for all commercial contracts.

4.7 Practical Shortcut on Common Used Electrical Connections

Common electrical connections/technical characteristics for residential and office buildings:

1. Which current rating and phasing (1-phase/3-phase) is used?

No info

2. How much 'voltage drop' is involved?

No info

3. Which earthing type is being used?

No info

4. What are the common meter types?

No info

5. FINLAND

The Finnish Electrical Contractors' Association STUL

SUMMARY

In 1996 a new Electrical Safety Act was passed in Finland. Under this act the status of electrical contractors was changed from “licenced” to “notified”. Nowadays it is possible in Finland to work as an electrical contractor if one fulfils the conditions which are set down in The Electrical Safety Act. The Finnish Electrical Safety Authority checks the conditions before registration of electrical contractors.

The Finnish electrical standards of equipments and installations are based on international IEC or CENELEC standards. The Ministry of Employment and Economy (previously Ministry of Trade and Industry) has confirmed specific electrical standards so that the installations which are made according to those standards accomplish the essential conditions of electrical safety regulations.

Electrical contractors shall be responsible for the initial verifications in all buildings and constructions in which they have installed electrical systems. In Finland the buildings which consist of more than two dwellings are classified into three categories. The classified electrical installations in all buildings and constructions must be approved by the inspection body or a neutral third party in a certification inspection before it is commissioned for regular use. The certificate inspection must in these cases be done along with the initial verification of the installer. It is enough for installations without category that the electrical contractor does his initial verification and writes his own certificate about this so that the installations are safe, active and according to agreement.

All other installations besides the domestic electrical installations shall be inspected regularly. Frequency can be 5, 10 or 15 years.

5.1 Electrical installation and related regulations

Electrical contracting and inspection of electrical installations are regulated in Finland with The Electrical Safety Act and by virtue of its' subordinate regulations.

The Electrical Safety Authority has drawn up rules, which complete the regulation. Electrical contracting is regulated in Finland purely because of electrical safety.

Electrical contracting

It is allowed to carry on electrical contracting in Finland, if one fulfils the following conditions according to The Electrical Safety Act

- a sufficiently qualified person is appointed to direct the work (supervisor), who accomplishes qualification conditions
- a person independently carrying out and supervising work should possess sufficient qualification or otherwise has sufficient professional skills
- premises and tools necessary for carrying out the work are used, and the provisions
- and regulations on electrical safety are observed and
- regulations and instructions of electrical safety are used.

The Electrical Safety Authority books in his register all electrical contractors, who fulfil the conditions above.

Registration fee for the authority is 97 € and the change of registration 59 €. After registration the Authority doesn't levy annual or control taxes or fees.

Regulations and standards

It's possible to seek on the internet free of charge the regulations and rules of authorities. These can be also bought from bookstores, the prices vary from 5 € to 20 €. Standards must be paid and these can also be purchased from [Sähköinfo Oy Bookstore](#). (in Finnish only!)

The Finnish electrical standards (both equipment standards and installation standards) are based on international examples. For low voltage installations standards are based on IEC 60 364.

The installation standards are the same standards which The Ministry of Employment and Economy has conformed. According to these standards made installations should accomplish all essential safety demands. Other solutions are also allowed according to The New Approach of EU only if it conforms to these essential safety demands.

The Finnish Electrical Standardisation Organisation SESKO (www.sesko.fi) is responsible for the preparing and developing of electrical standards and SESKO is corresponding on IEC and CENELEC. SESKO is owned by organisations of the electrical branch. SESKO co-operates with The Finnish Standardisation Organisation SFS which is corresponding on the international level to ISO and CEN.

Inspections

The safety inspections of electrical installations are regulated in The Electrical Safety Act (419/96) and in the rule of commissioning and use of electrical installations (517/96). The Electrical Safety Authority has drawn up rules S3-04 and S4-11.

The constructor of the electrical installations (electrical contractor) shall be responsible for the initial verifications. The electrical contractor is always responsible for making the initial verification in all self installed objects. The electrical contractor shall record resolutions of inspection on the report and documents. These documents are signed by the electrician who is the skilled workman (expert) or the electrician who has constructed these electrical installations. Anyway the electrician must fulfil the conditions which have been set for the skilled workman.

There are in Finland both unclassified and to three categories classified electrical installations. Unclassified buildings and constructions are buildings which have two or less dwellings and insignificant changes. Other electrical installations belong to categories 1, 2 or 3 (all business-buildings, service-buildings, industrial installations, hospitals etc.)

Electrical contractors shall be responsible for the initial verifications also in classified electrical installations and after that must be approved by the inspection body or another neutral third party in a certification inspection. Unclassified electrical installations should not be inspected by the third neutral party.

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5.2 Electrical qualifications required by personal

Manager of enterprise

The managing director of electrical contractors has no conditions for installation competence at all.

Supervisor

The supervisor, who is a sufficiently qualified natural person and is appointed to direct electrical work, must be in a contractors' employ because of electrical safety. The supervisor shall fulfil

conditions of electrical education and working experience and he or she has taken degree in electrical safety exam. After that the supervisor can get a certificate of electrical safety.

It's possible to get the electrical safety certificate in three categories:

- > S1 (all installations beside elevators),
- > S2 (all installations not more than 1000 volts)
- > and S3 (repair of equipments and devices).

The supervisor has no conditions for language skills, but in practice it could be difficult to get accepted in the electrical safety exam if one can't speak Finnish or Swedish.

A private body, which can verify competence of supervisor and permit certificate, has got the authorisation by the Ministry of Employment and Economy. There is only one kind of authorisation body in Finland. Its' name is Henkilö- ja yritysarviointi Seti Oy and it's owned by The Finnish Electrical Contractors' Association. The Finnish Electrical Safety Authority supervises the acting and qualification system of Seti Oy.

Independent skilled worker

Persons who make the essential electrical installations must fulfil certain conditions. He or she must be able to work independently. These conditions are defined in orders given by the Ministry. The person who can work alone or watch over other persons' work in the electrical branch, shall have sufficient electrical education and electrical working experience. It is also necessary to initiate the electrician into the methods of working.

For persons without electrical education, it is required to have at least six years of working experience and the basic knowledge of electrical issues.

The employer or supervisor checks the skills of an employee already during recruiting. The person, for instance a trainee, who doesn't meet the conditions of "skilled worker", isn't able to carry out electrical installations without being watched over by an independent skilled worker.

All the persons who carry out electrical installations must get through the training of electrical working safety according to EN 51110 and this training must be renewed every five years. The courses are organised by private education companies for instance Sähköinfo Oy, owned by the Finnish Electrical Contractors' Association.

Supervisor of electrical safety

The order of Ministry demands that in every electrical working group, there must be an supervisor

of electrical safety. This persons' task is to watch over the electrical safety physically, in the workplace. He also takes part into the installations.

It is also recommended that the employer keeps a register about the personals' electrical training.

The design of electrical installations

The Electrical Safety Act demands that electrical equipment and electrical installations are designed in such a way that the carried out electrical installations according to the design may not be hazardous to life, health and property. It is not allowed for an electrical contractor to carry out faulty designs.

The designers of electrical installations, don't have any demands of specific competence. In practice the demands are the same as for supervisors in categories S1 or S2.

In the early days, the designers had the same demands as the supervisors but it was changed in 1996. In 2004, the organisations of electrical designers have founded voluntary a certificate system of competence.

Additional information about working relations in Finland

In Finland, working conditions must comply within a general applicable collective agreement. This requires employers who are not making part of the agreeing party.

The Collective agreement is defined as the minimum conditions of employment, which cannot be waived. These terms include salary, working hours and other kinds of employee compensation.

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5.3 Inspection and supply authority procedures

Inspections

There are in Finland both unclassified and to three categories classified electrical installations. Unclassified buildings and constructions are buildings which have two or less dwellings and insignificant changes in installations. Other electrical installations belong to categories 1, 2 or 3 (all business-buildings, service-buildings, industrial installations, hospitals etc.)

The constructor of the electrical installations (electrical contractor) shall be responsible for the initial verifications. The electrical contractor is always responsible for making the initial verification in all self-installed objects. He shall also record resolutions of inspection on the

report and documents. These documents are signed by the electrician who is the skilled workman (expert) or the electrician who has constructed these electrical installations. The electrician must anyway meet the conditions which have been set for the independent skilled worker.

Electrical contractors are responsible for the initial verifications also in classified electrical installations and afterwards these installations must be approved by the private neutral third party during a certification inspection. Unclassified electrical installations don't need to be inspected by the third neutral party. There are in Finland 100 authorised inspectors and 3 authorized inspection bodies. The Safety Authorities don't inspect any objects but the Electrical Safety Authority watches over the inspection acting and all actors, including electrical contractors.

All installations of buildings except dwellings must inspect periodically:

- > every 5 years (in class 3)
- > or every 10 years (in class 2)
- > or every 15 years (in class 1).

Periodical inspections may be done by an authorized inspection body and its authorized inspectors. There are about 100 inspection bodies in Finland. These can be found in the webpage www.tukes.fi

The installer shall be registered to TUKES. The Procedure is as follows:

The electrical safety authority Tukes must be formally notified ([form SL 1](#)) before electrical work activities are commenced for the first time. The contractor can be a company or a natural person. You can find the form and additional information in this page:

<http://www.tukes.fi/en/Branches/Electricity-and-lifts/Persons-in-charge/>

Announcement

The electrical contractors or the authorized inspector of electrical installations must announce all new electrical installations in the buildings to the power companies or to the Electrical Safety Authority (TUKES). The inspection bodies must also announce all certification inspections to the power companies or Authority (TUKES). All announcements can be done after the certification inspection. There are no terms for announcements.

Before starting the electrical installations there are no announcements to the authorities.

Role of power companies

Neither power companies nor authorities inspect the electrical installations in Finland. Power companies concentrate on producing and selling electricity and authorities concentrate on supervision.

Power companies have no right to cut the currency from dwellings or buildings, but they are obliged to ask help from the Electrical Safety Authority. The authority can always deny the use of hazardous parts and of electrical installation and can demand it to be shut down from the electrical net.

The inspection bodies have also the right to give a request that one can't use hazardous parts of installation. They can also request to cut off the hazardous part of the installation from the electrical net. The inspection bodies are obliged to announce such an incident immediately to the authority.

5.4 Electrical installation materials and components

Materials and components which are used in electrical installations must accomplish demands of European standards. If there is no European standard, the materials and components must comply with the demands of the national standard. If there are no national standards, the manufacturer or importer should point out that the materials and components do comply with the essential safety demands.

The Finnish electrical contractors have representatives in all the crucial national committees of SESKO, where important issues for electrical contractors are dealt with, For instance, committees SK64 (low voltage installations), SK99 (high voltage installations) and SK 17D (distribution boards).

The participation to standardisation committees is liable to charges. That is why generally the representatives of electrical contractors in committees are the technical experts of STUL. STULs' board strengthens the representatives of committees. The biggest contractors have their own representatives in these standardisation committees. The charge of committees for SESKO is 750 € + VAT 23 %.

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5.5 Practical Shortcut on Common Used Electrical Connections

Common electrical connections/technical characteristics for residential and office buildings:

1. Which current rating and phasing (1-phase/3-phase) is used?

In Finland we use 230/400 V mostly, both 1-phase and 3-phases systems. In industry the 400/690 V voltage is also used.

2. How much 'voltage drop' is involved?

In distribution network - 10 % voltage drop is allowed. After the distribution point it is recommended that voltage drop is no more than - 3 % for lighting circuits and - 5 % for other circuits.

3. Which earthing type is being used?

TN- S-systems is used in new installations after distribution point. In older installations TN-C- S-systems are also used. In a distribution network, the TN-C- system is used. In industry, the IT-system is used.

4. What are the common meter types?

New meters and all other meters will be remote readable at the end of 2013.

6. LATVIA

6.1 General rules for establishing a business

Commercial activity in Latvia is mostly regulated by the Commercial Law, however the Civil Law and the Group of Companies Law have considerable significance as well. Moreover in many sectors special requirements prescribed in various Acts or Regulations of the Cabinet of Ministers have to be taken into account.

The Register of Enterprises of the Republic of Latvia (RE) represents an administrative institution that registers enterprises (companies), merchants, their subsidiaries and representative offices within the territory of the Republic of Latvia, as well as all amendments to the basic documents of their activity and takes other actions envisaged by legislative acts.

Latvian law permits developing business on its territory on the same grounds, and following the same rules for Latvian merchants as well as for foreigners. The types of business entities are:

- a) Individual Merchants
- b) General Partnership
- c) Limited Partnership
- d) Limited Liability Company
- e) Joint Stock Company

In order to be a legal entity and to undertake business activities all companies must be registered with the Latvian Registry of Companies and also as taxpayers with the State Revenue.

In order to carry out works in the regulated areas (design or supervision of electric installation works) the company has to be registered in the Construction Merchant Register. The register is under the supervision of Ministry of Economics.

6.2 Requirements relating to Electrical Contracting Personnel

To be authorized to carry out design works or supervision of installation works, the company has to employ personnel with the appropriate education (at least college or university) and professional certificate. According to the Construction Law private persons have the right to independent practice in the fields of construction (engineering research, design, construction expert-examination, construction works management and construction supervision), if they have received a relevant builder's practice or architects practice certificate. Register of Building Practice and Architect's Practice Certificates contains information about certified persons and their certificates and is under the supervision of the Ministry of Economics. The installation works can be done by personnel with the appropriate education or training - certification is not a must, as the higher level specialists (supervisors) have to be certified in all cases.

There are no restrictions for the higher level management and it is not obligatory for the members of the board to have the corresponding certification/education, if the personnel is certified.

According to the Section 8 of the Construction Law natural persons have the right to independent practice in the fields of construction (engineering research, design, construction expert-examination, construction works management and construction supervision) if they have received a relevant builder's practice or architects practice certificate.

Builder's practice or architect's practice certificates shall be issued, registered and cancelled in accordance with the Regulation of Cabinet of Ministers Nr.383: „Regulations Regarding Issuing, Registration and Cancellation of Builder's Practice and Architect's Practice Certificates” (8July 2003).

Builder's practice or architect's practice certificates shall be issued for a period of five years.

If a person has acquired the relevant education and professional qualifications in a foreign state and if the education and professional qualification is recognised according to the procedures specified in the Law On Recognition of Regulated Professions and Professional Qualifications, than this person shall have the same rights as the persons referred to in Section 8 of the Construction Law.

Register of Building Practice and Architect's Practice Certificates contains information about certified persons and their certificates.

Electricians professional organizations that certification bodies accredited to issue certificates in the field of building trade is regulated by:

- Certification Department of Latvia's Electricians' Brotherhood
A. Deglava ielā 60 - 13, Rīga, LV-1035, Latvia, www.leb.lv,
- Latvian Electrical Power Society Certification Bureau
Šmerļa iela 1, Rīga, LV 1006, Latvia, www.bleea.lv.

Building Practice and Architect's Practice Certificates public data base (in Latvian):
<http://buvkomersanti.bema.gov.lv/>.

6.3 Technical Standards

In Latvia several laws, regulations and standards are applied in the construction area. The most important concerning electrical works are:

- 1) Construction Law
- 2) Energy Law
- 3) Latvian Standards for Construction and Electrical Engineering;
- 4) General Construction Regulations issued by the Cabinet and regulating the basic conditions of construction not specified by Construction Law;

5) Latvian Construction Norms – an aggregate of norms and regulations binding on all persons participating in construction that regulate construction and the operation of structures, as well as explain construction terminology;

6.4 Inspection of installation

The inspection of installation is done by:

- 1) the company/personnel supervising the whole installation/construction process,
- 2) Contractors,
- 3) owners of the infrastructure, if the object is to be connected to the state network or the works are done on the premises of the infrastructure owner,
- 4) the commission which accepts the whole construction works after the particular building is completed.

6.5 Health and Safety

The basic principles of health and work safety are stated in the Labour Protection Law and the corresponding Regulations of the Cabinet where a more detailed description of particular areas is included. The main organisation in control of these matters is State Labour Inspectorate.

6.6 Contractual and Commercial Matters

For contractual matters concerning Procurement contracts the Procurement Law should be considered, which states the procedures controlled and supervised by the Procurement Monitoring Bureau.

Contact information:

- 1) Register of Enterprises
Perses street 2, Riga, LV 1011
Informative phone: 67031703 (Without legal advice)
Fax: 67031793
E-mail: info@ur.gov.lv
<http://www.ur.gov.lv>
- 2) Ministry of Economics or Republic of Latvia
55 Brīvības street, Riga, LV 1519
Phone: +37167013100
Fax: +37167280882
E-mail: pasts@em.gov.lv
www.em.gov.lv
- 3) Standardisation Bureau *Latvian Standard (LVS) of Standardisation, Accreditation and Metrology Centre Ltd*
157 K.Valdemara Street, Riga LV 1013
Phone: +371 67 362 250; +371 67 339 984

Fax: +371 67 371 324; +371 67 362 250
E-mail: lvs@lvs.lv; standard@lvs.lv
www.lvs.lv

- 4) State Labour Inspectorate Headquarters
Kr. Valdemara Street 38-1, Riga, LV 1010
Tel: (+371) 6 7021 704

Infolines: (+371) 67186522 FREE (+371) 67186522; 67186523

Fax: (+371) 6 7021 718
E-mail: vdi@vdi.gov.lv
www.vdi.gov.lv

- 5) The Procurement Monitoring Bureau
6 Eksporta street, Riga, LV 1010
Phone: +37167326719
Fax: +37167326720
E-mail: pasts@iub.gov.lv
www.iub.gov.lv

6.7 Practical Shortcut on Common Used Electrical Connections

Common electrical connections/technical characteristics for residential and office buildings:

1. Which current rating and phasing (1-phase/3-phase) is used?

In Latvia the 1-phase 220 V and 3-phase phasing 400/230 V are used.

2. How much 'voltage drop' is involved?

The maximum voltage drop is 5 %.

3. Which earthing type is being used?

The Type of the earthing is TN-S, TN-C, TN-C-S, IT, TT.

4. What are the common meter types?

In low-voltage network, commonly the A or B active energy meters are used:

- One phase meters with working power till 40 or 60A - 5(40)A, 10(40)A 5(60)A or 10(60)A;
- Three-phase active energy meters with working power till 60, 80, 100, or 120A - 5(80)A, 10(60)A, 10(100)A, in specific cases 20(120)A.

7. NETHERLANDS

7.1 General Rules for Establishing A Business

Records of trade and industry

Like any other business, electricians must register their business at the local Chamber of Commerce for the area where the company is situated. The registration includes the name of the company and the owner of the company. The Chamber of Commerce provides the information to the tax authorities for the purpose of collecting taxes and social security contributions. For information: www.kvk.nl

Professional certificate as electrical contractor

There is no statutory system prohibiting the performing of electrical installation work to a company or person with sufficient professional competence for those activities. Many clients only enter an agreement on the condition that the installer proves to have sufficient competence and experience.

There are two recognized acknowledgements for the electrotechnical branch. These acknowledgements certify that a company possesses the right tools and sufficient skills. There is more information about these conditions on www.erkendinstallatiebedrijf.nl and www.sterkin.nl.

Registration

There is no by public law enforced registration system for electrical contractors. The electrician should contact several authorities, such as the Tax Registration Office (for obtaining a VAT number), and the pension fund for the payment of premiums for employees.

Qualification of enterprises

In the Netherlands there is no statutory system for qualifying businesses. There are clients with their own system of registration and / or qualification for companies that perform electrical work.

7.2 Requirements Relating to Electrical Contracting Personnel

There are no special legal requirements for working as an electrician. Many clients issue their own requirements to an installation company and its employees to carry out installation work, for example, the installation company or its employee has to own a VCA-certificate or must have obtained a diploma/degree in the field of competence.

7.3 Technical Standards

There are legal requirements for installations (Building Act). These requirements are usually expressed in general rules that describe, for example, the purpose of ensuring (fire) safety and energy reduction/efficiency. The legal requirements often refer to technical standards for the practical means that help reach the described goal. In addition, an electrician can agree to technical standards by contract with the client. The following are the main technical standards for electrical installations. For some of the following technical standards counts that they are fully or partially recognized in the Building Act.

- NEN 1010 Safety requirements for low-voltage installations
- NPR 5310 Practical guideline with NEN 1010
- BS 5152:2009 Technical drawings - Electrical symbols
- NEN-EN-IEC 62305 Lightning Protection Systems
- BS EN 50164 Parts for lightning protection installations
- NEN 2535 Fire Alarm Installations
- BS 2555 Fire safety of buildings - Smoke detectors for residential functions
- BS 2575 Fire safety of buildings. Evacuation Alarms
- NPR 2576 Resistance to fire
- BS 2768:1998 "Meter Cabinets
- NPR 5313 Data centres
- BS EN 1838 (Emergency) lighting
- NEN-EN 12464 Workplace Lighting
- NEN-EN 50173 and 50174 (data cabling)
- NEN-EN-IEC 60079 / NPR 7910 Explosion prevention/safety
- NEN-EN-IEC 60204-1 Electrical Safety of machinery
- NEN-EN-IEC 60601 - Testing Medical Devices
- NEN-EN-IEC 61439 Switchboxes
- NTA 8012 Limitation of damage caused by fire from and through the electrical wiring in the electrical installation

The technical standards are developed by NEC and regularly evaluated and revised. When designing and revising the technical standards the NEC involves organizations or parties who have an interest in that standard. The technical standards are available at NEC, PO Box 5059, 2600 GB Delft, tel. 015-26.90.234, www.nen.nl, nec@nen.nl

7.4 Inspection of installations

For inspecting electrical installations the following standards of NEN exist;

- NEN 3140 Operational electrical installations - low voltage
- NEN 3840 Operational electrical equipment - high voltage
- NTA 8025 Inspection of installations

7.5 Health and Safety

The electrical contractor must ensure that its employees and other employed persons can work safe and without risk to their health. In the Netherlands, the responsibility for safety at work is regulated by the Working Conditions Act. In the past, this legislation included rules about health and safety that referred to certain standards (NEN 3140) when it comes to the safety of electrical installations and electrical equipment. Since the arrival of the health and safety catalogue in 2008, the previous rules expired as did the reference to NEN 3140. However, the NEN 3140 serves to this day as the basis for safe operation and execution of work on, with or near electrical installations. The NEN 3140 has thus no legal foundation in the legislation on working conditions. Since the arrival of the NEN 3140, in 1991, there is an obligation in an organization to provide an indication to persons working on or with electrical installations or electrical equipment. The Dutch standards in the field of low-voltage electrical installations and labour equipment relates to safe operation, maintenance, inspection and management.

The health and safety catalogue is a joint product of the organizations of employers and employees within a specific branch. The health and safety catalogue contains concrete measures, aimed at a specific branch to comply with the general rules on safety and health in the workplace. This way the main occupational risks within a specific branch are addressed with solutions that are supported by employers and employees in that branch. The health and safety catalogue is marginally tested by the Labour Inspectorate. The health and safety catalogue contains instructions for working with (low) voltage.

7.6 Contractual and Commercial Matters

The client who contracts professional installation work (subcontracting) is liable to pay value added tax (VAT) and social securities and wage tax when the installing company fails to pay the due amounts. The agreements between clients and installing companies therefore often contain agreements on this subject. In regard to VAT it is legally defined for certain situations that it is an obligation to work according to "tax shift". This rule simply means that the main contractor pays the VAT. As for wage tax and social securities parties often agree that the client pays the principal part (between 25-40%) of the contract price by depositing the equivalent in a special account (the so-called G-account) of the installing company. The installing company uses the so-called G-account solely to pay the due tax.

For information about VAT and G-accounts: www.belastingdienst.nl

7.7 Practical Shortcut on Common Used Electrical Connections

Common electrical connections/technical characteristics for residential and office buildings:

1. Which current rating and phasing (1-phase/3-phase) is used?

Information on current rating and phasing can be found on www.nma.nl, item Netcode.

2. How much "voltage drop is Involved?

See www.nma.nl, item Netcode.

3. Which earthing type is being used?

TT / TN-S / TN-C-S / IT

4. What are the common types of meter?

In the Netherlands one uses many different types of meters. For information about these meters see www.nma.nl, item Meetcode.

8. NORWAY

8.1 General rules for establishing a business

Records of trade and industry

To set up a company in Norway (private or public), the business must register with the Register of Business Enterprises (Brønnøysundregisteret)
<http://www.brreg.no/english/>

The Brønnøysund Register Centre develops and operates many of the nation's most important registers and electronic solutions. Administering Altinn, coordinating data in the public sector and providing advisory services are central tasks that make things easier for business and industry.

The Brønnøysund Register Centre is a government body under the Norwegian Ministry of Trade and Industry, and consists of several different national computerised registers. These registers contain information and key data about such matters as

All companies must also register with the local tax office for VAT.

Professional certificate as electrical contractor

For a person to work as an electrical contractor, the person has to pass the Norwegian Electrical contractor exam or be accepted by the Directorate for Civil Protection and Emergency Planning based on qualification from an EEA country.

Registration

Any company performing electrical engineering and/or electrical installation work shall be registered with the Directorate for Civil Protection and Emergency Planning (Direktoratet for samfunnssikkerhet og beredskap, DSB). The company must also have one registered electrical installer being responsible for the electrical engineering and installation work. The Directorate for Civil Protection and Emergency Planning (DSB) aims to maintain a full overview of risk and vulnerability for society in general.

The principal requirement for registration is the employment of individuals who have passed the electrical installation contractor exam according to "Forskrift om kvalifikasjoner for elektrofagfolk or Regulations governing the qualifications for skilled electro personnel".

Once registered, the contractor can carry out any low voltage work except in a very few cases, such as the installation of lifts and cable TV. For these and for high voltage installations, supplementary training is needed.

More information on:

<http://www.dsb.no/no/toppmeny/English/>

Qualification of enterprises

The registration process (see above) requires a company to indicate their competence which is to be verified by the authorities. Every company that does installation work shall have at least one employee fulfilling the requirement of Electrical contractor, and is thus responsible for the electrotechnical work.

8.2 Requirements relating to Electrical Contracting Personnel

The qualifications required by personnel within electrical contracting are as following:

- **Manager:** None required, providing that at least one employee is a qualified installation contractor
- **Electrical contractor:** Qualifications according to “Regulations governing the qualifications for skilled electro personnel” and passed examination for being an electrical installer.
- **Electrician:** Two years at school plus 2,5 years as trainee (Læring) and passed examination.

The Electrical contractor must be able to speak and read Norwegian.

All these requirements apply equally to non-nationals as to Norwegians. As yet, there are no mutual arrangements for recognition of non-national qualifications.

There are no formal requirements for those only doing design work, i.e. not installation work.

8.3 Technical Standards

All electrical installations shall comply with the Regulations governing electrical low voltage installations (Forskrifter om elektriske lavspenningsinstallasjoner), (under the Supervision of the electricity installations Act 24.05.29) and is issued by the Directorate for Civil Protection and Emergency Planning, under the authority of the Ministry of Justice (from 1. July 2003).

NEK 400 is a standard issued by the Norwegian Electrotechnical Commission (Norsk Elektroteknisk komite), and is the Norwegian implemented of the CENELC HD 60364 and IEC 60364 series. NEK 400 is referenced by the regulation as a pre-accepted method for fulfilling the safety requirements of the regulation. Thus, deviation from the requirements of NEK 400 may occur, but documentation of compliance with the safety level of the regulation (and NEK 400) will then be required.

The offshore and maritime fields have a separate set of regulations and standards. The same apply for the ECOM field.

8.4 Inspection of installations

Verification of compliance with the regulations (and/or NEK 400) is by self-certification. The electrical contractor company must keep records of checks made of installation work.

The local El-safety Authorities (Det lokale eltilsyn) on behalf of the Directorate for Civil Protection and Emergency Planning have a statutory right to inspect. Inspection procedures are the same throughout Norway.

Approx. 10% of new installations is inspected by the local El-safety Authorities, based on a random risk-based selection. If an electrical contractor company carries out a faulty installation, the installations installed by this company will probably be inspected more often

Inspection is more thorough and regular for dangerous installations where there is an above average possibility of a short circuit or fire.

The local El-safety Authorities should periodically inspect all electrical installations at an interval of 15-20 years. They also check that foreign companies starting up in Norway follow the Norwegian rules, standards and regulations and has established its own control system for self declaration.

Third party verification may take place due to customers' decision.

The offshore and maritime fields have different procedures for verifications.

8.5 Health and Safety

The Norwegian Health and Safety regulations are based on The Working Environment Act. Systematic Health, Environmental and Safety Activities in Enterprises; Internal Control Regulations require enterprises to have written objectives in relation to health, environment and safety activities. Roles and responsibilities pertaining to health and safety issues must be clarified. Action plans of risk analysis and assessment are compulsory and must be carried out accordingly.

8.6 Contractual and Commercial Matters

Standard forms of contract in Norway are issued by NBR (Norwegian Council of Building Standardization). NELFO is taking part in the development of these standard forms and members do use them.

Compulsory insurance requirements for electrical installation contractors include: third party, injury to people, damage to property and possible redundancy payments, if the business fails. There are no restrictions for non-national insurers underwriting risks in Norway, provided that they have a permanent base in the country.

Under Procurement Law in Norway, public works must be put out for procurement and large construction works must be open to the whole of the EU. For smaller public works, in general, at least three contractors must procure.

Contact information:

1. NELFO - Foreningen for El og IT bedriftene
Postbox 5467 Majorstuen
0305 Oslo

Tel. : 00 47 23 08 77 00
<http://www.nelfo.no/>
2. Direktoratet for samfunnssikkerhet og beredskap
(Directorate for Civil Protection and Emergency
Planning)
POB: 2014
3103 Tønsberg

<http://www.dsb.no>
2. Norsk Elektroteknisk Komite
Postboks 280
1326 Lysaker

Tel. : 00 47 67 83 31 00
<http://www.standard.no/elektro>
3. Brønnøysundregisterne
(National EDP registers in Norway)
Havnegata 48
8910 Brønnøysund

Tel. : 00 47 75 00 75 00
<http://www.brreg.no/>
4. Arbeidstilsynet Directorate
(Directorate of National Labour Inspection)
Postbox 8103 Dep.
0032 Oslo

Tel. : 00 47 22 95 70 00
<http://www.arbeidstilsynet.no/>
5. Post og teletilsynet
(Norwegian Post and Telecommunication Authority)
POB: 93
4791 Lillesand
Tel. : 00 47 22 82 46 00
<http://www.npt.no/>

8.7 Practical Shortcut on Common Used Electrical Connections

1. Which current rating and phasing (1-phase/3-phase) is used?

IT: 2-phase 230 V; 3-phase 230 V;
TN-C / TN-S: 1-phase 230 V; 3-phase+N 400 V;

2. How much 'voltage drop' is involved?

As specified by NEK 400.

3. Which earthing type is being used?

IT
TN-C-S

4. What are the common meter types?

From January 1st 2017, only smart metering shall be used.

9. PORTUGAL

9.1 General rules for establishing a business

Electrical contractors need to register with:

InCI - Instituto da Construção e do Imobiliário

Rua Júlio Diniz, 11 - 1050-130 Lisboa

Telephone: 00 351 217946700

inci@inci.pt

<http://www.inci.pt>

and obtain the necessary authorization in order to execute electrical installations.

Technicians responsible for the project and the execution of electrical installations must be an electrical engineer or an electrical technician register with the DGE - Direcção General de Energia.

The project of electrical installations requires an electrical engineering diploma. Personnel responsible for electrical installations should be engineers of the specialty of electricity and technical engineers of the same specialty. In what respects simple installations, the electricians with adequate studies and, at least, two years of experience and electricians with professional titles given before 1981 can also be responsible.

Records of trade and industry

To set up a business in Portugal, registration is necessary before the “Registrar of Companies”. A “Limited Liability Company” is the form of business most often adopted by foreign investors. Publication of the articles of association in the official gazette and a daily newspaper are among the procedures required.

Additional registration before the above mentioned InCI is also essential.

Registration is also required of a branch of a foreign company but these cannot obtain the necessary authorizations from InCI and will not, therefore, work in the electrical installations market.

Professional certificate as electrical contractor

Technical regulations are statutory (Decree-Law n° 949-A/2006, 11th September).

Previous approval of the project is mandatory for some installations and the certification is statutory, although inspection it is not carried out in every situations.

Registration

Electrical contractors need to register with:

InCI - Instituto da Construção e do Imobiliário
Rua Júlio Diniz, 11 - 1050-130 Lisboa
Telephone: 00 351 217946700
inci@inci.pt
<http://www.inci.pt>

and obtain the necessary authorization in order to execute electrical installations.

Qualification of enterprises

The body that approves the projects, certifies the installations and carries out the inspections regarding private installations, when due, is:

CERTIEL - Associação Certificadora de Instalações Eléctricas

Rua dos Anjos, 68, 1150-039 Lisboa,

Telephone: 00 351 213183200

certiel@certiel.pt

www.certiel.pt

Electricity cannot be provided by EDP - Electricidade de Portugal before the above mentioned certification is obtained.

9.2 Requirements relating to Electrical Contracting Personnel

No information

9.3 Technical Standards

The official regulations that have to be met regarding electrical installations are issued by the:

Direcção Geral de Energia e Geologia
Av. 5 de Outubro, nº 87
1069-039 Lisboa
Telephone: (351) 217 922 700/217 922 800
Fax: (351) 217 939 540
energia@dgeg.pt
www.dgeg.pt

These are national regulations which are statutory and there have no regional variations.

These are the main applicable regulations:

Decree-Law n° 740/74, 26th December 1974

Decree-Law n° 26 852, 30th July 1936, modified by:

- Decree-Law n° 40722, 2nd August 1956;
- Decree-Law n° 43 335, 19th November 1960;
- Decree-Law n° 446/76, 5th June 1976;
- Decree-Law n° 517/80, 31st October 1980;
- Decree-Law n° 131/87, 17th March 1987;
- Decree-Law n° 4/93, 8th January 1993.

Decree-Law n° 949-A/2006, 11th September.

9.4 Inspection of installations

Approval of Installation Designs

When related to situations that depend on City Hall approval, designs must be presented to the local municipality.

After the electrical supplier (EDP) certifies that the installation in project can be supplied, designs of private installations must also be presented to CERTIEL if the installation has power over 50kVA.

Inspection of Installations

Inspection takes place after completion of work and prior to connection.

CERTIEL is responsible for inspection, which is statutory for new or renewed installations.

However, not all installations are inspected. Much depends on the size and importance of installation, the reputation of the technician that installed it and several other factors.

There is a computer program conceived for the special purpose of selecting the installations that are going to be inspected.

New installations are usually inspected. Buildings are usually inspected, but not every apartment.

If the building is selected to be inspected, common installation and the column are always seen.

The inspection procedure demands, among others, the testing of the circuits. The contractor pays for the certification of the installation even if inspection does not take place.

9.5 Health and Safety

Electrical installations have not been subject to specific health and safety legislation but to general legislation - Health and Safety at Work: Decree-Law n° 102/2009, 10th September.

9.6 Contractual and Commercial Matters

There is a standard form of contract in Portugal between client and electrical supplier, which can be obtained in:

EDP-Electricidade de Portugal
Praça Marquês de Pombal, 12 1250-162 Lisboa

Tel.: +351 21 001 2500

Fax: +351 21 002 1403

edp@edp.pt

www.edp.pt

There is not a standard form of contract between client and electrical contractor, although the existence of a contract with a minimum content is mandatory.

InCI - Instituto da Construção e do Imobiliário

Rua Júlio Diniz, 11 - 1050-130 Lisboa

Telephone: 00 351 217946700

inci@inci.pt

<http://www.inci.pt>

Contact information:

Direcção Geral de Energia e Geologia

Av. 5 de Outubro, nº 87

1069-039 Lisboa

Telephone: (351) 217 922 700/217 922 800

Fax: (351) 217 939 540

energia@dgeg.pt

www.dgeg.pt

EDP-Electricidade de Portugal

Praça Marquês de Pombal, 12 1250-162 Lisboa

Tel.: +351 21 001 2500

Fax.: +351 21 002 1403

edp@edp.pt

www.edp.pt

ADENE - Agência para a Energia
Rua Dr. António Loureiro Borges, nº 5 - 6º andar
Arquiparque - Miraflores
1495-131 ALGÉS

Tel.: (+351) 214 722 800
Fax: (+351) 214 722 898

geral@adene.pt
www.adene.pt

ISQ - Instituto de Soldadura e Qualidade

Av. Prof. Dr. Cavaco Silva, nº 33
2740-120 Porto Salvo
Telephone: +351 214 228 100
Fax: +351 214 228 120

info@isq.pt
www.isq.pt

9.7 Practical Shortcut on Common Used Electrical Connections

1. Which current rating and phasing (1-phase/3-phase) is used?

1-phase: 230V; 3-phase: 400V

2. How much 'voltage drop' is involved?

3% in lighting - 5% in others

3. Which earthing type is being used?

TT

4. What are the common meter types?

Analogic and digital

10. SCOTLAND

10.1 General rules for establishing a business

The most usual forms of business entity in the UK are public and private limited liability companies, branches of foreign companies, and partnerships, but other forms exist including unlimited companies. Branches of foreign companies can be set up without difficulty and operate in the same way as a resident UK company.

Companies are formed under the Companies Act, and any new company, including the UK branch of a foreign company, must register with the Registrars of Companies who issue a Certificate of Incorporation. This involves lodging documents in respect of the formation of the company or branch with the Registrar. A public company cannot commence business until the authorised minimum share capital - currently £50,000 - has been invested. A private company may commence business immediately after incorporation without minimum capital required.

The Registrars, run by the Department for Business Innovation & Skills, or its Northern Ireland equivalent, are located in Cardiff, Edinburgh, London and Belfast.

Partnerships are formed under the Partnership Act of 1890 and there are no register requirements.

All new businesses, whatever their form, must notify their formation to the local HMRC (Her Majesty's Revenue & Customs) office, for tax and social security purposes, and, except for small or exempt businesses, they must register with the local HMRC office for VAT purposes.

Self-employed status is subject to recognition by HMRC, not by the Registrar of Companies. Single person companies are not a legally recognised form of business entity in the UK.

Licences to trade are not required in the UK except for some specific activities such as banking and insurance. Businesses are not required by law to join a chamber of commerce or trade association.

Other EC nationals may enter the UK freely to work or carry on any economic activity on the same terms as UK citizens, subject only to a few exceptions and to conditions of residence comparable to those in most other Member States.

Records of trade and industry

Professional certificate as electrical contractor

An electrical contractor or operative is not obliged to possess particular qualifications to carry out installation work.

Many UK employers, however, undertake only to employ operatives qualified for registration and grading by bodies established under the industry's self-regulatory arrangements.

Firms whose trade association membership, or enrolment with a national consumer protection body allows them to self-certify that their installations comply with technical standards, undertake the majority of electrical contracting in the UK.

Registration

There is no compulsory registration requirement for electrical contractors, although those now wishing to undertake certain Building Regulation work must be registered in a suitable Scottish Government approved scheme. These arrangements for self-certification would be open to suitably competent non-national firms, or they could have their compliance with technical standards validated by a firm accepted for self-certification. In the UK, anyone can set up as an electrical contractor or call himself an electrical operative. A company or other form of business entity has to do no more than undergo the general registration requirements outlined in 2.17.1 above.

There are a substantial number of self-employed individuals working with or without employees in electrical contracting and an element of electrical contracting takes place in the 'black economy'.

All contractors, including self-employed individuals, in electrical contracting and other construction trades are required to register with HMRC under the Construction Industry Scheme. The Construction Industry Scheme (CIS) is a set of rules for contractors and subcontractors in the construction industry. If you're a CIS contractor (any person carrying on a business which includes construction operations), or a deemed contractor (non-construction businesses, such as large manufacturing concerns, department stores, breweries, banks, oil companies and property investors) you'll need to register with HMRC. You'll also have to follow certain rules to make sure you pay your subcontractors within the scheme correctly. Advice on this can be found at www.hmrc.gov.uk/cis/contractors/reg-obs.htm.

To undertake work in certain industries such as the telecommunications, nuclear, offshore and petrochemical industries, contractors may have to hold a recognised quality assurance accreditation such as ISO 9001:2008.

There is no requirement for installers to be registered. However, as has been previously mentioned local authorities that are responsible for verifying the compliance of new installations specify a requirement for installers to be either a member of SELECT or enrolled with the NICEIC.

For membership of SELECT contact:

SELECT

The Walled Garden

Bush Estate

Midlothian EH26 0SB

United Kingdom

Tel: +44 1314455577

Fax: +44 1314455548

E-mail: admin@select.org.uk

Website: www.select.org.uk

Qualification of enterprises

Enterprises require no other qualifications other than those given under 2.17.1 to operate as an electrical contractor.

10.2 Requirements relating to Electrical Contracting Personnel

No formal qualifications are required for an individual to set up or manage an electrical contracting business or to work as an operative in electrical contracting in the UK. In fact, in popular parlance, it is not uncommon for an electrician to be referred to as an 'engineer', whereas, formally, this should apply only to people with higher education in engineering. 'Engineer' may also be applied to people working in the field but lacking basic formal qualifications as an electrician.

In the absence of formal regulations or regulatory bodies, however, a large part of the industry supports a well-established voluntary scheme of self-regulation whereby they undertake only to employ operatives who are registered and graded by the Scottish Joint Industry Board of the Electrical Contracting Industry. Giving this undertaking is a condition of membership of SELECT (the Electrical Contractors' Association of Scotland). While there is no mechanism to ensure that non-members do follow this practice, some do so in their own self-interest.

The SJIB was founded in 1969 by SELECT, formerly the Electrical Contractors' Association of Scotland, and Unite the Union, formerly AMICUS.

The principal objectives of the Board are to regulate relations between employers and employees engaged in the industry in Scotland, to provide benefits for persons engaged in the industry in Scotland, to stimulate and further the progress of the industry, and in addition, and in the public interest, to regulate and control employment, the level of skill and proficiency, health and safety competence, wages and welfare benefits.

The training levels recognised by the SJIB are as follows:

- Electrician (including Provisional Electrician) - Electricians must have:
 - Successfully completed a recognised apprenticeship in electrical installation. They must be able to carry out electrical installation work efficiently in accordance with relevant statutory regulations and industry codes of practice.
 - Knowledge of the National Working Rules for the Electrical Contracting Industry, relevant statutory regulations and industry codes of practice including specifically The Electricity at Work Regulations 1989, The Electricity Safety, Quality & Continuity Regulations 2002 (so far as they both deal with consumers' installation) and BS 7671 (as amended) IET Wiring Regulations.
 - Achieved the SVQ Level 3 Certificate in electrical installation jointly awarded by Scottish Qualifications Authority (SQA) and the SJIB or an approved equivalent.
- Provisional Electricians must have completed an apprenticeship in their country of origin and had their qualifications translated into English.
 - Provisional Electricians must have:
 - Completed SELECT's ECS Health and Safety course; and
- City and Guilds IET Wiring Regulations to BS 7671 (full course); or
- EAL Level Diploma in Requirements for Electrical Installation (code 500/3484/4); or
- EAL Level 3 Award in Requirements for Electrical Installation (code 600/3719/2); and
- Be registered on the Crediting Electrotechnical Certification Scheme (CEC):
 - A Provisional Grade Card is only valid for 18 months during which time an operative must have completed the CEC Scheme and achieved an SVQ Level 3 in Electrical Installation.
 - All operatives applying to be graded or re-graded must be in possession of an ECS Health and Safety Assessment or approved equivalent which is not due to expire within six months.
- Approved Electrician. Approved Electricians must have:
 - Satisfactorily completed a registered apprenticeship in electrical installation.
 - Had two years experience as a graded Electrician immediately prior to application for this grade.
 - Successfully passed the Advanced Competence Assessment (ACA), 1995 apprentice training scheme or an approved equivalent.

Approved Electricians must possess particular practical, productive and electrical installation skills with adequate technical knowledge, to work on their own proficiency and carry out electrical installation work without detailed supervision in the most efficient and economical manner.

They must have knowledge of the National Working Rules for the Electrical Contracting Industry, relevant statutory regulations and industry codes of practice including specifically The Electricity at Work Regulations 1989, The Electricity Safety, Quality & Continuity Regulations 2002 (so far as they deal with consumers' installation) and BS 7671 (as amended) IET Wiring Regulations.

They must have supervisory knowledge and the ability to set out jobs from drawings and specifications, and requisition the necessary installation materials.

Responsibility Money for Approved Electricians

Approved Electricians in charge of work who undertake the supervision of other operatives shall be paid 'responsibility money', the amount of which shall be specified by the SJIB.

All operatives applying to be graded or re-graded must be in possession of an ECS Health and Safety Assessment or approved equivalent which is not due to expire within six months.

- Technician Electrician. Technician Electricians must have:
- Experience as an Approved Electrician for a minimum of three years.
- Knowledge of the most economical and effective layout of such installations together with the ability to achieve a high level of productivity in the work they control. In addition they must have exceptional technical skill, ability and experience beyond that expected of an Approved Electrician.
- Knowledge of the National Working Rules for the Electrical Contracting Industry, relevant statutory regulations and industry codes of practice including specifically The Electricity at Work Regulations 1989, The Electricity Safety, Quality and Continuity Regulations 2002 (so far as they deal with consumers' installation) and BS 7671 (as amended) IET Regulations.

Technician Electricians must have completed either:

- The SQA Tailored Award in Design and Verification of Electrical Installation (BS 7671) within the last 5 years; or
- An HNC in Electrical Engineering; or
- An HNC in Contracting Management; or
- The City & Guilds of London Institute Electrical Installation Work Course 'C'.

In addition they must complete the following training courses (available from SELECT), approved by the SJIB (within the last 3 years):

- Asbestos Awareness (assessed)
- Ashton Supervisory Management Course (or the approved equivalent ***)
- Managing Health and Safety - An Introduction
- Risk Assessment
- Safe Isolation (assessed)
- Scottish Building Standards (assessed)

*** HNC in Contracting Management and / or Graduate Certificate in Management Practice run by Napier University.

All operatives applying to be graded or re-graded must be in possession of an ECS Health and Safety Assessment or approved equivalent which is not due to expire within six months.

10.3 Technical Standards

Scottish Ministers through the Building Standards Division are responsible for Building Standards in Scotland. The Building (Scotland) Act 2003 is statutory legislation that governs the application of those Building Standards and they are administered and enforced by Scottish local authorities (verifiers).

The Building Standards Division publishes Technical Handbooks that provide guidance on achieving the technical standards. If the guidance is followed in full then this should be accepted by the verifier as indicating that the building regulations have been complied with. Failure to comply with the Technical Handbook does not render a person liable to civil or criminal procedures, but proof of compliance with the guidance may be relied on in any proceedings as tending to negative liability for an alleged contravention of the building regulations. Following the advice in the Technical Handbooks is therefore likely to be the normal way of complying with the building regulations.

The Institute of Engineering & Technology (IET) publishes an industry code of practice and a recognised British Standard known as the Wiring Regulations. BS7671 (as amended) is the electrical industry code of practice for all aspects of electrical installation work undertaken in all parts of the UK. Whilst not in itself a statutory document, it is widely regarded as being the route to compliance with the main statutory regulations in the UK.

With a few exceptions, a building warrant is required for all building work and conversions to which the Building (Scotland) Regulations 2004 applies and applications must be made to the local authority verifier. The Building (Scotland) Act 2003 introduced the option of certification for specific aspects of work that requires a building warrant. Electrical work is one such aspect. It is the responsibility of the building owner to ensure that electrical work carried out to their property complies with the building regulations.

Certification provides the building owner with an easy means to ensure that specific aspects of a project are compliant. It is based on the principle that suitably qualified and experienced contractors (Approved Certifiers) can accept responsibility for ensuring work complies with the technical standards without the need for detailed scrutiny of designs or inspections by verifiers.

Scottish Ministers can, under Section 7 of the Building (Scotland) Act 2003, approve schemes for the certification of design or construction for compliance with the mandatory technical standards. Individuals approved to provide certification services under the scheme are assessed

to ensure that they have the qualifications, skills and experience required to certify compliance for the work covered by the scope of the scheme. .

Certification may only be undertaken by an Approved Certifier who is registered with a Certification Scheme Provider and only applies when the work being done requires a building warrant. There are two such scheme providers in Scotland that operate Certification of Construction Schemes for Electrical Installations to BS7671.

The two scheme providers for Certification of Construction Schemes for Electrical Installations to BS7671 are SELECT and the NICEIC. Further details on Certification of Construction and Scottish Building Standards can be found at:

www.sbsc.uk.net

www.scotland.gov.uk/Topics/Built-Environment/Building/Building-standards

10.4 Inspection of installations

Scottish local authorities have been empowered under statute to verify that electrical installations in Scotland comply with Building Regulations. There are two recognised and accepted methods of demonstrating compliance and those are:

- The issue of a Certificate of Construction by an Approved Certifier.
- The issue of an installation certificate in the form of that given in the IET Wiring Regulations BS7671.

Local authority verifiers are empowered to conduct a “reasonable enquiry” to determine if an installation complies with Building Regulations. If an Approved Certifier of Construction issues a Certificate of Construction (Electrical Installations to BS7671) for the work then the local authority verifier must take this as evidence of compliance and no further inspection is required. If there is no Certificate of Construction the local authority verifier must decide what level of inspection is required. The capacity of firms in membership with SELECT to issue an installation certificate in the form of that given in BS7671 is generally accepted by the local authorities. Firms, or individuals not covered by membership of SELECT can have their installations verified by firms, which are members.

Another option is for firms to become enrolled with the National Inspection Council for Electrical Installation Contracting (NICEIC). The local authorities also accept installation certificates in the form of that given in BS7671 from contractors on the NICEIC roll.

In addition, under health and safety legislation, installations are also open to inspection by the UK Health and Safety Executive.

Specific inspection rules/revision by official mandates after/during installing

The two main pieces of legislation governing electrical installations in the workplace are the Health and Safety at Work etc. Act of 1974, and the Electricity at Work Regulations 1989. Whilst there is no statutory requirement to inspect electrical installations, during or after completion, there is a statutory requirement under the Electricity at Work Regulations for electrical installations to be designed, installed, operated and maintained in a safe manner at all times. Guidance on how to achieve that can be found in the IET's Wiring Regulations (BS7671). The Electricity at Work Regulations 1989 makes no specific mention of BS7671. However, guidance on how companies can comply with these regulations is available from the UK Health & Safety Executive in the form of publication HS(R) 25 - Memorandum of Guidance on the Electricity at Work Regulations 1989. This publication can be purchased or downloaded free of charge from www.hse.gov.uk/pubns/books/hsr25.htm. HS(R) 25 states that "BS7671 is a code of practice which is widely recognised and accepted in the UK and compliance with it is likely to achieve compliance with relevant aspects of the Electricity at Work Regulations 1989".

There is no statutory requirement to inspect electrical installations in domestic premises intended to be used solely as places of habitation. Certain housing associations and local authorities maintain a supply of housing stock for rental purposes and as such have implemented a programme of inspection and testing of the electrical installations in those properties. This fulfils their duties as landlords under the Health & Safety at Work etc Act 1974.

Inspection of Installation Designs

There are no statutory requirements that designs should be subject to inspection or that particular technical qualifications should be held by individuals undertaking design work.

10.5 Health and Safety

Electrical installations are not subject to specific health and safety legislation but to general legislation known as the Health and Safety at Work etc. Act of 1974. In 1989,

The Electricity at Work Regulations were introduced. These acknowledge that many aspects of their requirements are likely to be met through compliance with the IET Wiring Regulations but they do not make the Wiring Regulations statutory.

10.6 Contractual and Commercial Matters

A variety of forms of contract are used in electrical contracting, including many standard and non-standard forms. In Scotland, SELECT member firms are covered by the:

- SELECT Code of Practice, which incorporates a complaints procedure that ensures the quality and standard of work from a SELECT Member firm matches the requirements of BS7671.
- SELECT Contract Completion Guarantee Scheme, which guarantees that if any work undertaken by a Member of SELECT on behalf of any customer cannot be completed by reason of that Member's insolvency then SELECT shall pay to that customer the additional cost of completion of that work by another Member firm.

Contact information:

For electrical standards visit www.select.org.uk or contact:

SELECT

The Walled Garden, Bush Estate, Midlothian EH26 0SB, United Kingdom

Tel: +44 1314455577 | Fax: +44 1314455548

E-mail: admin@select.org.uk | Website: www.select.org.uk

For building regulations visit www.sbsc.uk.net or contact the Scottish Government's Building Standards Division on +44 131 556 8400. Or email: buildingstandards@scotland.gsi.gov.uk

10.7 Practical Shortcut on Common Used Electrical Connections

1. Which current rating and phasing (1-phase/3-phase) is used?

For domestic/residential installations: typically single phase up to 100A

For commercial/industrial installations: current rating and phasing is very much dependent on the required load. This can be anywhere from single phase 100A right up to 3 phase primary high voltage at 33kV from a dedicated substation. It is difficult to give a typical response here but the maximum demand of such an installation is commonly expressed as a product of the connected load and the effect those loads have on the supply, expressed in kVA.

2. How much 'voltage drop' is involved?

The IET Wiring regulations contains four regulations specifying that the voltage at the terminals of equipment is:

- Suitable for that specified in the equipment product standard; or
- For equipment without a standard, suitable for correct functioning

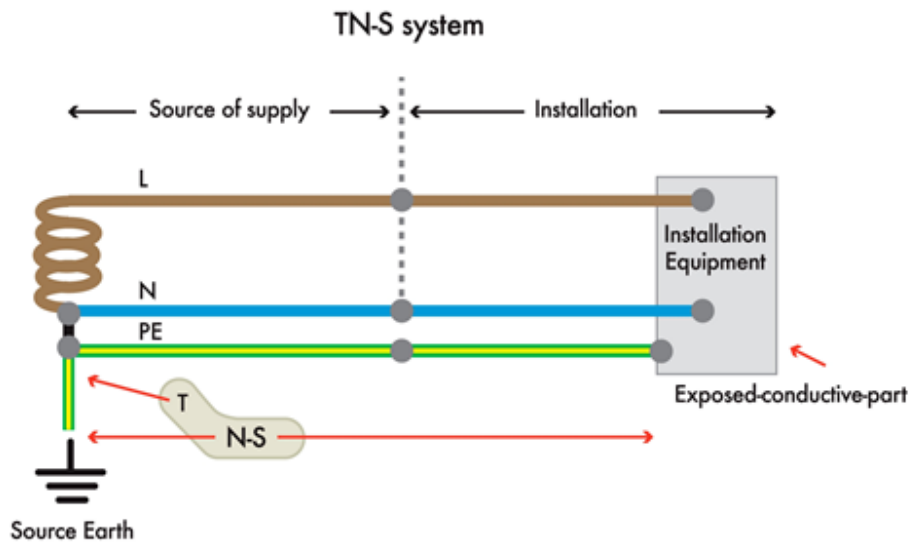
Appendix 12 of the Wiring Regulations gives nominal figures, which if followed are "deemed to comply" with the voltage drop design requirements of the Regulations. These are:

- 3% for lighting and 5% for other uses in low voltage (up to 1kV) installations supplied from a public network.
- 6% for lighting and 8% for other uses in low voltage installations supplied from a private supply.

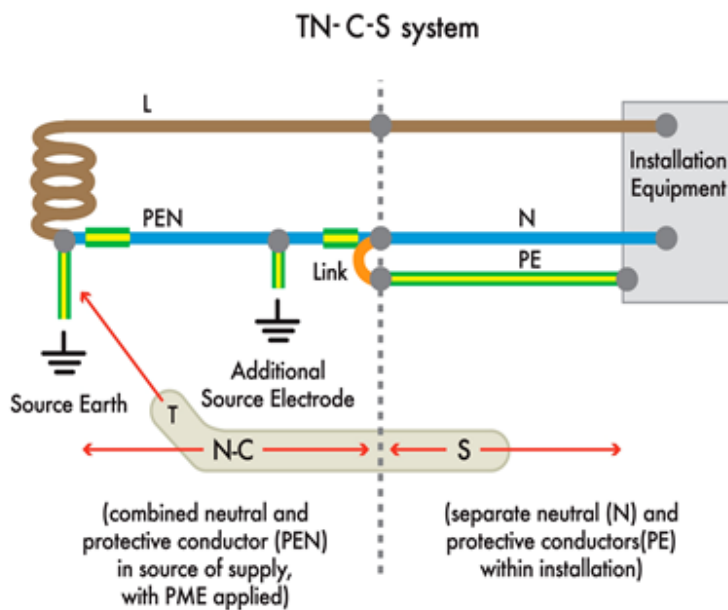
3. Which earthing type is being used?

There are three types of earthing used:

i. TN-S: where the neutral and protective conductors are separate throughout the system. The means of earthing is therefore an earth terminal connected to a separate conductor which may be the supply cable sheath.

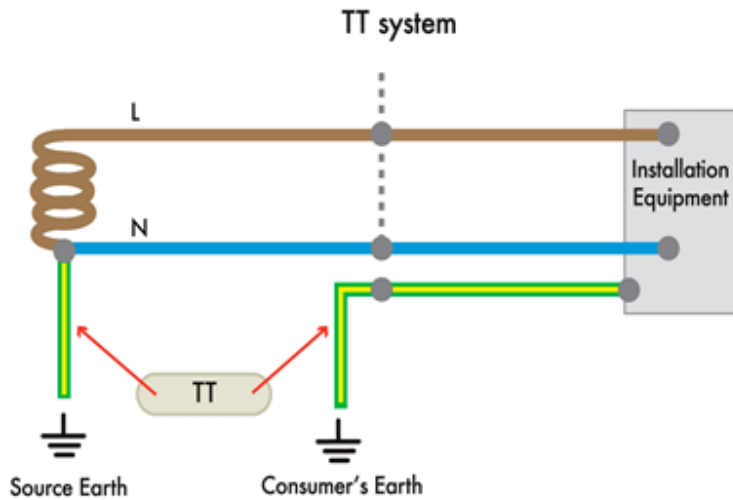


ii. TN-C-S: also known as PME (protected multiple earth) where the neutral and protective conductors are combined outwith the electrical installation. The means of earthing is therefore a PME earth terminal provided at the supply terminals. This is the preferred earthing arrangement for new installations.



Both TN-S and TN-C-S earthing is reliant on the electricity supplier providing an earth.

iii. TT: where an earth terminal is not provided from the supply a separate earth electrode is used.



4. What are the common meter types?

The Meter Operation Code of Practice Agreement (MOCOPA) is an Agreement between electricity distribution businesses and electricity meter operators in the UK.

The Agreement authorises meter operators to install and connect meters to the electricity network by clarifying that the equipment being provided, installed and maintained meets appropriate technical requirements and that work is carried out to adequate safety standards.

MOCOPA clarifies duties and obligations and sets out guidelines, compliance with which will give confidence to all parties in the electricity supply market that meters will not introduce barriers to customers switching suppliers nor introduce barriers to entry to participants in these markets.

UK nationally approved electricity meters are approved under The Electricity Act 1989 and the pattern or construction of the meter type must conform to the requirements specified in the accompanying Regulations. Both induction (electro-mechanical) and static (electronic) meters can be approved in the UK.

It is important to note that unless a meter is approved by the UK National Measurement Office or another EU Member State (in the case of induction meters) it cannot be used for billing purposes in the UK. On its own, conformance to a standard does not amount to UK national approval and formal certificated approval is a prescribed requirement.

Since the European Measuring Instruments Directive (MID) was fully implemented on 30th October 2006, there can be no new UK national approvals of meter types within the scope of the Directive. However the MID provides a 10 year transitional period and minor modifications to existing UK nationally approved meter types can be approved by NMO until October 2016. After this time, no UK nationally approved electricity meters shall be allowed to enter the market, although those meters already 'on the wall' will be allowed to remain in use for as long as they meet the legal requirements.

11. SLOVENIA

Company registration is required for all businesses in Slovenia whatever their size or activity.

Companies Act (ZGD-1) defines various legal organisational forms. The most common are “Private Entrepreneur” and “Limited Liability Company”.

An electrical contractor is not obliged to possess particular qualifications to carry out installation work.

Additional to general qualification for an electrical installation, an enterprise should have a qualification from the responsible Ministry on: alarm systems, machines and equipment safety, emergency and safety lightning and installation in explosive zones.

Technical standards for electrical installations are specified in the Code of Practise for electrical installations and lightning systems.

11.1 General rules for establishing a business

Company registration is required for all businesses in Slovenia whatever their size or activity.

Records of trade and industry

Legal Organisational Forms of Enterprises

Companies Act (ZGD-1) defines various legal organisational forms. The most common are “Private Entrepreneur” and “Limited Liability Company”:

Individual Private Entrepreneur - s.p.

- Natural entity (holder of rights and obligations) is liable for his/her obligations with all his/her personal property.
- There are no members and no founder's capital.
- Limited powers and liabilities in carrying out commercial transactions. Limited Liability Company (d.o.o.)
- The authorised capital is composed of an amount of contributions paid in by members. The appropriate portions necessary to operate their business; there can also be a single member.
- The personal elements are more explicit, the number of members is limited, there are no shares issued.

- The members are entitled to profits in proportion to their contributions (or contractually).
- The decisions are taken by all members (in proportion to their contributions or contractually).
- LLC (d.o.o.) has a manager(s) who runs/run a company at his/their responsibility.

Other possible forms are: Unlimited Liability Company, Public Limited Company, Limited Partnership and a Limited Partnership with Share Capital etc.

The establishing, managing and organization of companies is regulated by the Commercial Companies Act, which is harmonized with the EU Acquis Communautaire. The court registration of companies is regulated by the Court Register Act and the Decree on the entry of companies and other legal entities in the court register.

Organizational forms

The Companies Act provides for the following organization forms:

- General partnership (Družba z neomejeno odgovornostjo - d.n.o.)
- Limited partnership (Komanditna družba - k.d.)
- Dormant partnership (Tiha družba)
- Limited liability company (Družba z omejeno odgovornostjo - d.o.o.)
- Private Entrepreneur (Samostojni podjetnik - s.p.)
- Joint-stock company (Delniška družba - d.d.)
- Partnership limited by shares (Komanditna delniška družba - k.d.d.)

Since 2006 the establishment of a European company (SE) is possible in Slovenia.

Founders

All the companies may be established by any domestic or foreign, legal or natural person. The law prescribes forms of the minimum or maximum number of founders for an individual type of company.

Legal personality

Companies obtain the status of a legal person through court registration.

Registered name

The company must use its registered name in all operations. The mandatory elements of the registered name are the name of the company, an indication of the company's economic activity and a statement on its organizational form.

The registered name has to be in the Slovenian language. Any translation must only be used in conjunction with the Slovenian wording.

Registered office

The registered office of the company is the place entered in the court register as the registered office. This must be the place where the company performs the main part of its activities or the place where the bulk of its business is conducted.

Economic activity

The company enters the economic activities it plans to perform in the court register as the registered activities. Upon entry, the Standard Classification of Industries must be used. A company is only allowed to conduct businesses for which it has been registered! The company is free to choose any activities it intends to perform, however certain activities can only be performed after obtaining a permission of the competent authority.

Representation

The company has to enter in the register at least one person who is authorized to represent the company and to sign company documents. There is no requirement that the director, any member or the majority of the management board must be Slovenian citizens or residents.

Special Procedures

If specific regulations or additional conditions are required for some of your or your company's activities prior to the start of business activities you must acquire a specific administrative authorisation. This is usually the case with a craft activity.

- Chamber of Crafts and Small Businesses of Slovenia
- List of Activities

Chamber of Craft and Small Business of Slovenia

Section of electro activities

Celovška cesta 71

1000 Ljubljana

Slovenia

Tel. +386 1 583 05 01

Fax +386 1 505 92 70

E-mail: info@ozs.si

Website: <http://www.ozs.si>

11.2 Professional certificate as electrical contractor

The authorised person, who must satisfy specific educational requirements and be principally employed by the company, possesses the overall responsibility for electrical safety, including responsibility for issuing safety instructions and supervising work carried out by the company's staff.

Most applicable Standard classification of activities for contractor (SKD):

- 43.210 Installation of electrical systems in all kinds of buildings and civil engineering structures.
- 43.220 Installation of plumbing, heating and air-conditioning systems, including additions, alterations, maintenance and repair.
- 43.290 Installation of equipment other than electrical, plumbing, heating and air-conditioning systems or industrial machinery in buildings and civil engineering structures, including maintenance and repair.
- 80.200 Monitoring or remote monitoring of electronic security alarm systems, such as Burglar and fire alarms, including their maintenance. Installing, repairing, rebuilding, and adjusting mechanical or electronic locking devices, safes and security vaults.

Registration

The registered office of the company is the place entered in the court register as the registered office. This must be the place where the company performs the main part of its activities or the place where the bulk of its business is conducted.

Before use and when periodic testing is applied, an electrical installation needs to be inspected. Inspector of an electrical installation safety and lightning protection must be registered (MzIP).

There are two levels of registering for the installer:

- basic condition buildings with registering under NPK-NVQ No. 87658650 or
- demanding condition buildings with registering under NPK-NVQ No. 65332730.

Such person is normally employed by an electrical contractor or can be acquired as independent expert entrepreneur.

Demanding condition buildings are:

- Where Explosive Zones are present,
- Where Solar Power Plant is part of the building,

- Where the Power Transformer is on the building's yard,
- Where Lightning protection of expensive technology is built in.

Professional Electrical Inspectors also established an optional organisation which is called “eTest scheme”. It is governed by “Electrical Board on Low voltage electrical installation and lightning protection”(NNELI). Board NNELI was established by EZS and OZS. (“NNELI-Odbor za nizkonapetostne električne inštalacije in zaščito pred strelo”.pri EZS-Elektrotehniška zveza. The “ETest scheme” represents the professional association of individual inspectors of electrical installations, lightning protection and associated companies.



Elektrotehniška zveza Slovenije
 Electrotechnical Association of Slovenia
 Board of low voltage electrical installation and lightning protection (NNELI)
 Janez Guzelj, Chairman
 eTest scheme
 Stegne 7
 SI 1000 LJUBLJANA

Slovenian Geo-electricity, Static Electricity and Lightning Society
 Member of Electrotechnical Association of Slovenia
 Prof.dr. Maks Babuder, Chairman
 Dean Ogrizek, Secretary
 Vetrinjska ulica 16,
 SI-2000 MARIBOR

Latest state of the technology and training:

Training courses for installers of small scale renewable energy systems (photovoltaic, solar thermal, heat pumps and biomass systems) in buildings are now available in Slovenia. There is an opportunity to attend one of the Install+RES training courses to become an installer of the most innovative and market oriented energy technologies of the future.

Economic activity

The company enters the economic activities it plans to perform in the court register as the registered activities. Upon entry, the Standard Classification of Industries must be used. A company is only allowed to conduct businesses for which it has been registered! The company is free to choose any activities it intends to perform, however certain activities can only be performed after obtaining a permission of the competent authority.

Representation

The company has to enter in the register at least one person who is authorized to represent the company and to sign company documents. There is no requirement that the director, any member or the majority of the management board must be Slovenian citizens or residents.

Qualification of enterprises

Qualification for electrical machines and equipment: enterprises that install and repair machines and equipment have to be qualified to do so by the Ministry of Labour, Family and Social affairs - Health and Safety at Work

Qualification for emergency and safety lighting: enterprises: enterprises that install, repair and inspects emergency and safety lighting have to be qualified to do so by the Ministry of Defence - Administration of the Republic of Slovenia for Civil Protection and Disaster Relief

Qualification for intrusion detection: enterprises that develop and install burglar alarm systems have to be qualified to do so by the Ministry of Internal Affairs. They have to meet requirements in training, in permanent accessibility, the protection of client files, the reliability of the employees.

Qualification for explosive zones, enterprises that install and repair installation in explosive zones have to be qualified to do so by the auditor and Ministry of Labour, Family and Social affairs - Health and Safety at work.

11.2 Requirements relating to Electrical Contracting Personnel

No particular qualifications are legally required to work in electrical contracting in Slovenia.

However, the knowledge and experience required are specified in detail in standard of working operations and catalogue of knowledge and experience for inspector of electrical installations and lightning protection. (Preglednik).

“Inspector of electrical installation” is defined in Regulations UL RS 41/2009 and UL RS 28/2009.

Electrical contractors are usually members to the voluntary scheme called “eTest” run by the association EZS.

Members of “eTest scheme” are Contractors and Inspectors of electrical installation who are employed by electrical contractors.

Managing board of low voltage electrical installation (NNELI) organises for the members of the “eTest scheme” all support to make inspections in best shape, quality and traceability for each installation. When all conditions for the acceptance test are fulfilled, installation is labelled with “eTest label” and all reference data on it.

In practise, most employees have the following certificates based on formal standard classification of contractor activities:

- Manager: engineer (from an engineering school or university)
- Technician: technical college diploma
- Operative: lower secondary school.

However, employees without proper qualifications can still work as electrician when properly guided.

In fact, the general rules concerning electrical installations and Lightning System are involved in:

1. Regulation on requirements for low-voltage electrical installations in buildings (UL RS 41/2009) and Code of Praxis TSG-N-002,

2. Regulation on Lightning protection (UL RS 28/2009) and Code of Praxis (UL RS TSG-003).

This Acts defines Inspectors of electrical installation and lightning system (Preglednik) (with NVQ -NPK qualification) of Electrical Installation and Lightning System.

Such person is able to assign measurement protocol and final statement of inspected installation.

11.3 Technical Standards

Materials and components, which are used in electrical installations, must fulfil demands of European standards. If there are no European standards materials and components must meet the demands of the national standard. If there is no national standard, the manufacturer or importer must point out that the materials and components fulfil the essential safety demands.

11.4 Inspection of installations

Official mandates inspection:

First buildings inspection of new buildings and Periodical Inspection of all residence buildings excluded single and double apartment houses.

Mandatory inspection in Slovenia is based on Regulation on demands for electrical installations in buildings and the Code of Practice TSG-N-002:2009 - (Pravilnik o zahtevah za električne inštalacije v stavbah in Tehniška smernica TSG-N-002:2009), and Regulation on Lightning protection and Code of Practice TSG_N003:2009. - (Pravilnik o zaščiti stavb pred delovanjem strele in Tehniška smernica TSG-N-003:2009)

Inspection of electrical installation and lightning protection is mandatory and is realised by the Inspector for electrical installations and lightning protection.

Mandatory inspection check includes:

- Visual inspection, measurement, testing, compatibility check of applied equipment and making of a final audit report.
- The Inspection protocol should be signed by a professional Inspector for electrical installations and lightning protection (Preglednik) who has a certificate of national vocational qualification NVQ (NPK-nacionalna poklicna kvalifikacija).

Such person should be trained and should pass an examination at the National Examinations Centre.

Specific inspection rules/revision by official mandates after/during installing

Official mandates inspection: First inspection of new buildings and Periodical Inspection of buildings and all living buildings excluding single and double residential houses.

First buildings inspection of new buildings and Periodical Inspection of all residence excluded single and double apartment houses.

Mandatory inspection in Slovenia is based on Regulation on demands for electrical installations in buildings and Code of Practice TSG-N-002:2009 - (Pravilnik o zahtevah za električne inštalacije v stavbah in Tehniška smernica TSG-N-002:2009), and Regulation on Lightning protection and Code of Practice TSG_N003:2009. - (Pravilnik o zaščiti stavb pred delovanjem strele in Tehniška smernica TSG-N-003:2009).

Mandatory inspection consist of:

Visual inspection, measurement, testing, compatibility check of applied equipment and making final audit report.

Inspection protocol should be signed by an Inspector of electrical installation and lightning protection (Preglednik) who has a certificate of national vocational qualification NVQ (NPK-nacionalna poklicna kvalifikacija). Such person should be trained and should pass an examination at the National Examinations Centre. This Centre is a central institution established for the external assessment of pupils, apprentices, students and adults in Slovenia.

National examination centre

Ob železnici 16

1000 Ljubljana

tel: 01 548 46 00

fax: 01 548 46 01

info@ric.si

<http://www.ric.si/>

<http://www.nrpslo.org/>

A national vocational qualification (NVQ) is a formally recognised work-related, competence-based qualification, which reflects the skills and knowledge needed to do a job effectively and shows that a candidate is competent in an area of work, or individual segments of work, within an area at a certain level of achievement, and as such, part of the national qualification framework.

An NVQ is shown by a public document - a certificate whose form and content are defined by the Minister of Labour.

The system of assessment and certification of NVQs in Slovenia is regulated by the National Professional Qualifications Act (Official Gazette of the Republic of Slovenia, Nos 81/2000, 55/2003, 118/2006, 1/2007) adopted by the Ministry of Labour, Family and Social Affairs. This Act regulates the procedure and the competent bodies, agencies and organisations for adopting catalogues of standards of professional knowledge and skills, and the conditions and procedures for obtaining NVQs.

Normally, NVQ professionals are employed by an electrical contractor or are organised as Individual entrepreneur.

A. Inspection professionals of demanding Installations:

1. KATALOG STROKOVNIH ZNANJ IN SPRETNOSTI

CATALOG OF PROFESSIONAL KNOWLEDGE AND EXPERIENCE

Ime in koda kataloga strokovnih znanj in spretnosti

Name and code of a catalog of professional knowledge and experience

Preglednik zahtevnih električnih inštalacij in inštalacij zaščite pred delovanjem strele

Inspector of demanding electrical installations and for lightning protection.

Koda/ Code 6533273011

2. POKLICNI STANDARD

STANDARD OF PROFESSION

Ime in koda poklicnega standarda

Name and code of a professional standard

Preglednik zahtevnih električnih inštalacij in inštalacij zaščite pred delovanjem strele

Inspector of demanding electrical installations and for lightning protection.

Koda/ Code 65332730

B. Inspection professional of less demanding Installations:

1. KATALOG STROKOVNIH ZNANJ IN SPRETNOSTI

CATALOG OF PROFESSIONAL KNOWLEDGE AND EXPERIENCE

Ime in koda kataloga strokovnih znanj in spretnosti

Name and code of a catalog of professional knowledge and experience

Preglednik manj zahtevnih električnih inštalacij in inštalacij zaščite pred delovanjem strele

Inspector of less demanding electrical installations and of lightning protection.

Koda/ Code 8765865011

2. POKLICNI STANDARD

STANDARD OF PROFESSION

Ime in koda poklicnega standarda

Name and code of a professional standard

Preglednik manj zahtevnih električnih inštalacij in inštalacij zaščite pred delovanjem strele

Inspector of less demanding electrical installations and of lightning protection.

Koda/ Code 87658650

Inspector of electrical installation and lightning protection is registered.

Country inspectorates in the field of electrical installations:

1. Electrical inspection | Transport, energy and spatial planning inspectorate of the Republic of Slovenia

Vožarski pot 12

1000 Ljubljana

SLOVENIA

Tel: 00386 (0)1 420 44 88

Faks: 00386 (0)1 420 44 91

e-pošta: [gp.irspep\(at\)gov.si](mailto:gp.irspep(at)gov.si)

2. Health and safety labour inspectorate of the republic of slovenia

Parmova 33

SI-1000 Ljubljana

Slovenia

phone: + 386 1 280 36 60

fax: + 386 1 280 36 77

e-mail: irsd@gov.si

3. Fire safety inspection:

INSPECTORATE OF THE REPUBLIC OF SLOVENIA FOR PROTECTION

AGAINST NATURAL AND OTHER DISASTERS- FIRE SAFETY

Vojkova cesta 61,

1000 Ljubljana,

SLOVENIJA

Phone: +386 1 230 53 68

Fax: +386 1 471 20 41

E-mail: irsvndn@mors.si

11.5 Health and Safety

Electrical installations have not been subject to specific health and safety legislation but to general Building up legislation mentioned at item 2.18.2.

1. Regulation on requirements for low-voltage electrical installations in buildings (UL RS 41/2009) and Code of Praxis TSG-N-002,

2. Regulation on Lightning protection (UL RS 28/2009) and Code of Praxis (UL RS TSG-003).

This Acts defines the “Inspector of electrical installation and lightning protection” (Preglednik) (with NVQ -NPK qualification).

The electrical safety of machines and equipment and explosive zones though are covered by the health and safety legislation.

11.6 Contractual and Commercial Matters

There are a wide variety of forms of contract. Each project has its own contract varying according to the size and content of the job.

Large public installations use third party organisations for tendering which prescribe the contract involved.

Codes of practise regarding tendering procedures are worked out according to the individual projects, whether private or public.

11.7 Practical Shortcut on Common Used Electrical Connections

1. Which current rating and phasing (1-phase/3-phase) is used?

25A and 20A on the main board and 16A or less per circuit on sub boards. Usualy 3 phase system.

2. How much ‘voltage drop’ is involved?

4% on incoming loops and 3% on inside building conductors / cables.

3. Which earthing type is being used?

Mainly TN in cities and urban areas, TT where longer lines or higher Loop Impedances are present.

4. What are the common meter types?

3 phase, electronical, new ones are remote reading type

11.8 Facts about Slovenia

The Republic of Slovenia lies at the heart of Europe and is often called „Europe en miniature“.

It contains Alpine and Mediterranean landscapes, the Pannonian plains and the mysterious Karst. It's neighbours are Austria, Hungary, Croatia and Italy.

Slovenia is a country with 2 million inhabitants and a size of 20.000 km². The Slovene

Southern Slavonic - language has played a special role throughout Slovenia's history and is still considered as one of the foundations of national identity.

Key facts:

- Area: 20,273 km²
- Population: 1.997.590
- GDP per capita 2009: 17.657 EUR
- Capital city: Ljubljana
- Language: Slovene; in nationally mixed areas, also Italian and Hungarian
- Currency: Euro (EUR)

Contact information:

1. Chamber of Craft and Small Business of Slovenia

Section of electro activities

Celovška cesta 71

1000 Ljubljana

Slovenia

Tel. +386 1 583 05 01

Fax +386 1 505 92 70

E-mail: info@ozs.si

Website: <http://www.ozs.si>

2. Contact information on country inspectorates in the field of electrical installations:

A. ELECTRICAL INSPECTION

Transport, energy and spatial planning inspectorate of the Republic of Slovenia

Vožarski pot 12
1000 Ljubljana
SLOVENIA

Tel: 00386 (0)1 420 44 88
Fax: 00386 (0)1 420 44 91
e-mail: [gp.irspep\(at\)gov.si](mailto:gp.irspep(at)gov.si)

B. HEALTH AND SAFETY

Labour inspectorate of the Republic of Slovenia
Parmova 33
SI-1000 Ljubljana
Slovenia

Tel: + 386 1 280 36 60
Fax: + 386 1 280 36 77
e-mail: irsd@gov.si

C. FIRE SAFETY INSPECTION:

Inspectorate of the republic of slovenia for protection
Against natural and other disasters- fire safety

Vojkova cesta 61,
1000 Ljubljana,
SLOVENIJA

Tel: +386 1 230 53 68
Fax: +386 1 471 20 41
E-mail: irsvndn@mors.si

3. Contact info on the Slovenian electrical Standard Institute:

SIST

Slovenian Institute for Standardization

Tel.: +386 1 478 3075

vesna.klofutar@sist.si

Šmartinska cesta 152

SI - 1000 Ljubljana,

Slovenia

www.sist.si

4. Contact information on the Slovenia electrical installation regulation:

Ministry for Infrastruktura and spatial planning

Department of building up and housing

Langusova ulica 4

SI - 1000 Ljubljana

Slovenia

www.mzip.gov.si

5. Contact information on the NPK certificates

National examination centre (RIC)

Ob železnici 16

1000 Ljubljana

tel: 01 548 46 00

fax: 01 548 46 01

info@ric.si

<http://www.ric.si/>

<http://www.nrpslo.org/>

6. Professional organizations:



Elektrotehniška zveza Slovenije

Electrotechnical Association of Slovenia

Board of low voltage electrical installation and lightning protection (NNELI)

Janez Guzelj, Chairman

eTest scheme

Stegne 7

SI 1000 LJUBLJANA

Slovenian Geo-electricity, Static Electricity and Lightning Society

Member of Electrotechnical Association of Slovenia

Prof.dr. Maks Babuder, Chairman

Dean Ogrizek, Secretary

Vetrinjska ulica 16,

SI-2000 MARIBOR

12. SPAIN

SUMMARY

All electrical contractors must register within the Ministry of Industry, Energy and Tourism.

Registration applies to national and not national companies. It allows the electrical contractor to work in the whole territory without expiration date.

To carry out work, a contractor must employ a person who is qualified and has the necessary installation equipment.

There are statutory technical standards for electrical installations, which are separate from Health and Safety legislation, but do refer to technical standards within its regulations.

Inspection for some kind of works is statutory/compulsory.

12.1 General Rules for Establishing a Business

The procedure for setting up a business in Spain can be found in this Web page: <http://www.ipyme.org> of the Ministry of Industry, Energy and Tourism.

The procedure depends on the legal form of the company but is basically a two steps procedure. First of all the company must be registered by the Commercial Register and the Tax Agency (voluntary for the independent entrepreneurs) and they will authorize if the activity can be carried out or not. This second step can be covered filling in some documents in these institutions: the local Council, the local Social Security Treasury, the local Job Department, again, the Tax Agency and finally, the Local Labor Inspection Department.

Requirements for Registration as an Electrical Contractor

In addition to the above, an electrical contractor must register as such with the Ministry of Industry, Energy and Tourism.

This is a statutory requirement backed by our Low Voltage Electrotechnical Regulations..

There are two different certificates known as, the “basic” one and the “specialist”.

The certificate in the “basic category” allows the electrical contractor to install, maintain and repair electrical installations in buildings or industries not reserved for the specialist category.

The certificate in the “specialist category” allows the electrical contractor to install, maintain and repair electrical installations in buildings or industries of the basic category which are:

- Automation Systems
- Technical energy management
- Building security (alarm systems and fire detection)
- Distributed control systems

- Monitoring systems, control and data acquisition
- Process control
- Overhead or underground lines for the energy distribution
- Installations with fire or explosion risk
- Operating rooms
- High voltage discharge lamps, neon signs or similar
- Low voltage generating facilities

To obtain the certificate, the applicant must meet the following conditions:

- (a) He or she should have the documentation that identifies the person as an electrical contractor. In case of an independent entrepreneur, this is the proof of being legally constituted.
- (b) He or she should have the technical and human resources required to carry out the activities for the respective categories (“basic” or “specialist”).
- (c) He or she should have signed a professional liability insurance or other equivalent guarantee covering the possible damages that may result of the service. The minimum amount is 600.000 Euros for the “basic category” and 900.000 Euros for the “specialist category”.

To carry out work, the electrical contractor must have, at least, one person who complies with these requirements in the “basic” or in the “specialist” category according to the installation works.

The technical resources to be able to work as an electrical contractor are described in the ITC-BT-03 of the Low Voltage Electrotechnical Regulations (REBT).

The certificate allows the company to work in the whole Spanish territory without expiration date.

Any electrical contractor legally established in some other country of the European Union wishing to undertake any activity in the Spanish territory, must previously submit, in the region where it wants to start its business, a sworn statement in which the owner of the company or its legal representative declares, that they meet the Spanish requirements to work as an electrical contractor.

12.2 Requirements Relating to Electrical Contracting Personnel

The Directive 2006/123/EC of the European Parliament and of the Council of 12 December 2006 on services in the international market, introduced changes in our Low Voltage Electrotechnical Regulations.

As a result of this, an electrical installer is now the person who develops his activity with an electrical contractor and must cover one of these competences:

- a) A university degree related to the Low Voltage Electrotechnical Regulations.
- b) A professional training related to the Low Voltage Electrotechnical Regulations
- c) A professional competence gained through working experience related to the Low Voltage Electrotechnical Regulations.

To carry out work, the electrical contractor must have, at least, one person who complies with these requirements in the “basic” or in the “specialist” category according to the installation works.

12.3 Technical Standards

The national Spanish regulations regarding low voltage electrical installations are the “Reglamento Electrotécnico Para Baja Tensión” (REBT). These are statutory regulations according to the Royal Decree 842/2002 and subsequent amendments, issued by the Ministry of Industry and Energy. The REBT is national.

There are some complementary technical rules called “Instrucciones Técnicas Complementarias del Reglamento Electrotécnico para Baja Tensión”, published, trying to cover the main doubts obtained by the interpretation of the REBT. These rules are not compulsory and are basically the REBT texts with extra information and some examples.

Finally, you would have to take into account the particular specifications of the distribution companies. These specifications are periodically modified, as each utility has its own rules and may vary from one region to another.

For more information, please visit
<http://www.f2i2.net/legislacionseguridadindustrial/LegislacionNacional.aspx>

12.4 Inspection of Installation

The inspection and verification of an installation is described in the chapter number 5 (ITC-BT-05) of the REBT.

Having finished the installation, the electrical installer is responsible of its verification, previous to the commissioning.

These installations must be inspected by an inspection body (Organismo de Control Autorizado (OCA)) on their conformity of standards and regulations.

Inspections can be initial (before the commissioning) or periodic.

Installations that must be inspected before the commissioning are:

- a) Industrial installations with project and an installed power upper to 100 kW
- b) Public places
- c) Installations with fire or explosion risk(class I), except garages of less than 25 seats
- d) Wet locations with an installed power upper to 25 kW
- e) Swimming pools with an installed power upper to 10 kW
- f) Operating and intervention rooms
- g) Outdoor lighting installations with a power upper to 5 kW

The installations that must be inspected each 5 years are those which need an initial inspection and, each 10 years, the common facilities of the residential building with a power installed up to 100 kW must undergo inspection.

Extensions and modifications of major importance, that is, any alterations that increase the power supply with more than 50 %, are considered as “new installations”.

As a result of the inspection, the inspection body (OCA) would issue an inspection certificate with the identification data, the electrical faults, its classification and the qualification of the installation. Would it be positive, the installer will begin the legalization process of the installation.

Inspections do not vary from region to region and their charges are included in the connection costs.

Basically, the legalization process consists of presenting to the Local Delegation of the Ministry of Industry, Energy and Tourism, for its registration, the electricity certificate, the project or the electrical design memory and the construction management certificate and the inspection certificate, should they be necessary.

Having registered the installation at the Local Delegation of the Ministry of Industry, Energy and Tourism the installer must have received the certificate of the installation, necessary for the commissioning of the installation with the electricity supply company.

The electricity supply company could verify the installation if desired (without cost for the owner). In a positive case, the installation will be connected to the electrical network/grid.

These inspections are carried out by OCAs (Authorized Control Organizations) that must be accredited by ENAC (Spanish National Accreditation Body). It is possible to find the contact details of any OCA visiting his web page: <http://www.enac.es>.

12.5 Health and safety

The statutory Health and Safety regulations in Spain are vast.

The main laws are: the Law 31/1995, of 8 November on occupational risk prevention and the Royal Decree 39/1997, of 17 January on the approval of the regulations for prevention services.

The areas covered by the Health and Safety regulations are: 1. prevention/management, 2. business sectors, 3. places and facilities, 4. teams and individual protection, 5. chemicals, 6. environmental agents, 7. Specific groups, and 8. Ergonomic and psychosocial hazards and specific jobs.

Trying to help the access to this information, the National Institute for Occupational Safety and Health has elaborated some documents called “Notas Técnicas de Prevención” which are very useful. These notes are never binding or enforceable. The company is required to comply only with the regulatory requirements that apply at any time.

The Health and Safety regulations apply nationally across all industry sectors and refer to the technical regulations REBT.

For more details, please visit <http://www.insht.es>.

12.6 Contractual and commercial matters

Any construction contracts in Spain, including electrical installations, are open to EC contractors. However, in practice, the non-national companies would find it easier to work in Spain if they could enter into a joint venture with a Spanish contractor.

Electrical contractors must have sufficient insurance to meet any claims for damages being directly or through third party.

Contact information:

FENIE

C/ Príncipe de Vergara, 74 - 3ª planta
28006 Madrid

Tel: +34 91 411 32 17 Fax: +34 91 564 68 07

E-mail: fenie@fenie.es

www.fenie.es

1. Ministerio de Industria, Energía y Turismo
Ministry of Industry, Energy and Tourism
Paseo de la Castellana, 160
28.046 Madrid

Tel: +34 91 349 46 40

www.minetur.gob.es

2. Red Eléctrica de España
Spain National Electricity Transporter
Paseo del Conde de los Gaitanes, 177
28109 Alcobendas (Madrid)

Tel: +34 91 650 45 42

www.ree.es

3. Instituto Nacional de Higiene y Seguridad del Trabajo
National Institute for Occupational Safety and Health
Calle Torre Laguna 73
28027 Madrid

Tel: +34 913 634 100

www.insht.es

12.7 Practical Shortcut on Common Used Electrical Connections

1. Which current rating and phasing (1-phase/3-phase) is used?

- > For domestic/residential installations: typically single phase up to 63 A
- > For commercial /industrial installations: typically 3 phase

2. How much 'voltage drop' is involved?

According to the ITC-BT-14 (principal line) the maximum voltage drop will be:

- For principal lines with an only set of counters: 0,5%
- For principal lines with some set of counters: 1,0%

According to the ITC-BT-15 (individual branches) the maximum voltage drop will be:

- For a set of counters in more than one place: 0,5%
- For an only set of counters: 1,0%
- For individual branches (one single user): 1,5%

3. Which earthing type is being used?

The design of our earthing installations is described in the ITC-BT-18 of our Low Voltage Electrotechnical Regulations.

4. What are the common meter types?

The rule that establishes the requirements of our meters is the Royal Decree 1110/2007 of 24 August 2007. It explains how they should be built and installed.

The model of meter installed in Spain, following this Royal Decree, can vary from one region to another according to the particular specifications of the distribution companies.

13. SWEDEN

13.1 General rules for establishing a business

Different business forms

In Sweden, you can choose to be a sole trader when starting a business. As a sole trader you run and are responsible for the business as a private person. You are personally responsible for agreements being kept and liabilities being paid, but you must keep the finances of the enterprise separate from your own private finances. No starting capital is required for sole traders. Your business will be identified by your personal ID number.

If you want to run your business with somebody else, you can form a trading partnership. The trading partnership has to have at least two owners, referred to as partners. You are not counted as employees, but the trading partnership may employ staff. A trading partnership must always be registered with the Swedish Companies Registration Office. No starting capital is required for a trading partnership. You decide how much you want to invest in the enterprise. You are personally and jointly responsible for ensuring that the partnerships agreements are kept and that its debts are paid. Consequently, you may be forced to pay the partnerships debts from your own private finances alone.

There is also the option of starting a limited partnership. The rules for a limited partnership are the same as for a trading partnership, with a few exceptions. The largest difference is that a limited partnership has at least one general partner, who is liable for all the debts of the partnership. The partners who only invest capital are called limited partners and are only liable for the capital investment they made in the company. Therefore, this investment has to be registered with the Swedish Companies Registration Office.

You can also start a limited company. A minimum of SEK 50,000 in share capital is needed. When you own shares in a limited company, you are at risk of losing the invested capital if the limited company goes bankrupt. However, most people who start a limited company are themselves members of the Board of Directors and may be the managing director of the company and thereby have a significantly larger responsibility if they mismanage their assignments. All limited companies must file an annual report with the Swedish Companies Registration Office. You must register your limited company with the Swedish Companies Registration Office.

Another option is to start an economic association which is formed by a minimum of three members. Every member pays a contribution and usually an annual membership fee. The association itself decides how large the contribution should be. Members are not personally liable for the association's debts and other commitments in excess of their contribution. However, those who are members of the Board can be held personally liable if they mismanage their assignment. An economic association must be registered with the Swedish Companies Registration Office.

Contact information:

Swedish Companies Registration Office (Bolagsverket)

Telephone: +46 771 670 670 or +46 60 18 40 00

Fax: +46 60 12 98 40

Visiting address: Stuvarvägen 21, Sundsvall, Sweden

bolagsverket@bolagsverket.se

www.bolagsverket.se

Electrical installation business - certain requirements

In order to carry out electrical installation work in any form of business in Sweden, at least one person in the company shall be authorised as an electrical installer.

Personal authorisation is obtained by applying to the Swedish National Electrical Safety Board. Applicants must show that they meet certain requirements set out in regulation ELSÄK-FS 2007:2, regarding, among other things, proof of training and experience.

According to section 3, 2nd chapter in ELSÄK-FS 2007:2, a person who complies with the requirements of section 1 of the 2nd chapter in ELSÄK-FS 2007:2, may carry out temporary electrical installation work without applying for an authorisation. Electrical installation work that is limited in time is considered to be temporary. Any electrical installation work that is permanently, regularly, or limited in time but regularly repeated are not considered as being temporary.

Some utility network owners request the contractor to register. However, this is not a legal requirement.

Contact information:

Elsäkerhetsverket (The National Electrical Safety Board)

Box 4

SE-681 21 Kristinehamn

SWEDEN

registrator@elsakerhetsverket.se

<http://www.elsakerhetsverket.se/en/>

13.2 Requirements relating to Electrical Contracting Personnel

Any person who shall carry out electrical installation work shall either be authorised as an electrical installer (please, see above 2.21.1) or appointed as a craftsperson by a person who is an authorised electrical installer. Any appointed craftsperson shall be employed in the same company as the authorised electrical installer. The craftsperson's work shall only be carried out under the installer's supervision.

In addition to the governmental requirements mentioned above, there are also collective agreements between unions and employers' organisations for certain fields of electrical work.

Contact information regarding the collective agreement:

Swedish Electrical Contractors' Association, EIO
Rosenlundsgatan 40
Box 17537
118 91 Stockholm
+46 8-762 75 00
info@eio.se
www.eio.se

13.3 Technical Standards

Safety requirements for electrical installations are stipulated by the Electrical Act (SFS 1997:857), the Electrical Safety Ordinance (2009:22) and the Swedish Electrical Safety Board's regulations (ELSÄK-FS 2008:1).

The government rules above are presumed to be complied with if you carry out the installation according to the safety requirements of Swedish Standard.

The essential Swedish Standard concerning safety requirements for electrical installations is SS 436 40 00 - Low-voltage electrical installations - Rules for design and establishment of electrical installations. This standard is based on the standards of the IEC and HD 60364 series issued by IEC and CENELEC respectively, but contains a few deviations and additions specifically for Swedish conditions. This standard is translated into English, but only the Swedish language version is stated as standard and therefore considered to be referred to in case of interpretation issues.

There are also a few standards concerning additional rules for electrical installations:

- SS 436 21 01 - Electrical operating area for low-voltage switchgear and control gear
- SS 437 01 40 - Connection of low-voltage installations to the utility supply network
- SS 437 01 45 - Electrical installations of buildings - Basic design rules
- SS 437 01 46 - Electrical installations in buildings - Connection points - Mode and range
- SS 437 01 51 - Electrical installations in buildings - Arranging the intake of electric power and telecommunication cables

- SS 437 01 52 - Electrical installations of buildings - Spaces for electrical and telecommunication equipment in blocks of flats

This set of standards is only available in a Swedish language version. However, the basic requirements are bundled in another publication called Elbasen that is translated into English. Furthermore, this set of standards is presently (autumn 2012) under revision. They shall be merged into one standard.

Contact information:

SEK Svensk Elstandard (the Swedish National Committee of IEC and CENELEC)

Box 1284

SE-164 29 Kista

Sweden

sek@elstandard.se

<http://elstandard.se/om/about.asp>

13.4 Inspection of installations

According to the ordinance for authorised electrical installers (SFS 1990:806) and the regulation for establishment of electrical installations (ELSÄK-FS 2008:1), an electrical installation shall be inspected and tested before it is activated.

Technical rules for inspections are stated in the Swedish Standard SS 436 40 00.

13.5 Health and Safety

The Swedish Work Environment Authority is the administrative authority for issues relating to the working environment.

The statutory foundations are laid in the Work Environment Act (AML), passed by the Swedish parliament). The Work Environment Act defines the outer framework of the work environment regulation.

The Swedish Work Environment Authority issues regulations under AML (i.e. AFS), which are translated into English. One example is AFS 2000:02, which states rules for the use of chainsaws and brush saws. These regulations can be downloaded free of charge as PDF files. See <http://www.av.se/inenglish/lawandjustice/provisions/>.

Specific requirements for electrical occupational work activities on or near an electrical installation shall be carried out in accordance with the requirements in ELSÄK-FS 2006:1.

See http://www.elsakerhetsverket.se/Global/F%C3%B6reskrifter/Engelska/2006_1_English.pdf.

This regulation stipulates that if you comply with the safety requirements of the Swedish Standard, you are presumed to comply with the regulation. The relevant standard in this case is SS-EN 50110-1, which is identical to any other member state's version of the EN 50110-1.

13.6 Contractual and Commercial Matters

The standard forms of contracts that are used in Sweden are issued by The Construction Contracts Committee (Byggandets Kontraktskommitté, BKK). BKK is a non-profit making association consisting of authorities, associations and organisations on the building owner, consultants and contractor sides of the construction sector.

BKK constitutes a negotiation body for establishing general conditions for different kinds of contracts, to draw up such conditions, to work for the observance of agreements made within the association and to conduct other activities connected therewith.

At present, many larger contracts regarding electrical installations in Sweden are based either on General Conditions of Contract for Building, Civil Engineering and Installation Work (AB 04) of 2004 or General Conditions of Contract for Building, Civil Engineering and Installation Work performed on a package deal basis (ABT 06) of 2006. Supporting these two documents, there are commentaries and forms of agreement that have been worked out jointly by the parties. English versions of the Conditions can be obtained by Svensk Byggtjänst.

It follows from these contracts that collateral security shall be provided by the contractor to the client. Unless otherwise agreed, the contractor's security shall equal a sum of 10 percent of the contract price during the time for completion and 5 percent for time thereafter and two years after approval of the total works or until any defects has been rectified.

Further, insurance requirements must be met by electrical installation contractors and the agreed insurance policy shall be provided by the contractor. The contractor must provide an all-risk insurance against damage caused to the total works. Also, the contractor shall provide a third party liability insurance for contract activities during the time for completion and for at least two years after the approval of the total works. The insured amount shall be not less than 200 times the price base amount (the price base amount is SEK 44 000 for 2012).

For buying electrical components and products, there are several standard forms of contracts that are used by the parties in the market. The standard form of contract that is mainly used between electrical installation contractors and wholesalers of electrical products is ALEM 09.

Contact information:

The Construction Contracts Committee, BKK
http://www.foreningenbkk.org/In_English.asp

EIO - The Swedish Electrical Contractors' association

Box 17537
SE-118 91 Stockholm
SWEDEN
info@eio.se
<http://www.eio.se/>

Contact information for English versions of the above mentioned conditions:

AB Svensk Byggtjänst
113 87 Stockholm
kundservice@byggtjanst.se

The Swedish National Committee of IEC and CENELEC:

SEK Svensk Elstandard (the Swedish National Committee of IEC and CENELEC)
Box 1284
SE-164 29 Kista
Sweden

sek@elstandard.se
<http://elstandard.se/om/about.asp>

The Swedish National Committee of CEN and ISO:

Swedish Standard Institute
118 80 Stockholm
Tel. 08-555 520 00

info@sis.se
<http://www.sis.se/en/>

The regulating office for electrical safety:

Elsäkerhetsverket (The National Electrical Safety Board)
Box 4
SE-681 21 Kristinehamn
SWEDEN
registrator@elsakerhetsverket.se
<http://www.elsakerhetsverket.se/en/>

13.7 Practical Shortcut on Common Used Electrical Connections

1. Which current rating and phasing (1-phase/3-phase) is used?

The standard voltage provided from public networks is 230/400 V three phase, TN system. This is required by regulation ELSÄK-FS 2008:1. For private/industrial networks, IT and TT systems may be used. IT systems are used in some industrial applications, e.g. for pulp machinery. TT systems are practically never used.

2. How much 'voltage drop' is involved?

The acceptable voltage drop (+/- 10%) according to EN 50160 applies. However, many public networks apply the old Swedish Standard, which allows +6% and -10%.

3. Which earthing type is being used?

See item 1.

4. What are the common meter types?

Three-phase meters are the most common meter types. 91 percent of the meters are smart meters with bi-directional communication with real time data collection capabilities. 9 percent of the meters are meters with one-way fixed network automatic meter reading capability.

14. SWITZERLAND

SUMMARY

Electrical contractors must register in the appropriate section of the Register of the Federal Inspectorate for Heavy Current Installations (Eidgenössisches Starkstrominspektorat).

Registration of the company must be applied by an Individual with a Master's Degree (Meisterprüfung). An Electrical Technician (Elektro-Techniker) with three years of installation practice or an Electrical Engineering Degree (El.-Ing.-Studium) plus practical experience, to be confirmed by a practical exam, are acceptable alternatives to the Master's Degree.

The Technical Standards established in the 'Low Voltage Installations Norm' (Niederspannungsinstallations-Norm/NIN) are statutory.

Periodic inspection is statutory according to the Ordinance about Electrical Low Voltage Installations (Niederspannungs-Installationsverordnung, NIV).

14.1 General Rules for Establishing a Business

The terms and conditions to be observed when opening a business in Switzerland are contained in the Swiss Code of Obligations. There is a wide range of legal forms under which a business can be established. Distinction is made between a personal company with unlimited liability of the owner(s), and a partnership company with limited liability of the owner(s).

Registration with both the Federal and the Cantonal Commercial Registers (Eidgenössisches und Kantonales Handelsregisteramt) is compulsory for any business with a yearly turnover exceeding CHF 100'000.

Requirements for Registration as an Electrical Contractor

Most electrical contractors in Switzerland are companies with unlimited, or partnerships with limited liability of the owners.

The electrical contractor must apply for registration in the relevant register held by the Federal Inspectorate for Heavy Current Installations (Schweizerisches Starkstrominspektorat).

The permit obtained from the Federal Inspectorate for Heavy Current Installations is a personal authorization which entitles its owner to carry out electrical installations throughout Switzerland.

Registration entitles the 'Authorized Electrical Contractor with a Diploma', or with an equivalent qualification, to carry out any type of electrical installation work with the exception of a few specific areas.

Expulsion: Unless a contractor commits a crime, repeatedly produces bad workmanship, gets into financial difficulties, or if the company ceases to employ qualified personnel it is unlikely that a registered contractor will be expelled from the register.

> Swiss public companies often will only accept bids from Swiss based companies because they guarantee to conform to Swiss standards!!

14.2 Requirements Relating to Electrical Contracting Personnel

Operational organization

1. One full-time professional expert with a Master's Degree or an equivalent qualification, may supervise no more than twenty collaborators such as electrical surveyors (Elektro- Kontrolleure), chief electricians (Chefmonteurs), electricians (Elektromonteurs), fitting electricians (Montage-Elektriker), apprentices or assistants.
2. This requirement applies to independently operating subsidiaries as well.
3. The realization of Electrical installations may only be assigned to employees with one of the following qualifications:
 - a) Federal Certificate (Fähigkeitszeugnis) as an Electrician (Elektromonteur) or an equivalent qualification; whereby the equivalency of the qualification has to be confirmed by the Federal Inspectorate for Heavy Current Installations. The latter will confirm the equivalency of qualification after having consulted with the Federal Office for Professional Education and Technology.
 - b) Federal Certificate as a Fitting electrician (Montage-Elektriker)
4. Electrical installations may exclusively be put into operation under the supervision of an individual with professional expertise (fachkundige Person) or a person as described in paragraph 3, letter b) above.
5. Apprentices or assistants may only carry out an electrical installation, under the condition that they are guided and supervised by an individual with professional expertise (fachkundige Person) as described in paragraph 3 above.
6. Individuals with professional expertise and other individuals as described in paragraph 3 above may supervise no more than five apprentices or assistants.
7. The supervising expert ensures that the installation work is checked regularly.

14.3 Technical standards

The regulations of the Association for Electrical Energy and Information Technology ('Electrosuisse' - Schweizerischer Elektrotechnischer Verein/SEV) apply to both, products as well as installations.

Standards to be adhered to during the installation are generally agreed on between the client and the contractor before the beginning of the work. In the event of an injury, the electrical contractor has to prove that his installation methods conform to SEV standards.

There are additional legal requirements laid down by the SEV, and further requirements may yet be stipulated by the Association of Insurers for Fire Protection. Insurance companies apply SEV standards.

In general, SEV standards apply throughout the territory of Switzerland, whereby minor regional differences with regard to measuring and tariff may exist.

Special standards may be applicable for other industrial sectors, notably for the chemical industry, motor industry, oil refineries, hospitals, schools, and the Swisscom.

14.4 Inspection of Installations

Before connection to the mains is carried out, the contractor sends a 'Completion Report' to the Network Operating Authority informing them that the work has been completed according to the Ordinance about Electrical Low Voltage Installation Norm under the supervision of a Master Electrician. The connection to the mains itself is carried out by the Network Operating Authority or by an electrical contractor acting as its agent.

Before commissioning parts or the whole installation, a primary check has to be done according to the Low Voltage Installations Norm (NIN)

Before handing over the installation to the owner, an approved Electrical Contractor with Diploma or an Electrical Security Consultant with Federal Certificate has to carry out a final check and the results of the control must be recorded in a Security Certificate.

The local Network Operating Authority has the right to inspect before and after completion. The frequency of inspections can vary between ten and twenty percent.

It is compulsory to be registered by the Federal Inspectorate for Heavy Current Installations in order to be entitled to self-certify or to seek third party inspection. A contractor doing work for the first time would be very likely to be inspected by the local Network Operating Authority to ensure the future standard of the work. If the installation work does not adhere to the NIN, the Network Operating Authority can oblige the contractor to change the installation.

If the client is not satisfied with the work, he can ask the Network Operating Authority or a consultant to inspect the installation but he/she will have to pay for it. If malfunctions are discovered, the contractor is punishable under civil or criminal law, depending on the seriousness of the offence.

There are 4 control periods for periodic inspections to be carried through after 1, 5, 10, and 20 years. The control period for domestic installations is 20 years.

14.5 Health and safety

The statutory Health and Safety regulations in Switzerland are contained in the guidelines of the Federal Coordination Commission for Occupational Safety/FCOS (Eidgenössische Koordinationsstelle für Arbeitssicherheit/EKAS). There are additional regulations specific to mining, oil refining and the chemical industry. Regarding electrical installations, however, specific health and safety regulations do not exist.

The title of the legislation that refers to health and safety is the Swiss Accident Insurance Law'/Schweizerisches Unfallversicherungs-Gesetz, and the Authority in charge of the implementation of the law is the Swiss Accident Insurance Company (Schweizerische Unfall-Versicherungs-Anstalt/SUVA).

With the industry solution "Occupational health and safety in the industries of building" costs can be significantly reduced for the individual company. To ensure the sustainability of this industry solution, a sponsor has been established in the form of an association called Batisec. Carriers are different organizations from the Baunebenbranche. The VSEI is one of the founding organizations. The Batisec is composed of employer and employee representatives of the participating associations or unions. She can be contacted at the following address:

Batisec

Avenue de la Gare 1

2000 Neuchâtel

Phone 032 722 16 30 / Fax 032 722 16 39

info@batisec.ch

www.batisec.ch

14.6 Contractual and commercial matters

The different kinds of contracts are described in the Swiss Code of Obligations. They include, for example:

- Contract of employment
- Publishers' contract
- Representation contract
- Contract of manufacture etc.

Contracts may be concluded by oral or written agreement. In some cases contracts must be drawn up in writing by law. Depending on the complexity and financial implication, it is customary that contracts regarding electrical installations are made out in every detail in writing, observing the norms and requirements of the Contract of Manufacture (Werkvertrag) drafted by Swiss Association of Engineers and Architects/SIA.

State owned and other large enterprises like for example Swisscom, Migros, the individual states (Cantons), etc. are likely to draft their own Contracts of Manufacture.

If no specific Contract of Manufacture is concluded, the legal requirements of the Swiss Code of Obligations will automatically apply.

13.08.2003 / Vo/Ra

ORGANISATIONS INTERVIEWED

1. Ingenieur Heinz Nienhans

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Hauptverwaltung
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Lahmeyer International
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4 Frau Koch

Herr Roth
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5 Dipl. Ing. Horst Thierolf

Rechtsanwalt (technical)
Herr Reinhard Diescher
Geschäftsführer (manager)
ZVEH (trade association)
Speyererstr. 9
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Tel: 069 730496

14.7 Practical Shortcut on Common Used Electrical Connections

1. Which current rating and phasing (1-phase/3-phase) is used?

1-phase 230V / 3-phase 400V

2. How much 'voltage drop' is involved?

4%

3. Which earthing type is being used?

TN-S / TN-C / TN-C-S - very rare TT

4. What are the common meter types?

On time it's still the 3 phase electronic meter but some of the electricity suppliers are now changing to the smart meter.

B. Annex 1. National Electro-Technical Standardization Committees

AUSTRIA - OVE



Österreichischer Verband für Elektrotechnik
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A - 1010 VIENNA

Tel: + 43 1 587 63 73
Fax: + 43 1 586 74 08
Email: ove@ove.at
<http://www.ove.at>

BELGIUM - BEC-CEB



Comité Electrotechnique Belge
Belgisch Elektrotechnisch Comité
Boulevard Auguste Reyers 80
B - 1030 BRUSSELS

Tel: + 32 2 706 85 70
Fax: + 32 2 706 85 80
Email: centraloffice@bec-ceb.be
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CYPRUS - CYS



Cyprus Organization for Standardization
Leoforos Lemesou and Kosta Anaxagora 30
office 320
CY - 2014 NICOSIA

Tel: + 357 22 411 411
Fax: + 357 22 411 511
Email: cystandards@cys.org.cy
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CZECH REPUBLIC - CNI



Czech Standards Institute
Biskupsky dvur 5
CZ - 110 02 PRAHA 1

Tel: + 420 221 802 100
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Email: extrel@cni.cz
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DENMARK - DS



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DK - 2920 CHARLOTTENLUND

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Fax: + 45 39 96 61 03
Email: dansk.standard@ds.dk
<http://www.ds.dk>

ESTONIA - EVS



Estonian Centre for Standardization
Aru Street, 10
EE - 10317 TALLIN

Tel: + 372 605 50 50
Fax: + 372 605 50 70
Email: info@evs.ee
<http://www.evs.ee>

GERMANY - DKE



Deutsche Kommission Elektrotechnik Elektronik
Informationstechnik im DIN und VDE
Stresemannallee 15
D - 60 596 FRANKFURT AM MAIN

Tel: + 49 69 63 08 0
Fax: + 49 69 631 29 25
Email: dke.zbi@vde.com
<http://www.dke.de>

FINLAND - SESKO



Standardization in Finland
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FIN - 00211 HELSINKI

Tel: + 358 9 696 391
Fax: + 358 9 677 059
Email: finc@sesko.fi
<http://www.sesko.fi>

FRANCE - UTE



Union Technique de l'Electricité et de la
Communication

Avenue du Général Leclerc 33

BP 23

F - 92262 FONTENAY-AUX-ROSES CEDEX

Tel: + 33 1 40 93 62 00

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GREECE - ELOT



Hellenic Organization for Standardization

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GR - 111 45 ATHENS

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Fax: + 30 210 228 30 34

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Fax: + 361 45 66 823

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ICELAND - IST



Icelandic Standards

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LATVIA - LVS



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LV - 1013 RIGA

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Email: ivs@ivs.lv
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LITHUANIA - LST



Lithuanian Standards Board
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LT - 01100 VILNIUS

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LUXEMBOURG - SEE



Service de l'Energie de l'Etat - Organisme
Luxembourgeois de Normalisation
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NETHERLANDS - NEC



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NORWAY - NEK



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N - 1326 Lysaker

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POLAND - PKN



Polish Committee for Standardization
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P.O. Box 411
PL - 00 - 950 WARSZAWA

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Fax: + 48 22 55 67 786
Email: intdoc@pkn.pl

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PORTUGAL - IPQ



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Rua António Gião, 2
P - 2829-513 CAPARICA

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SPAIN - AENOR



Asociación Española de Normalización y Certificación
C/ Génova, 6
E - 28004 MADRID

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Fax: + 34 91 310 45 96 (or 310 36 95, Standardization
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Email: norm.clciec@aenor.es
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SLOVAKIA - SEV



Slovak
Electrotechnical
Committee

Slovak Electrotechnical Committee
Slovak Standards Institution
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SLOVENIA - SIST



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SWITZERLAND - CES



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UNITED KINGDOM - BEC



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British Standards Institution
389, Chiswick High Road
GB - LONDON W4 4 AL

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C. Annex 2. AIE survey: Working on Live Electrical Systems in Europe

SUMMARY

SITUATION IN FRANCE:

French electrical installers will soon face a change in their working methods when working on electrical installation ‘under voltage’ (in the case where it is impossible to shut off the power as some circuits in hospitals for example). Indeed, workers who will be working on those electrical installations will need to be certified by an independent organization. This certification is meant to be a personal worker’s certification, not a company’s certification.

This new procedure is specified by a decree of the ministry of labor and these measures will be soon confirmed by a French Regulation. The French Federation for electrical installers (FFIE) is about to propose modifications to this project.

We’d like to know:

- *whether similar measures do exist in your own country?*
If so, what are the consequences for the companies (costs, organization,...)?
- *Do you have accident statistics or do you have studies that could prove that certification brings additional safety training?*

Pierre-Mary Leperson, technical director at FFIE, asked feedback from other European countries and colleagues.

You will find the answers of **9 countries** below - [click to go](#)

[AUSTRIA](#) |

[FINLAND](#) |

[GERMANY](#) |

[NETHERLANDS](#) |

[NORWAY](#) |

[SPAIN](#) |

[SWEDEN](#) |

[SWITZERLAND](#) |

[UNITED KINGDOM](#) |

1. AUSTRIA:

. In Austria we have to follow the EN 50110 and a special law covering working under voltage, called « Elektroschutzverordnung 2012 » (meaning Regulation on protection from electrical hazards, 2012)

(excerpt)

Arbeiten unter Spannung "AUS" (working under voltage)

§ 13. (1) Arbeitgeber/innen haben dafür zu sorgen, dass Arbeiten unter Spannung nach den anerkannten Regeln der Technik durchgeführt werden.

-> Employers have to take care, that working under voltage is carried out according to acknowledged technical rules

(2) Die Arbeiten dürfen nur von Elektrofachkräften oder elektrotechnisch unterwiesenen Personen durchgeführt werden, die

-> Work may only be carried out by skilled electrical working personnel or by electrotechnically advised persons, who

1. eine für die betreffenden Arbeiten einschlägige Spezialausbildung sowie die erforderlichen Nachschulungen erhalten haben, und

-> have received specific training according to the field of work or as well as required additional training, and

2. über die für die betreffenden Arbeiten notwendige Ausrüstung und persönliche Schutzausrüstung verfügen.

-> have available required equipment according to the field of work and personal protection equipment.

(3) Die Arbeiten dürfen nur durchgeführt werden, wenn schriftliche Arbeitsanweisungen festgelegt sind.

-> Work may only be carried out, if written working directives have been established.

(4) Von Abs. 2 Z 1 und von Abs. 3 kann abgewichen werden, wenn die Ermittlung und Beurteilung der Gefahren nach den anerkannten Regeln der Technik ergibt, dass ein sicheres Arbeiten trotzdem möglich ist.

-> Exemptions from (2 Z 1) and (3) are only possible, if investigation and judgment of possible dangers according to acknowledged rules of technology indicate, that safe working is possible.

(5) Bei starkem Regen, bei schlechter Sicht, bei Gewitter, bei Brand- und Explosionsgefahr oder wenn Arbeitsmittel nicht ungehindert benutzt werden können, dürfen Arbeiten unter Spannung nicht durchgeführt werden. Bei sonstigen ungünstigen Umgebungsbedingungen hat der/die Arbeitgeber/in Arbeiten unter Spannung entsprechend der Minderung der Isolationseigenschaften und der eingeschränkten Sicht und Bewegungsfreiheit zu beschränken.

-> Working under voltage must not be carried out in case of heavy rain, bad sight conditions, thunderstorms, danger of fire or explosion, or if working equipment cannot be used without obstruction. In case of other awkward environment conditions the employer has to limit working under voltage according to reduced insulating properties, limited sight conditions or restrictions in freedom of motion.

(6) Arbeitgeber/innen haben dafür zu sorgen, dass Arbeitsmittel und persönliche Schutzausrüstung für das Arbeiten unter Spannung in ordnungsgemäßem Zustand erhalten werden. Die Arbeitnehmer/innen sind in der dazu erforderlichen Vorgangsweise (betreffend Aufbewahrung und Lagerung, Transport, Pflege, Instandhaltung) zu unterweisen.

-> Employers have to ensure, that working equipment as well as personal protection equipment is maintained in proper form. Employees have therefore to be advised properly regarding depositing and storage, transport, service and maintenance of equipment.

AUSTRIAN POINT OF VIEW:

- Regularly, a skilled worker in electrical installations in Austria, who has gone through apprenticeship and passed the final exam, fulfills above mentioned requirements.
-> NO ADDITIONAL CERTIFICATE REQUIRED!
- An Electrical Installer in his own trade, who has passed the craftsmen examination, also fulfills the requirements.

-> NO ADDITIONAL CERTIFICATE REQUIRED!

- All other persons, who intend to carry out working under voltage, have to undergo specific training on electrotechnical safety. Training schemes and certificates exist.
-> NO ADDITIONAL CERTIFICATE REQUIRED !
- No Re-certification enforced by law!

2. FINLAND:

According to Finnish regulation “Safety at electrical work” following is valid:

Live Working in low- and high-voltage installations is allowed to skilled persons, having special training for live working, only.

The theoretical education shall consist of the basic principles of this standard and the detailed work instructions for the intended work. Content and length of the theoretical education should be specified based on the basic education level of the trainees and time period gone from the latest training of electrical safety rules.

Training for live working shall also contain practical work exercises. Every trainee has to perform training exercises in practical working conditions for such live working, as he intends to start to work. Training can also be done in consequent work actions. By combining several work actions the same training can prepare the trainees for several work activities done in accordance with detailed work instructions.

In training attention shall be paid on isolating or covering of such live parts, which are located in the vicinity of the work location.

This should be done in the way that e.g. that bare parts of live working tools cannot cause short circuit or earth fault between phases or from phase to earth, when touching them.

A certificate of the successful training shall be handed over to the trainees. The certificate shall indicate to which specific live works the training has given the competence. The following matters shall be mentioned in the certificate, at least:

- Voltage level for which the training has been done,
- Working methods trained during the training course,
- Contents of theoretical education,
- Contents of the practical training,
- Length of the training,
- Details and competence of the trainer.

The certificate can be e.g. a card license.

Training takes one day and you have to do this once in five years period. Cost of one training day is app. 400 €.

Unfortunately we don't have any statistics about efficiency of training.

3. GERMANY

There is no law that explicitly regulates the handling of work on life electrical systems (WOLES).

But we have a system of regulation to protect workers that is applicable:

- « Arbeitsschutzgesetz »
- « Arbeitssicherheitsgesetz »
- « Betriebssicherheitsverordnung »

...

According to these laws, the employer has to follow the commonly acknowledged standards (CAS) or even the state of the art to ensure safety of workers

The accident insurance for workers « Berufsgenossenschaft » (organised as a public form of cooperative with a mandatory membership for the employer) sets special CAS for WOLES e.g. the BGR A3 (attached).

Also other technical standards which have the status of a CAS have to be met, e.g. standards set by the standardisation bodies (norms).

The responsible leaders in the company (CEO, chief of department) have to ensure that the company processes cover these standards. They have to define the processes and nominate responsible persons which have to be competent.

Some basic points for the process are:

- In general all potential dangerous processes have to be monitored constantly. Special work orders have to be provided as well as for WOLES (so called « Betriebsanweisungen » example attached).
- The employer has to appoint a responsible electrically qualified person. This person has to be qualified, functional independent and empowered to give technical instructions.
- WOLES must be monitored by this responsible electrician.
- The electrician who fulfills the work has to be specially qualified for the work (not only for WOLES but generally speaking!). Lots of special work descriptions define the work process and the necessary skills and knowledge (so called « Arbeitsanweisungen »).
- The employer and the responsible electrician have to ensure that the personal qualification is present.

A written order for the WOLES given by the responsible electrician is necessary.

4. NORWAY

Electrical installations in Norway are regulated by law with accompanying regulations. These laws and regulations specify qualification requirements, technical requirements and how the executive persons shall perform their work to avoid electric shock.

It is the “Safety regulations related to the maintenance and operation of electrical installations” (Forskrift om sikkerhet ved arbeid i og drift av elektriske anlegg, fse) that regulate live working. These regulations are warranted by law 24. May 1929 No. 4 relating to inspection of electrical installations and electrical equipment intended for people with electro technical expertise in accordance with the Regulations on electrical companies and qualification requirements for work related to electrical installations and electrical equipment (Forskrift om elektroforetak og kvalifikasjonskrav for arbeid knyttet til elektriske anlegg og elektrisk utstyr, fek).

Fse specify three working methods:

- 1) Dead working, §§ 14 and 15
- 2) Live working, § 16
- 3) Work in the vicinity of live parts, §§ 17 and 18

Fse § 10 states that before any work is commenced, necessary information about the installation needs to be collected. Furthermore, a risk assessment provides the basis for selecting one of the three working methods, necessary equipment (hereby personal protective equipment) and personnel which are to carry out the work.

Regardless of which working method that is chosen, two barriers shall be established which protect executive persons against electric shock. Further, the guidance to § 10 states that assuming all safety measures are operative, in principle, the three work methods provide equivalent levels of safety.

Training

Requirements for training and repetition of this is given in § 7. Workers must have access to, and be familiar with all relevant provisions in both the Regulations and accompanying guidelines, and receive necessary training, practice and instruction in these. This requirement is considered to be fulfilled when the training, practice and instruction are repeated at least annually and more frequently if necessary. No more than 12 months may lapse between training sessions. In addition, the worker must annually receive training in first aid, including specialized training in first aid in case of accidents caused by electric shock.

Live working

Requirements that must be followed when carrying out work after the working method live working are stated in § 16. Live working may only be conducted by those with sufficient training in live working, and the work must follow approved methods and applicable work procedures.

The safety regulations do not state how often this training may be conducted or the minimum content of such training, but training must be documented.

The Norwegian Directorate for Civil Protection (DSB) keeps statistics on accidents where people have been exposed to electric shock. Unfortunately, these statistics do not paint a correct picture if accidents happen due to low expertise or violation of the safety regulations. The misleading statistics is mainly due to lack of accidents being reported.

The Directorate for Civil Protection regards the Norwegian electro-technical standard NEK EN 50110-1 as satisfying the safety requirements in the safety regulations.

5. SPAIN:

In Spain under voltage works are covered by the *Royal Decree 614/2001, health and safety minimum requirements for workers in electrical risk situations.*

As you could see in page 20 of this technical guide of the mentioned Royal Decree : http://www.insht.es/InshtWeb/Contenidos/Normativa/GuiasTecnicas/Ficheros/g_electr.pdf, under voltage works must be done by :

- qualified workers (in low voltage installations) or
- by qualified workers with a written authorization in high voltage installations.

A qualified worker is an authorized worker who has a specialized knowledge in electrical installations, due to:

- their university or professional accredited training or
- certified experience of 2 or more years.

Regarding to the certified experience, the company or companies where the worker developed their skills on electrical installations must be the ones who expedite this certificate.

The certificate should include the concrete installation or installations where the worker developed their skills.

Authorizations shall be renewed after checking the worker's ability to follow the established working procedure, when:

- it changes significantly or
- the employee ceased to perform the type of work in question for a period of time greater than one year.

The authorization shall be withdrawn if it is found that the employee:

- fails to comply with the safety standards or
- when the health monitor reveals that the situation of the worker do not fit the psychophysical demands required for the type of work developed.

6. SWEDEN:

In Sweden there is no detailed regulation concerning live working ("working under voltage"). The legislation states more or less that electrical danger shall be eliminated for any electrical work. Electrical danger is deemed to be eliminated if you comply with Swedish Standard.

For this reason the standard SS-EN 50110-1 (identical to EN 50110-1) is commonly complied with. Clause 6.3.2 of SS-EN 50110-1 states the following :

"A specific training programme shall be set out to develop and maintain the capacity of skilled or instructed persons to perform live working. This programme shall comply with special requirements for live working and shall be based on theoretical and practical exercises.

These exercises shall be representative of the work to be done after training or, if different from the work itself shall be based on the same safety principles.

On successful completion of the training a certificate of training shall be given to the participant to confirm that the personnel are able to undertake live working for which they have been trained and according to their level of training.

The level of ability should be confirmed by a live working authorization."

This means that any person who performs live working passes a specific training for this.

Live working is not widely used in low-voltage installations in Sweden, but to some extent on high-voltage and medium-voltage power lines.

Live working is often more expensive to perform than dead working (without voltage), considering the cost of the electrical work. However, when it comes to work on power-lines, the cost of a power-out is often considered so expensive that live working is applied in many cases.

We have no record of accidents with electricians using the method live working.

7. SWITZERLAND:

Our statement to the topic working under voltage.

According to Swiss regulation are just special skilled electrician allowed to work under voltage.

Always must be two people for doing this work and the contract must be in written form.

One of this two people has to be the leader and must monitor the work.

Also both have to wear the personal protective equipment.

A training course takes 2 days and cost about 1'000.-- SFr.

Every 2 years must be done a repetition course.

8. THE NETHERLANDS

In Holland, by law, it is forbidden to work under voltage, unless:

1. The urgent need of performing the work under voltage has been shown and
2. There has been given an explicit order for the work under voltage. This order must be in writing and can only be given by the person who is responsible for the work, and
3. The installation is suitable for the work under voltage and effective measures have been taken to avoid the risks associated with these activities.

These rules are only applicable for work under low voltage. Low voltage is less or equal to 1000 V DC or 1500 V AC. If there is a risk of fire or explosion, then it is always forbidden to work under voltage.

9. UNITED KINGDOM:

The legislation which covers this in the UK is The Electricity at Work Regulations 1989 and section 14 states the requirements for working on or near live electricity.

It states:

Work on or near live conductors

14. No person shall be engaged in any work activity on or so near any live conductor (other than one suitably covered with insulating material so as to prevent danger) that danger may arise unless- (a)it is unreasonable in all the circumstances for it to be dead; and (b)it is reasonable in all the circumstances for him to be at work on or near it while it is live; and (c)suitable precautions (including where necessary the provision of suitable protective equipment) are taken to prevent injury.

The Management of the Health and Safety at Work Regulations 1989 states that a risk assessment must be undertaken for all work activities in order to ensure safety. Hence, any person who is to work on live equipment would need to be able to demonstrate suitable training and adequate experience so as to ensure their personal safety and the safety of others. However, it does not prescribe suitable training or procedures.

In the UK an organisation called the Health and Safety Executive (HSE) issues guidance, which is always complied with and although it is not law, but is cited by them when accidents occur and used in prosecutions.

They state the following:

When is it safe to work on live electrical equipment?

It is never absolutely safe to work on live electrical equipment. There are few circumstances where it is necessary to work live, and this must only be done after it has been determined that it is unreasonable for the work to be done dead. Even if working live can be justified, many precautions

are needed to make sure that the risk is reduced 'so far as is reasonably practicable'. Their guide 'Electricity at work: Safe working practices' gives further details (Attached).

Under Voltage Working

In the UK this is known as 'Live Working'. This is not permitted under our statutory regulations the HSE Electricity at Work Regulations 1989 (EAW Regulations 1989). In the circumstances outlined it is still not permitted if there is any other way of doing the work. Cost cannot be used as a mitigating factor, if for valid reasons the electrical installation or equipment cannot be switched off and it has to be carried out on premium rates, then it has to be. Where there is no alternative to full isolation of electrical supply, special arrangements have to be made and a 'Safe System of Work' has to be employed (see Regulation 14 of EAW Regulations 1989).

Where 'Live Working' is unavoidable, there is not any requirement for individual certification, or to be a member of an organisation or Body, but operatives carrying out the work **must** be proven competent by their employer or the person responsible delegating the work in accordance with the requirements of Regulation 16 - EAW Regulations 1989.

It is important not to confuse 'Live Working' with 'Live Testing'. Live Testing is permitted, provided there is not a risk of inadvertent contact with live parts; an IP2X environment within a control panel, for instance. However, the requirement to prove competence remains the same.