Global PS&S Standard - Electrical Safety

People Safety and Security

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Contents

1 Principles

Nokia recognizes that working on or adjacent to electrical systems and equipment is an essential part of Nokia's business, if not managed correctly this poses a significant risk to our employees, contractors, and service providers.

This standard describes the minimum health and safety requirements that must be adopted whilst working on electrical systems and equipment on behalf of Nokia. Nokia expects that its staff and partners return home safely at the end of each working day by applying the following principles when working with electricity:

- **Under normal circumstances live working is not permitted.**
- **Live work will only be done when risk controls have been implemented and a safe system of work established.**
- **All electrical systems and equipment must be properly designed, installed, commissioned, maintained, and decommissioned.**
- **All persons working on electrical systems and equipment must be competent to carry out the intended work.**
- **All electrical equipment, including tools and associated personal protective equipment must be suitable for the work being done.**
- **A First Aider with CPR training will be present at all times when electrical work with significant risk (Cat 3 and Cat 4) is happening.**

Using This Document

This Standard details Nokia's expectations in relation to working on or near electrical systems and equipment. The expectations detailed here apply to all Nokia business units and all contractors and service providers conducting work on its behalf and are in addition to local legal requirements:

Section 3 contains the minimum requirements that Nokia expects. If these cannot be achieved a documented exception needs to be agreed upon with PS&S setting out the reason why an exception is required and the duration of the exception.

Section 4 explains who is responsible for ensuring that the requirements are implemented.

2 Key Definitions and Scope

2.1 **High voltage* (HV)** means all voltage exceeding low voltage (>1000v AC and >1500V DC)

2.2 **Low voltage* (LV)** means voltage normally exceeding extra-low voltage but not exceeding 1000V AC or 1500V DC between conductors, or 600V AC or 900V DC between conductors and earth.

2.3 **Extra-low low voltage* (ELV)** means voltage not normally exceeding 50V AC or 120V DC, whether between conductors or to earth**.**

(Voltage classifications of the International Electrotechnical Commission (IEC) 60038).

2.4 **Competent person means someone who has:**

2.4.1 Technical knowledge (acquired by academic study or through a combination of academic study and practical training) of electricity and electrical work.
2.4.2 Knowledge and understanding of the system to be worked on and practical experience of working on that system.
2.4.3 Understanding of the hazards which may arise during the work and the precautions which need to be taken.
2.4.4 Knowledge of relevant local safety regulations; and
2.4.5 Ability to recognize at all times whether it is safe to continue.

2.5 **Conductor** means a material or component that can conduct (carry a charge) electrical energy.

2.6 **Dead** means not electrically energized.

2.7 **Electrical equipment** means anything used, intended to be used, or installed for use to generate, provide, transmit, transform, rectify, convert, conduct, distribute, control, store, measure or use electrical energy.

2.8 **Exclusion zone** means a pre-determined area, into which no person can enter without the permission of the electrical power provider or person in control of the works.

2.9 **Isolated** means that the equipment is securely disconnected from all sources of electrical energy.

2.10 **Live** means that the equipment in question is connected to a source of electricity so that parts of it will be at a voltage other than earth potential.

2.11 **Live work** means work where there is a danger of inadvertent contact with conductors which are accessible, and which are live or charged.

2.12 **PPE** means personal protective equipment.

2.13 **Safe System of Work** means a documented process to identify significant residual risks and establish effective, practical controls and procedures.

2.14 **Electrical system** is a combination of electrical equipment which can be or is connected to a common electrical energy source and includes that source.

2.15 **Earth** means a conductor of low impedance which provides an electrical connection between a given point in equipment (an installation or system) and an earth electrode.

2.16 **Fixed wiring installation** is the distribution network of electrical cables from the incoming electrical energy supply to the outlets to which the end equipment is connected. It includes the wires, fuses circuit breakers, distribution boards and power outlets of the electrical installation.

Scope

This standard applies to all work, including the design, installation, commissioning, decommissioning and maintenance of electrical systems carried out by or on behalf of Nokia.

Electrical work within the telecoms industry involves working on, or adjacent to the following types of installation:

- Alternating Current (AC) – usually but not limited to 110Volts, 230 Volts and 415 volts.
- Direct Current (DC) – usually 48 Volts DC in telecoms equipment.

In order to simplify the management of electrical Work, the following categories are defined.

Category	Description	Scope
CAT 1	Telecommunications Equipment & Simple Electrical Works	Work limited to plugging equipment into or out of racks, turning items of equipment on or off or replacing items of equipment. These are electrical activities an unskilled person would undertake in their own home. No live working.
CAT 2	Minor Electrical Works	Permitted to carry out minor electrical work on installations. Work is limited to adding to, repairing or replacement of existing electrical AC circuits. Low-capacity DC (up to 50Ahr) Operatives would require formal electrical training and be under the direct supervision of someone qualified to registered electrician level or equivalent standard. No live working.
CAT 3A	High-Capacity DC	High-Capacity DC, installation, maintenance and testing of high-capacity DC systems (Over 50Ahr). Qualified registered Electricians or equivalent. Live working is often unavoidable.
CAT 4	Install test and commission electrical installations	Design, installation and testing of circuits on both AC and DC systems. Certification that the electrical installation is safe and compliant. Qualified registered Electricians or equivalent.

See Guidance Document for more details on categories.

Nokia operations do not routinely involve working on or managing work on High Voltage systems and so there are no requirements defined in this standard.

3 Requirements

The requirements listed in this Standard apply to all Nokia operations and apply equally to all contractors, suppliers and partners working on behalf of Nokia. They are non-negotiable.

Electricity presents a variety of risks to exposed workers including, electric shock, heart defibrillation, burns, arc flash blindness, explosions, fires, smoke, and secondary hazards such as falling as a result of electric shock and death.

People non-negotiable requirements

3.1 General Awareness

3.1.1 Everyone working for Nokia, whose role involves working on or coming into proximity of electrical systems, circuits and installations must receive sufficient training related to the electrical risks to which they are exposed.

3.1.2 The training must cover the risks arising from Nokia or customer electrical equipment and the associated electrical installation i.e., fixed wiring, switches breakers, protective devices, power supplies, or batteries, in the general vicinity.

3.1.3 The training must cover the defined rules, expected behaviours and controls detailed in this standard.

3.1.4 The training must cover the “right to refuse” to work on something they believe is dangerous and the escalation process to be followed for both unsafe practices and reporting unsafe installations.

3.2 Competence and Supplier Qualification

All electrical work must be conducted by competent people:

3.2.1 Only suppliers that have been H&S qualified to deliver electrical work are to be used.

3.2.2 Only persons, including subcontractors competent to design, install, commission, maintain or decommission electrical circuits and equipment may do so.

3.2.3 Where local electrical registration/certification schemes exist, only registered/certified electrical contractor’s personnel will be used for electrical work; Records of certifications or evidence of qualifications must be held and made available on request by subcontractors.

3.2.4 In countries where no such registration/certification schemes exist, further evaluation and assessment of the individual/s must be

completed before they are permitted to undertake electrical work on behalf of Nokia (this must be determined and approved in-country).

3.2.5 Work on high transmission voltages can only be undertaken by specialized electricians trained to work in such high voltage environments.

3.3 Medical Fitness to Work

3.3.1 Electrical workers must be medically and physically fit to work and be assessed according to local legislation where required.

3.3.2 If no legislative requirements exist, as a minimum, a medical fitness assessment must check for the absence of colour vision deficiency, or medical conditions that might impact an individual's ability to work with electricity safely.

Installation non-negotiable requirements

3.4 Design, Installation & Maintenance of Electrical Systems

3.4.1 All electrical systems and equipment must be designed and installed by a competent person in accordance with local legal requirements and must specifically consider the Intended load; electrical source capacity, cabling requirements, fault, and overload protection, means of isolation and emergency shut off, earthing and bonding.

3.4.2 When working on third-party premises: The site occupier/owner/customer must be consulted prior to any installation or modification of electrical systems i.e., as-built drawings, circuit diagrams, circuit loading.

3.4.3 Commissioning of Electrical Systems: All new and altered wiring installations must be inspected, tested, and certified by a competent person in accordance with local legislation, prior to the system being put into service.

3.4.4 Maintenance of Electrical Systems. **All electrical systems must be safe to use and work on and must be:**

- Inspected and tested in line with manufacturers' recommendations (e.g., for UPS) and by a competent person in accordance with local legislation or where this is not specified, at a maximum interval of 5 years for fixed wiring installations.
- Supported by appropriate records, including up-to-date circuit diagrams/plans.
- Live/functional testing of an electrical system must only be carried out by a competent person and only after appropriate control measures have been implemented.
- If the environment in which electrical systems or equipment are located poses a specific risk, maintenance requirements and schedules must reflect that additional risk.

3.5 High Voltage Rooms

3.5.1 Access must be restricted to authorized persons using physical access control.

3.5.2 All tools and equipment used must be specifically rated and insulated.

3.5.3 Barriers and signs including hazard warning signs must be in place to restrict access to the high voltage rooms and the live conductors within.

3.6 Distribution Boards/Power Supplies

3.6.1 Distribution boards, power supplies and electrical panels must be fitted with guarding, screening, or shielding to prevent contact with live terminals or conductors.

3.6.2 Distribution boards and electrical panels within publicly accessible areas must be locked.

3.6.3 Distribution boards or enclosures containing exposed live busbar systems or readily accessible uninsulated terminations are considered live.

3.7 UPS, Batteries and Battery Arrays.

3.7.1 All UPS systems including smaller base station UPSs and the larger equipment room UPSs, must be designed, and installed in such a way that live components are insulated and guarded or enclosed to prevent inadvertent access.

3.7.2 UPS systems can store large amounts of energy at various voltages and must be maintained by competent trained specialists in accordance with the manufacturer's specifications.

3.7.3 The battery manufacturer's gas venting requirements must be complied with in all design, installation, and maintenance operations. Failure to do could result in the accumulation of gas with a risk of explosion. The presence of the required venting arrangements must be part of site inspection regimes, with an emergency procedure in place to react to their absence.

3.7.4 All tools and equipment used must be specifically rated and insulated.

3.7.5 All work on Nokia and customer UPS systems is to be considered as CAT 3A, therefore requiring an appropriately trained qualified electrician, unless the system capacity in ampere-hours is less than 50Ahr.

3.8 Management Requirements (Nokia premises)

Nokia People and Places (Real Estate – Workplace Resources) must ensure that:

3.8.1 All electrical systems located within Nokia premises are designed, installed, commissioned, decommissioned, and maintained in such a way that makes them safe to be used, worked on or nearby.

3.8.2 Up-to-date circuit diagrams and plans are maintained for all electrical systems within Nokia premises where Nokia is responsible for design, installation, or maintenance.

3.8.3 All electrical work carried out within Nokia premises is appropriately planned and managed.

Nokia Laboratory/R&D/IT groups must ensure that:

3.8.4 All electrical equipment, cabinets/racks, and electrical cords within their areas are suitably and safely maintained.

3.8.5 All electrical work within their areas, excluding that which takes place directly on/within test equipment and racking etc., is coordinated, and controlled by Nokia WR. Only competent persons may undertake electrical work within labs.

Methods and practice non-negotiables

3.9 Working On Live Electrical Systems

3.9.1 Live working is typically prohibited, however, if it is not possible to isolate the circuits concerned, or de-energizing them creates a greater hazard, an exception process must be established which ensures:

- The reasons for the work needing to be conducted live are recorded.
- A safe system of work is defined by a person competent in managing live working and the controls necessary to reduce the very high risks involved.
- There are at least two qualified persons present i.e., lone working is not permitted.

Note: Swapping out circuit boards or packs that are designed to be swapped out whilst the rack or unit is powered up is not considered “live” working.

3.10 Isolation of Electrical Systems

3.10.1 Electrical systems must be isolated from **all sources** of electrical power prior to working on or adjacent to exposed conductors or terminals.

This includes supply from backup generators, UPS, control circuits and other dual supply situations.

3.10.2 Physical isolation methods should be used where possible i.e., removal of fuses, circuit isolators, or Lock-out /Tag-out.

3.10.3 If there is the possibility of the system being re-energized by another person, without the knowledge of the person working on the system physical isolation is mandatory.

3.10.4 If physical isolation is not possible the switching point must be supervised for the duration of the work.

3.11 Proving ‘Dead’

3.11.1 The system/equipment/circuit must be tested and “proved dead” using appropriate insulated test equipment prior to any work starting.

3.11.2 The test must be repeated after any interruptions such as meal breaks or needs to leave the location for any amount of time.

3.12 First Aid & Emergency Response

3.12.1 An individual or individuals trained and capable of giving first aid and cardiopulmonary resuscitation (CPR) must be available on-site where

electrical work Category 3A and Category 4 or any live work is undertaken.

3.12.2 A site-specific emergency plan must be in place and communicated to workers at sites where electrical work Category 3A and Category 4 are undertaken.

3.13 Working Adjacent to Live Electrical Systems

The following work carries risks from adjacent electrical installations.

3.13.1 Buried/Hidden Cables -

The location of all services must be identified using a previously determined and consistent method prior to any intrusive works. This includes before cutting, piercing, or drilling any wall, floor, ceiling, or any other structural element where a likelihood of contacting energised electrical cables or parts exists.

3.13.2 Overhead Lines

When working near overhead power lines:

- Safe horizontal and vertical clearance distances from overhead lines must be established; if any need to go any closer than 10m horizontal distance you must seek professional advice from the electricity utility company or competent professional.
- Clearly marked exclusion zones must be set up and maintained.
- The use of vehicles, plants, machinery, equipment, or materials that could reach beyond the safe clearance distance is not permitted, except where specific supplementary controls are implemented to ensure that safe distances are maintained. See Appendix of Guidance Document for details of safe clearance distances.
- Where supply lines contact a structure that is to be climbed, the integrity of the insulation on the cables must be confirmed before climbing can begin. A combination of visual inspection of the cables at points of contact and the structure's earthing arrangements should be undertaken. If this integrity cannot be confirmed, a competent electrician must inspect the installation and confirm that it is safe to climb.

3.14 Exclusion Zones

3.14.1 Exclusion zones including the use of barriers and signage must be used if there is a risk of untrained persons entering the areas where electrical work is being done.

3.14.2 The access points must be physically controlled or supervised at all times.

3.15 Safety Signs

3.15.1 Safety and warning signs must be used to inform of the danger of electrical hazards whilst work is ongoing. The signage should be pictorial and easily recognizable to all persons.

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Tools and Equipment non-negotiables

3.16 Tools & Protective Equipment

Hand Tools: All hand tools used for working on or near live electrical systems must be:

3.16.1 Fully insulated.

3.16.2 Maintained in good condition.

3.16.3 Checked for defects before use and replaced as necessary.

3.16.4 Rated for the voltages they are intended to be used on.

3.17 Portable Power Tools

3.17.1 Electrical power tools must be selected in the following order of preference unless local legal requirements define more restrictive requirements:

- Battery powered.
- Those powered by an isolating transformer with an earthed centre tapped voltage of 110V AC.
- If powered directly from a mains supply, be of double insulated construction and protected at the point of connection by a Residual Current Device (RCD).
- The RCD should be tested using the device test button before use.

3.17.2 All portable electrical power tools and equipment must be appropriately inspected and maintained which means:

- As a minimum, all portable electrical tools and equipment must be visually inspected before use and taken out of service if faulty.
- Regular inspection by a competent person should be undertaken; the frequency of which is dictated by local legal requirements or based on the type of equipment, the severity of use and usage rate. The frequency of inspection of portable tools should be at least annually.
- Results of inspections should be recorded.

3.18 Ladders & Platforms

3.18.1 Only non-conductive ladders/platforms can be used in the vicinity of exposed electrical circuits or whilst undertaking electrical work.

3.18.2 Ladders should be subject to regular documented inspections.

3.19 Portable Electrical Appliances

3.19.1 As a minimum, all portable electrical appliances and equipment (laptop power supplies, kettles, desk lamps, printers, etc.) must be visually inspected before use and taken out of service if faulty.

3.19.2 In addition, regular inspection by a competent person should be undertaken; the frequency of which is dictated by local legal requirements or based on the type of equipment and usage rate. (Usually referred to as Portable Appliance Testing (PAT).

3.19.3 Results of inspections should be recorded.

3.20 Personal Protective Equipment (PPE)

3.20.1 All PPE must be appropriate for the electrical risk encountered, inspected at a frequency dictated by local regulations or annually as a minimum and especially before use, and taken out of service if defective and replaced.

3.20.2 An approved list of the PPE must be maintained for all foreseeable works. For electrical works appropriate, hardhats, insulated gloves, and face guards. Specific selection guidance can be found in the Guidance to the Electrical Standard.

Implementation Expectations

3.21 Every business unit leader must ensure, within their area of responsibility, that the requirements of this standard are implemented.

3.22 PS&S must ensure that for every location that Nokia operates in, the minimum requirements defined in section 3 are defined for local implementation, captured in local documentation, consulted with local stakeholders, and communicated to all relevant parties. This can be:

3.22.1 Specific to a country.
3.22.2 Defined across a region where there is regional alignment or Nokia requirements exceed local requirements in all listed areas.
3.22.3 Tailored based on customer requirements or expectations.
3.22.4 Consider local legal requirements and restrictions.

3.23 Nokia People and Places must ensure that:
All electrical systems located within Nokia premises are designed, installed, commissioned, decommissioned, and maintained in such a way that makes them safe to use, be worked on or nearby.

3.24 Nokia Laboratory/R&D/IT groups are responsible for ensuring that:
All electrical equipment and cabinets/racks within their areas are suitably and safely maintained and all electrical work within their areas is coordinated and controlled by Nokia People and Places.

3.25 Nokia HR must ensure that a process exists for the management of all employed Nokia employees that:
Enables action to be taken should an individual not meet the requirements defined in the standard.

3.26 Procurement and Sourcing must ensure that where companies or individuals are sourced to provide electrical work that:

3.26.1 The requirements in section 3 are communicated and understood and the supplier can meet these expectations when they are awarded work.
3.26.2 The supplier is made aware of Nokia reporting requirements related to electrical work.

3.27 Contractors/Third Parties are responsible for ensuring that minimum requirements defined in section 3 are locally adopted, clearly communicated to their employees, understood, and implemented within their area of work.

5. Recommendations

The requirements listed in section 3 apply to all Nokia operations, but the geographical spread of the business means that the extent of implementation varies. The recommendations contained in this section aim to guide how to achieve the requirements. Should these be deviated from, that decision needs to be documented.

Electrical risk is a factor that Nokia field employees, suppliers, contractors, and partners working for or on behalf of Nokia may be exposed to. Where they are exposed to this risk, the consequences of an incident can be severe including death.

The requirements of this standard apply to all these groups, when approaching implementation this needs to be conducted on a risk-based approach.
In order to determine the extent to which the requirements of this standard apply each business unit should conduct an assessment of the electrical risk posed to their operation.

The requirements in section 3 detail **WHAT** is expected, as the measures needed to reach this standard vary around the world, there is a Global PS&S Guidance Document available that should be read in conjunction with this standard.

Ver	Status	Date	Author	Owner	Reviewed by	Reviewed date	Approver	Approval date	Description of changes
1.0	Approved		Robert Nolan	Robert Nolan				2016.12.19	New Issue
2.0	Approved		Sameh Eisa	Sameh Eisa				2019.01.18	Minor changes: Creator changed to Owner and Sameh Eisa. The header & footer are updated to reflect the new template.
3.0	Approved		Sameh Eisa	Sameh Eisa				2022.06.28	Changes to reflect organizational changes
4.0	Approved	2023.10.11	Sameh Eisa	Sameh Eisa	Paulo Conceicao	2023.10.11	Paulo Conceicao	2023.10.11	Modifications include rebranding and organizational changes.