

## Practice Note

Competence of persons controlling, operating, and working on high-voltage apparatus. May 2023.



## Foreword

A primary duty of engineers is the health and safety of their work for themselves and the general public. This practice note is intended as guidance for engineers and non-engineers working on the design, installation and maintenance of high-voltage systems. The safe and reliable operation of high-voltage apparatus is critical in ensuring the smooth functioning of power systems. High-voltage systems can be dangerous, and failures or mistakes can result in severe consequences, including injury or loss of life, damage to equipment, and downtime. Therefore, it is crucial to have competent individuals capable of designing, operating, and maintaining high-voltage apparatus.

Historically in Ireland, high-voltage systems have been managed by a small number of specialist organisations; as we progress our electrifications of sectors like heat and transport, along with additional growth, more groups are operating high-voltage systems.

This practice note will guide the competence requirements for individuals working with high-voltage apparatus. It covers various topics, including the knowledge, skills, and qualifications needed to work on high-voltage equipment safely. The importance of competence cannot be overstated regarding high-voltage apparatus. It is essential that workers understand the risks associated with their work and are capable of identifying and mitigating potential hazards.

The current requirements for high-voltage systems require review and consideration of some subtle differences between low- and high-voltage systems. Engineers Ireland are in discussion with the Health and Safety Authority (HSA), Commission for Regulation of Utilities (CRU) and Department of Communications, Climate Action and Environment, providing our expert opinion on the topic. We will continue this discussion and seek appropriate regulation updates on our members' behalf.

Until these regulations are updated, we hope this practice note will serve as a valuable resource for employers, employees, and other stakeholders involved in high-voltage apparatus operation and maintenance. By following the guidelines in this note, organisations can ensure that they have a competent and safe workforce, reducing the risk of incidents and promoting a safety culture.

I wish to express my thanks to the experts in the Engineers Ireland Electrical Division for giving of their expert opinion and time to address this important topic for the benefit of the sector.

Kind regards,



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Director General, Engineers Ireland

# Competence of persons controlling, operating, and working on high-voltage apparatus

## Introduction

As Ireland continues growing its high-voltage (HV) network to meet demand and support future electrification of heat and transport, correct management, and operation of high-voltage systems by competent people will become a more prevalent requirement.

High-voltage systems are integral to modern electrical power transmission and distribution networks, providing efficient and cost-effective energy delivery over long distances. However, they also present significant challenges and potential hazards to human safety, equipment reliability, and environmental protection.

High-voltage systems' design, operation, and maintenance require specialised knowledge, skills, and resources to ensure safe and reliable performance. Historically, experts in Eirgrid, the Transmission System Operator (TSO) and ESB, the Distribution System Operator (DSO), have provided this level of knowledge in Ireland. However, as new players such as renewable energy generators, data centres and large manufacturing centres develop in Ireland, this responsibility is being handed over to potentially less experienced professionals.

In this context, understanding the issues of high-voltage systems and guidance is crucial for professionals and stakeholders involved. This practice note aims to provide an overview of some key issues associated with high-voltage systems, including safety risks, current regulations, and additional regulatory compliance.

## Meaning of High-Voltage

High-voltage is defined by IEC and CENELEC standards as an electrical voltage higher than 1000 V, which includes all voltages on the distribution and transmission networks from 10kV to 400 kV.

In the context of electrical power transmission and distribution, HV is necessary for efficient power transmission over long distances, as higher voltages allow for lower current levels and reduced energy losses.

However, high-voltage presents a particular danger to humans with the associated risk of death or life-changing injury from electrical shock, burns and trauma. For this reason, particular safety precautions and protective measures, as detailed in the applicable international standards listed below, are necessary when working with or around high-voltage equipment.

The dangers from high voltage include:

1. Contact with live HV conductor: When a person comes in contact with or too close to high-voltage, the resulting arc-flash causes severe burns, trauma and electrical current to pass through the body, leading to muscle contractions, and organ damage.
2. Faults on the HV network: High-voltage faults result in potentially high fault currents, which can result in injury or death from electric shock and arc-flash.
3. Induction: High-voltages can be induced on adjacent isolated conductors resulting in injury or death from electric shock and arc-flash.
4. Failure of electrical equipment: Failure of high-voltage equipment results in a high-energy explosion, causing catastrophic damage to the equipment, including the production of extremely explosive force, hot gasses, molten metal and shrapnel with the associated risk of death or life-changing injury to any person in close proximity.

To prevent these dangers, it's essential to take the mitigation measures detailed in the applicable international standards, including:

- Verification of design and construction
- Detailed planning
- Risk assessment
- Control of access
- Management and execution by competent persons
- Use of appropriate tools and protective equipment.

## Current regulation

The Health and Safety Authority (HSA) work with industry to ensure safe working conditions when maintaining and operating electrical installations, including high-voltage systems. Duties on installation owners, employers and other persons are detailed in the:

- Safety, Health & Welfare at Work Act 2005. (SHAWW 2005)
- Safety, Health & Welfare at Work (General Applications) Regulations 2007 to 2016

Guidance in relation to carrying out these duties is provided on the HSA website (note i), including reference to;

- I.S. EN 50110-1 Operation of Electrical Installations - Part 1: General
- I.S. EN 61936-1 Power Installations exceeding 1KV (AC) Part 1: Common Rules

Regulation of contractors is primarily governed by the Commission for Regulation of Utilities (CRU), which is an independent statutory given this responsibility under the Energy (Miscellaneous Provisions) Act 2006.

The CRU ensure this through a series of [Completion Certificates](#). Of note in this context are Certification No.1 and No.2. Certification No.1 focuses on systems under 50 kVA connecting to the Distribution System Operator (DSO). Certification No. 2 focuses on systems over 50 kVA, with no upper limit connecting to the DSO and TSO.

Overall, this regulation is intended to ensure the reliable and safe supply of electricity to homes and businesses throughout the country and promote competition and innovation in the energy sector.

## Engineers Ireland guidance

Upon reviewing the current regulations and certificates, Engineers Ireland believes that the focus is on low-voltage installations with reference to ET101, National Rules for Electrical Installations, which is now superseded by I.S. 10101:2020, and there is a lacuna of guidance on high-voltage installations.

Therefore, to ensure owners of and persons working on or near high-voltage electrical installations can carry out their duties described in the Safety Health & Welfare at Work Act 2005 regarding the prevention of danger from electricity, Engineers Ireland members are advised to ensure insofar as is reasonably practicable and within their control, that:

1. High-voltage installation owners and operators (incl. the Transmission System Operator and Distribution System Operator) only energise high-voltage installations, which a suitably competent person has confirmed as being compliant with I.S. EN 61936-1.
2. Contractors delivering high-voltage works have a nominated person employed or engaged as a consultant with the necessary competence to confirm high-voltage works as compliant with I.S. EN 61936-1.
3. High-voltage installations owners comply with I.S. EN 50110-1, including appointing an Installation Manager and providing Electrical Safety Rules and organisation, as required by clauses 3.2.1 and 4.3.1 of I.S. EN 50110-1.
4. Operations and work on or near high-voltage installations are carried out in accordance with I.S. EN 50110-1 and only on high-voltage installations which are managed in accordance with Electrical Safety Rules by a nominated Installation Manager.
5. Contractors and high-voltage installation owners have clear processes in place for the assessment of competence and Authorisation of Persons managed by a nominated competent person.

## Notes

- i. *HSA guidance is that “Adherence to EN 61936-1 and EN 50110-1 could be used as an argument to demonstrate compliance with relevant parts of Part 3 of the 2007 Safety Health & Welfare at Work (General Application) Regulations and other relevant legislation.”*  
[https://www.hsa.ie/eng/topics/electricity/information\\_guidance\\_legislation/](https://www.hsa.ie/eng/topics/electricity/information_guidance_legislation/)
- ii. *Confirmation of compliance with I.S. EN 61936-1 could be included on a Declaration of Fitness or another form of certification.*
- iii. *The “person responsible for an electrical installation” (I.S. EN 50110-1 3.2.1) is commonly known as an “Installation Manager” or “System Manager”.*
- iv. *A ‘Contractor’ is any person or organisation that manages, operates or carries out work on a High Voltage installation under a contract or service agreement for, or on behalf of, the owner of that installation.*
- v. *Current Best Practice regarding the assessment of competence and Authorisation of Persons is described in paragraph 7.2 of Engineers Ireland Issues Paper:*  
<https://www.engineersireland.ie/listings/resource/819>
- vi. *Current EU Best Practice regarding the safe operation of electrical installations is described in Appendix 4 of Engineers Ireland Issues Paper:*  
<https://www.engineersireland.ie/listings/resource/819>

## Further reading

- Competence of Persons controlling, operating and working on HV Apparatus (9 May 2022)  
<https://www.engineersireland.ie/listings/resource/819>
- Commission for Regulation of Utilities safe electric certifications [Completion Certificates – Safe Electric](#)
- Health and Safety Authority guidance [Information Guidance Legislation - Health and Safety Authority \(hsa.ie\)](#)
- Health and Safety Authority guidance [https://www.hsa.ie/eng/publications\\_and\\_for\\_ms/publications/retail/gen\\_apps\\_electricity.pdf](https://www.hsa.ie/eng/publications_and_for_ms/publications/retail/gen_apps_electricity.pdf)

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Background to Engineers Ireland  
With over 25,000 members from every engineering discipline, Engineers Ireland is the voice of the engineering profession in Ireland. Engineers Ireland was established in 1835, making us one of the country's oldest and largest professional bodies. Members come from every discipline of engineering and range from engineering students to fellows of the profession.

Our responsibility is to

- Promote knowledge of engineering
- Establish and maintain standards of professional engineering and engineering education
- Provide opportunities for Continuing Professional Development (CPD)
- Maintain standards of professional ethics and conduct
- Ensure that professional titles are granted to qualified candidates
- Act as the authoritative voice of the engineering profession in Ireland

Our Vision Statement

Engineers Ireland: a community of creative professionals delivering sustainable solutions for society.

Our Mission Statement

Engineers Ireland is an institution that enables the engineering community to progress their professional development and make a sustainable impact on society, advocates for the profession, quality assures education and encourages the future generations of engineers.



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