

OCCUPATIONAL QUALIFICATION STANDARD

Diploma Electrical Engineer, EstQF Level 7

An occupational qualification standard is a document which describes the set of skills, knowledge and attitudes, i.e. competence requirements, needed to successfully accomplish duties. Occupational qualification standards are used for compiling curricula and awarding qualifications.

| Occupational title | Level of Estonian Qualifications Framework (EstQF) |
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| Diploma Electrical Engineer, EstQF Level 7 | 7 |

| Possible specialisation and titles on occupational certificate | |
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| Specialisation | Title on occupational qualification certificate |
| Electrical networks and systems | Diploma Electrical Engineer of Electrical Systems and Networks, EstQF Level 7 |
| Electric automation | Diploma Electrical Engineer of Electric Automation, EstQF Level 7 |
| Consumer electrical installations | Diploma Electrical Engineer of Consumer Electrical Installations, EstQF Level 7 |

Part A DESCRIPTION OF WORK

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| <p>A.1 Description of work</p> <p>It is the job of electrical engineers to ensure the effective, safe, environmentally friendly and both economically and socially acceptable functioning of electrical systems and equipment.</p> <p>Diploma Electrical Engineer, Level 7 is an experienced specialist whose role is to maintain and develop existing technologies.</p> <p>They are prepared to work with a team of engineers and specialists in related areas, lead working teams or the organisation and assume responsibility for the employees' performance.</p> <p>The job requires individual action in situations that are complex and unexpected and call for an innovative approach. Diploma electrical engineers specialise in:</p> <ul style="list-style-type: none"> ☐ electrical networks and systems (transmission and distribution systems, larger electrical power plants and large-scale consumers with transmission systems); ☐ electric automation (automated devices and systems which control the operations of power plants, electrical systems and consumers); ☐ consumer electrical installations (electrical installations starting from the distribution system supply point, including small-scale and micro power plants). <p>Competence in at least one of the listed fields must be certified during every instance of specialisation (elective duties):</p> <ol style="list-style-type: none"> 1) research and education 2) development and management 3) energy policy 4) electrical and technological commerce 5) design 6) installation, operation and oversight <p>Occupational qualification standards compiled for occupation of electrical engineer:</p> <p>Electrical Engineer, Level 6</p> <p>Diploma Electrical Engineer, Level 7</p> <p>Chartered Electrical Engineer, Level 8</p> |
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| A.2 Tasks |
| <p>A.2.1 Electrical engineering</p> <ol style="list-style-type: none"> 1. Fulfilling technical engineering tasks 2. Using information and communications technology (ICT) 3. Fulfilling occupational norms <p>A.2.2 Management and supervision</p> <ol style="list-style-type: none"> 1. Management 2. Supervision |
| Specialised areas of work |
| <p>A.2.3 Electrical networks and systems</p> <ol style="list-style-type: none"> 1. Maintaining and developing electrical networks and systems 2. Resolving specialist problems <p>A.2.4 Electric automation</p> <ol style="list-style-type: none"> 1. Maintaining and developing automated equipment and systems that conduct the work of electrical networks and systems 1. Resolving specialist problems <p>A.2.5 Consumer electrical installations</p> <ol style="list-style-type: none"> 1. Maintaining and developing consumer electrical installations 1. Resolving specialist problems |
| Elective areas of work |
| <p>A.2.6 Research and education</p> <p>A.2.7 Development and management.</p> <p>A.2.8 Energy policy.</p> <p>A.2.9 Electrical and technological commerce.</p> <p>A.2.10 Designing.</p> <p>A.2.11 Installation, operation and oversight</p> |
| A.3 Work environment and specific nature of work |
| <p>Electrical engineers usually work in offices or on site. Working hours can be flexible. Electrical engineers must be guided by general occupational, electricity and environmental safety requirements.</p> |
| A.4 Tools |
| <p>The tools necessary for carrying out tasks are IT hardware and software, electrical tools, measuring tools and protective gear.</p> |
| A.5 Personal qualities required for work: abilities and characteristics |
| <p>The profession requires an innovative and environmentally friendly way of thinking that facilitates sustainable development, plus decision-making and analytical skills, precision, a sense of responsibility, willingness to communicate and cooperate, spatial imagination and adaptability.</p> |
| A.6 Professional preparation |
| <p>Diploma Electrical Engineer, Level 7 must have either completed a relevant Master's degree or acquired the occupation of Electrical Engineer, Level 6. Professional experience is required in both cases.</p> <p>In the event of having acquired the occupation of Electrical Engineer, Level 6, further academic and in-service training must also be completed.</p> |

A.7 Most common occupational titles

Power Engineer, Designer, Project Manager, Site Manager, Building Manager, Duty Manager, Duty Coordinator, Dispatcher, Consultant, Expert, Development Manager, Analyst, Researcher, etc.

A.8 Regulations governing profession

Electricity Market Act, Building Code and Equipment Safety Act.

Part B COMPETENCY REQUIREMENTS

B.1 Structure of occupation

To obtain the qualification of Diploma Electrical Engineer, Level 7 specialising in electrical networks and systems, competences B.2.1-B.2.3 and one competence from B.2.6-B.2.11 must be certified;
To obtain the qualification of Diploma Electrical Engineer, Level 7 specialising in electric automation, competences B.2.1, B.2.2 and B.2.4 and one competence from B.2.6-B.2.11 must be certified;
To obtain the qualification of Diploma Electrical Engineer, Level 7 specialising in consumer electrical installations, competences B.2.1, B.2.2 and B.2.5 and one competence from B.2.6-B.2.11 must be certified.

B.2 Competences

MANDATORY COMPETENCES

| B.2.1 Electrical engineering | EstQF Level 7 |
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| <p>Performance indicators:</p> <ol style="list-style-type: none"> defines and solves complex engineering tasks, using knowledge of the following: <ul style="list-style-type: none"> - mathematics, science, programming, economics, foreign language and philosophy; - strength of materials, graphics, theoretical mechanics and machinery; - basics of electrotechnics, principles of power-generating systems (including those connected through an inverter), electricity transmission devices and switchgears, electric automation, functioning of electricity-powered devices, renewable energy and energy efficiency uses solution methods across technological and economic sectors connected with the electrical industry (electronics, market statistics, economy and environmental protection). assesses the applicability of technologies taking into consideration user needs, the market situation and restrictions; fulfils the requirements of pertinent legal acts and quality systems (including normative documents and standards). uses a computer for information processing, communication, safety and problem-solving at the Independent user level and for content creation at the Advanced user level (see Annex 2 – Scale of self-assessment in digital competence); uses appropriate hardware and modern software solutions to resolve specialist problems (e.g. modelling, simulation, analytical and synthesis technology and smart network solutions); keeps up to date with developments in digital technology and supports others in improving their ICT skills; sets ICT-related tasks and places orders with professionals to find solutions; complies with basic data protection requirements; is guided in their work by the professional ethics of engineers (see Annex 3 – Engineer's professional ethics); supports the wider promotion and appreciation of the work and occupation of engineering in society; explains the nature and importance of the occupation and ways in which to pursue it; maintains their qualifications and keeps up to date on technological developments; navigates the various aspects of the occupation and makes proposals for innovative changes; uses at least one foreign language (including Estonian as a foreign language) at the B2 level (see Annex 4 – Language skills level descriptions); mediates and provides technical information for everybody in a comprehensive manner and participates actively in discussions and meetings; | |

16. builds relationships and works with colleagues and clients, acting in accordance with best practice in communication;
17. meets the requirements of standards and regulations associated with the occupation (quality management systems, environmental protection and electrical, fire and occupational safety).

B.2.2 Management and supervision

EstQF Level 7

Performance indicators:

1. develops and leads their team to achieve the best results.
2. gathers information on an ongoing basis, analyses activities, gives feedback and adjusts activities as necessary;
3. coordinates project activities using appropriate management techniques and systems;
4. keeps the project in compliance with the planned budget, activities and legal acts;
5. plans a project's economic activities;
6. coordinates the work of those being supervised based on the task and developments in the field;
7. passes on professional skills and knowledge, taking into account the needs and expectations of those being supervised.

COMPETENCES RELATED TO SPECIALISATION

To obtain the qualification of Diploma Electrical Engineer, Level 7 specialising in electrical networks and systems, competence B.2.3 must be certified;

To obtain the qualification of Diploma Electrical Engineer, Level 7 specialising in electric automation, competence B.2.4 must be certified;

To obtain the qualification of Diploma Electrical Engineer, Level 7 specialising in consumer electrical installations, competence B.2.5 must be certified;

Electrical networks and systems

B.2.3 Electrical networks and systems

EstQF Level 7

Tegevusnäitajad:

1. korraldab elektrivõrkude ja -süsteemide käigushoidmist, arvestades sidusvaldkondadega (nt automaatika, tarbijapaigaldised).
2. leiab erialastele probleemidele lahendusi, kasutades meetodeid, mis põhinevad järgmistel asjakohastel teadmistel:
 - a) elektritootmisseadmete (sh läbi inverteri ühendatud) toimimise põhimõtted;
 - b) elektrivõrgu (ülekande- ja jaotusvõrgu) toimimise ja kaitsmise põhimõtted;
 - c) elektrisüsteemi komponentide (elektrijaam, generaator, tuulik, läbi inverteri ühendatud tootmiseseade, õhuliin, kaabelliin, alalisvoolulink, alajaam, trafo, lülitusseadmed, kondensaator, reaktor, elektrienergia salvestusseadmed, releekaitse, elektritarbimise seadmed jms) toimimise põhimõtted;
 - d) taastuvenergeetika ja energiatõhususe põhimõtted;
 - e) elektrisüsteemi stabiilse toimimise põhimõtted (pinge ja sageduse hoidmine);
 - f) elektrituru toimimise põhimõtted;
 - g) süsteemiautomaatika toimimise põhimõtted - süsteemi töös esineda võivad kõrvalekalded ja nende ennetamise meetodid.

Electric automation

B.2.4 Electric automation

EstQF Level 7

Performance indicators:

1. plans and manages automation devices and systems that conduct electrical networks and systems being kept operational and their development, taking into account related fields (manufacturing and production automation, etc.);
2. finds the best solutions to complex specialised problems in their area of operation using methods based on experience and relevant knowledge of the following:
 - a) operating principles of automated devices used to produce, transmit, distribute and consume electricity;
 - b) operating principles of electronic equipment and installations powering industrial and energy enterprises, buildings and the technology within them;

- c) operating principles of automatic control, system theory and technological processes (including electrical light and electronic technology);
- d) operating principles of the instrumentation and appliances used in machines and power plants;
- e) operating principles of telematics and data communication protocols; electric local area and smart networks
- f) operating principles of relay control (selectivity, coverage, speed, sensitivity and reliability);
- g) operating principles of system automatics.

Consumer electrical installations

B.2.5 Consumer electrical installations

EstQF Level 7

Performance indicators:

1. plans and manages electrical devices and systems leading the work of consumer electrical installations being kept operational and their development, taking into account related fields (heating and ventilation installations, robotics, automatics and communication installations, etc.);
2. finds the best solutions to complex specialised problems in their area of operation based on experience and relevant knowledge of the following:
 - a) operating principles of devices and systems used in micro and small-scale electrical production, business, manufacturing and community buildings and houses (e.g. local area and smart networks);
 - b) operating principles of electronic equipment and installations linked to technology found in consumer electrical installations;
 - c) operating principles of automatic control and technological processes (electrical lighting, industrial and building automatics, etc.) in consumer electrical installations;
 - d) operating principles of electrical machines (including engines, generators and transformers), electrical drives (including electric transport) and the instrumentation used to drive them;
 - e) function and choice principles (including selecting the right fit) of protection equipment for electrical installations.

OPTIONAL COMPETENCES

To obtain the qualification of Diploma Electrical Engineer, Level 7 one competences from B.2.6 - B.2.11 must be certified;

B.2.6 Research and education

EstQF Level 7

Performance indicators:

1. conducts scientific research and development work and publishes their results according to the subject and methodology;
2. teaches according to the syllabus using appropriate teaching methods;
3. compiles study materials using appropriate methods;
4. supervises Bachelor's and Master's theses.

B.2.7 Development and management

EstQF Level 7

Performance indicators:

1. compiles development plans and short-term plans in accordance with development trends in the electrical engineering field;
2. identifies the field's critical success factors and conducts analyses of competition;
3. compiles alternative strategies, choosing the appropriate measures to realise them and evaluating their efficiency;
4. manages energy reserve systems in accordance with the nature and practical functioning of strategic management.

B.2.8 Energy policy

EstQF Level 7

Performance indicators:

1. analyses and describes the process of shaping energy policy in an international context;
2. predicts the effects of energy policy on the economy and assesses potential risks;
3. assesses the effect of energy economics and related fields on society and energy security (including cyber-security);

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| 4. analyses, assesses and creates balanced energy policies with mandatory security of supply, optimal influence on the environment and socio-economics and balanced energy prices. | |
| B.2.9 Energy and technology commerce | EstQF Level 7 |
| Performance indicators: 1. assesses the importance of regional fuel and energy markets from the point of view of both security of supply and competitiveness, and predicts market developments; 2. assesses the effect of market distortion on prices; 3. compiles a balance sheet for energy and capacity and analyses trends in manufacturing and consumption; 4. carries out economic transactions, mediating electrical appliances profitably from manufacturer to consumer, implementing appropriate business methods in different economic situations. | |
| B.2.10 Designing | EstQF Level 7 |
| Performance indicators: 1. collects and analyses the input required for designing; 2. compiles projects and analyses existing ones based on the specific nature of the field and using appropriate software; 3. compiles and approves project solutions (including calculations and schematics), taking into account technical compatibility and suitability, ensuring that the electrical installation is safe to use; 4. chooses devices compatible with the requirements and specialisation, using normative documents and standards; 5. works with the subscriber at all stages of the project and seeks feedback in order to boost project quality; 6. leads the design process and is responsible for the compatibility of systems; 7. compiles expert reports in compliance with the requirements of legal acts. | |
| B.2.11 Installation, operation and oversight | EstQF Level 7 |
| Performance indicators: 1. organises installation, operation and oversight duties, following project requirements, legal acts and normative documents (including standards and user manuals) and assuming responsibility for the fulfilment of safety requirements; 2. compiles an operating schedule (including the appliance maintenance plan), organising the necessary work and the ordering of materials; 3. manages the use of proper devices, software and technology in diagnostics, testing and configuration; 4. organises the documentation of information relating to a given electrical installation; 5. assesses the safety of the construction and use of a given electrical appliance in accordance with the requirements established in legal acts; 6. organises and performs audits and expert reports on electrical installations in compliance with the requirements of legal acts. | |

Part C

GENERAL INFORMATION AND ANNEXES

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| C.1 Information concerning compilation and certification of occupational qualification standard and reference to classification of occupations | |
| 1. ID of occupational qualification standard in register of occupational qualifications | 07-30032023-2.2/7k |
| 2. Occupational qualification standard compiled by: | Lembit Vali, Eesti Elektroenergeetika Selts Lauri Öövel, OÜ Energoservis Hannes Mäe, Siemens Osakeühitis Eestis filiaal Tiit Metusala, Tallinna Tehnikaülikool Tõnis Viira, Elering AS Renè Nukki, Tallinna Tehnikakõrgkool |
| 3. Occupational qualification standard approved by: | Energy, Mining and Chemical Industry |
| 4. No. of decision of Sectoral Council | 30 |
| 5. Date of decision of Sectoral Council | 30.03.2023 |

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| 6. Occupational qualification standard valid until | 13.03.2024 |
| 7. Occupational qualification standard version no. | 7 |
| 8. Reference to International Standard Classification of Occupations (ISCO 08) | 2151 Electrical Engineers |
| 9. Reference to European Qualifications Framework (EQF) | 7 |
| C.2 Occupational title in foreign language | |
| English: | Diploma Electrical Engineer, EstQF Level 7 |
| English: | Diploma Engineer of Consumer Electrycal Equipment |
| English: | Diploma Engineer of Electrical Automation |
| English: | Diploma Engineer of Electrical Systems and Networks |
| C.3 Annexes | |
| Lisa 1 Elektriinseneride kutsete tasemed | |
| Lisa 2 Scale of self-assessment in digital competence | |
| Lisa 3 Engineer's Professional Ethics and Code Of Conduct | |
| Lisa 4 Language skills level descriptions | |