

OCCUPATIONAL QUALIFICATION STANDARD

Diploma Thermal Energy 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 Thermal Energy Engineer, EstQF Level 7 | 7 |

| Possible specialisation and titles on occupational certificate | |
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| Specialisation | Title on occupational qualification certificate |
| Thermal energy economy | Diploma Thermal Energy Engineer, EstQF Level 7 Thermal energy economy |
| Thermal equipment and systems | Diploma Thermal Energy Engineer, EstQF Level 7 Thermal equipment and systems |
| District heating and district cooling systems | Diploma Thermal Energy Engineer, EstQF Level 7 District heating and district cooling systems |
| Gas equipment and installations | Diploma Thermal Energy Engineer, EstQF Level 7 Gas equipment and installations |
| Heat sources and heating centres | Diploma Thermal Energy Engineer, EstQF Level 7 Heat sources and heating centres |
| Industrial and commercial cooling equipment and systems | Diploma Thermal Energy Engineer, EstQF Level 7 Industrial and commercial cooling equipment and systems |
| Research and education | Diploma Thermal Energy Engineer, EstQF Level 7 Research and education |

Part A DESCRIPTION OF WORK

| A.1 Description of work |
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| <p>The aim of a thermal energy engineer's work is to create solutions for the safe and efficient functioning of thermal and energy technologies.</p> <p>Thermal energy engineering occupations: Thermal Energy Engineer, Level 6 Diploma Thermal Energy Engineer, Level 7 Chartered Thermal Energy Engineer, Level 8.</p> <p>Thermal Energy Engineer, Level 7 develops, maintains and optimises existing thermal and energy equipment and systems. They work independently in complex, unpredictable situations that require an innovative approach, cooperate with specialists from related fields and are prepared to lead teams.</p> <p>Diploma thermal energy engineers specialise in:</p> <ul style="list-style-type: none"> <input type="checkbox"/> developing the thermal economy*; <input type="checkbox"/> thermal equipment and systems**; |

- ☐ district heating and cooling systems***;
- ☐ gas equipment and installations****;
- ☐ heat sources and heating centres*****;
- ☐ industrial and commercial cooling devices and systems ***** or
- ☐ research and education*****.

More specific occupational fields of Diploma Thermal Energy Engineer, Level 7 (excluding the thermal economy and research and education specialisations, which have no specific occupational fields) are:

- ☐ designing buildings;
- ☐ expert analysis of building projects;
- ☐ construction management;
- ☐ owner's supervision;
- ☐ organising operations.

For competence restrictions concerning occupations, see Annex 1.

*Organising the energy economy of businesses and local governments and compiling development plans fall under development of the thermal economy;

**Thermal equipment and systems are heating and auxiliary equipment which utilises primary energy or perform energy conversion (boilers, industrial furnaces, driers, heat pumps, solar panels, refrigeration equipment, cooling devices, fuel preparation systems, heat storage devices, etc.);

***District heating and cooling systems are recirculation systems installed in the ground or on supports (pipelines, closing devices, regulatory and measuring devices, leak detection systems, devices compensating for thermal pressure, etc.) which are designed to transport heating or cooling energy to consumers. In general, the heat transfer medium used to transport energy is cleaned and chemically treated water;

****Heat sources and heating centres are local boiler units, heat pumps, solar panels and boiler rooms; These do not include radiator, hot-air and underfloor heating systems, hot water systems, domestic ventilation systems, air-conditioning systems and noise-suppressing systems.

*****Gas equipment and systems are equipment and installations for producing, processing, transmitting, storing and using gas and filling gas containers, including pressure vessels for natural gas, biogas, industrial gas, fuel gas, evaporators, internal piping, external piping, terminals, filling stations, petrol stations and gas stations;

*****Industrial and commercial cooling equipment and systems are heating and cooling pump systems, including direct evaporation systems, pump systems, absorption cooling systems and adiabatic systems, compressor devices, heat exchangers, pressure vessels and piping.

*****Research and development consists of systematic creative tasks (baseline studies, applied research and product development) aimed at gathering new knowledge using the scientific method.

A.2 Tasks

A.2.1 Engineering work

1. Fulfilling technical engineering tasks.
2. Using information and communications technology (ICT).
3. Fulfilling occupational norms.

A.2.2 Cooperation and supervision

1. Organising cooperation.
2. Providing supervision.

Specialised areas of work

- A.2.3 Thermal energy economy
- A.2.4 Thermal equipment and systems
- A.2.5 District heating and cooling systems
- A.2.6 Gas equipment and installations
- A.2.7 Heat sources and heating centres
- A.2.8 Industrial and commercial cooling equipment and systems
- A.2.9 Research and education

Elective areas of work

- A.2.10 Building design
 1. Planning project solutions.

2. Formalising construction projects.

A.2.11 Expert analysis of building projects

1. Determining the complexity and volume of construction projects.
2. Oversight and evaluation of construction projects.
3. Documenting the results of the evaluation of construction projects.

A.2.12 Construction management

1. Making preparations for construction.
2. Organising construction.
3. Arranging the handover of the construction site.

A.2.13 Owner's supervision

1. Verifying compliance of design project with requirements.
2. Checking compliance with safety regulations.
3. Checking documentation.

A.2.14 Notifying the client

1. Organising equipment operations.
2. Organising operations and maintenance.
3. Identifying and rectifying faults.
4. Documenting operations.

A.3 Work environment and specific nature of work

Thermal energy engineers work in offices and on site. Working hours can be flexible.

A.4 Tools

Thermal energy engineers use ICT tools and software in their work (e.g. specialised computer programmes, tools and measuring devices).

A.5 Personal qualities required for work: abilities and characteristics

The profession requires an engineering-minded, environmentally friendly way of thinking that facilitates sustainable development, plus creativity, independence, decision-making and analytical skills, precision, a sense of responsibility, willingness to communicate and cooperate, spatial imagination and adaptability.

A.6 Professional preparation

Diploma Thermal Energy Engineer, Level 7 has either obtained a relevant Master's degree or the qualification of Thermal Energy Engineer, Level 6 along with further training. Professional experience is required in both cases.

A.7 Most common occupational titles

Thermal Technology Engineer, Electric Energy Production Engineer, Manufacturing Engineer, Thermal Automatics Engineer, Regime Engineer, Dispatcher, Energy Systems Expert, Electrical Plant Operations Manager, Energetics Engineer, Energy Block Specialist, Head Engineer, Planner, Project Lead, Site Manager, Consultant, Expert, Head of Development, Department Head, Scientist, Cooling Device Engineer, etc.

A.8 Regulations governing profession

Equipment Safety Act and Building Code and their implementing acts and EVS EN 378 and EU regulation No 517/2014.

The aforementioned regulations regulate the activities of those who compile projects for district heating and district cooling systems, construction site inspectors, construction leads, building auditors, those carrying out owner's supervision, fitters of fuel gas installations and refrigeration equipment and those in charge of inspecting whether the usage requirements of pressure devices are being met.

The occupational qualification enables a competence to be obtained by registering it with the Economic Activity Registry.

Part B COMPETENCY REQUIREMENTS

B.1 Structure of occupation

Competences B.2.1 and B.2.2 and at least one specialised competence from B.2.3-B.2.7 must be certified when applying for the qualification of Diploma Thermal Energy Engineer, Level 7.
To specialise in heating devices and systems, district heating and district cooling systems, heat sources and heating centres, gas devices and appliances and industrial and commercial refrigeration devices and systems, at least one competence from B.2.8-B.2.10 must be certified.

B.2 Competences

MANDATORY COMPETENCES

| B.2.1 Engineering work | EstQF Level 7 |
|---|---------------|
| <p>Performance indicators:</p> <ol style="list-style-type: none"> 1. defines and completes complex engineering tasks using appropriate contemporary knowledge of the natural sciences and engineering (mathematics, physics, engineering mechanics, material technology, programming, thermodynamics, heat transfer, hydrogen gas mechanics, fuels and combustion, engineering graphics, strength of materials, etc.); 2. links engineering with social, economic, environmental and ethical aspects using knowledge of economics, social studies and humanities (business and economics, business processes, etc.); 3. utilises solutions linked to fields related to thermal energetics (e.g. ICT, construction, electricity, automatics and mechanics); 4. assesses the applicability of technologies taking into consideration user needs, the market situation and restrictions; 5. 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); 6. uses appropriate hardware and modern software solutions to resolve specialist problems (e.g. modelling, simulation, analytical and synthesis technology and smart network solutions) and can choose the best hardware and software for a project; 7. keeps up to date with developments in digital technology and supports others in improving their ICT skills; 8. follows the occupational requirements of legal acts and standards, e.g. work organisation and occupational safety requirements; 9. is guided in their work by the requirements of the professional ethics of engineers, (see Annex 3 – Engineer’s professional ethics and code of conduct); 10. supports the wider promotion of the work and occupation of engineering through their actions and protects the interests of the occupation; 11. maintains their qualifications, keeps up to date on technological developments and proposes innovations to improve energy efficiency; 12. mediates and provides technical information for everybody in a comprehensive manner and participates actively in discussions and meetings; 13. uses at least one foreign language at the B2 level (see Annex 4 – Language skills level descriptions). | |
| B.2.2 Cooperation and supervision | EstQF Level 7 |
| <p>Performance indicators:</p> <ol style="list-style-type: none"> 1. creates and maintains effective professional relationships and networks with individuals, colleagues and business partners (including organisations), bearing in mind their goals and quality of service; 2. organises the work of teams, instigating activities and guiding their progress towards results; 3. plans the project financially, keeps the project in line with its planned budget and legal acts, creates a functioning supply chain using principles of project management; 4. delegates work fairly and expediently, granting rights and authorisation, including workers and motivating them; | |

5. observes and checks work performance, giving appropriate/constructive feedback in a timely manner and making suggestions to improve further work;
6. passes on professional skills and knowledge, taking into account the needs and expectations of those being supervised;
7. shapes appropriate professional attitudes through active inclusion.

COMPETENCES RELATED TO SPECIALISATION

At least one specialised competence from B.2.3-B.2.7 must be certified when applying for the qualification of Diploma Thermal Energy Engineer, Level 7.

| Thermal energy economy | |
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| B.2.3 Thermal energy economy | EstQF Level 7 |
| Performance indicators: 1. plans heat supply on the basis of economic analysis, using statistical data to analyse the development of the energy sector; 2. chooses an appropriate energy source for heating systems and assesses the necessity of investment, taking into account the cost-benefits of investments; 3. assesses the cost-benefits of investments, energy conservation and energy conservation methods, taking into account energy policy trends in the European Union and trends in the Estonian energy sector. | |

| Thermal equipment and systems | |
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| B.2.4 Thermal equipment and systems | EstQF Level 7 |
| Performance indicators: 1. develops complex technical solutions using methods based on experience, skills and relevant knowledge: a) principles of thermodynamics and heat and mass distribution processes; b) requirements of the use of thermal equipment and systems; c) operating principles of the technological processes of equipment and systems; d) main technical solutions of thermal equipment and systems and the principles behind their choice; e) requirements of the energy efficiency of thermal equipment and systems. 2. takes into account the specific nature of related fields (electric power supply, automatics, constructions, water supply, fuel management, etc.). | |

| District heating and district cooling systems | |
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| B.2.5 District heating and district cooling systems | EstQF Level 7 |
| Performance indicators: 1. develops complex technical solutions using methods based on experience, skills and relevant knowledge: a) principles of thermodynamic and hydraulic processes; b) compensation solutions for thermal shock; c) operating principles of automatic control and technological processes; d) overview of the main technical solutions of district heating and district cooling systems and the principles behind their choice; e) requirements of the energy efficiency of district heating and district cooling systems; 2. takes into account the specific nature of related fields (external communications, geotechnics, automatics, road construction, constructions, etc.). | |

| Gas equipment and installations | |
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| B.2.6 Gas equipment and installations | EstQF Level 7 |
| Performance indicators: 1. develops complex technical solutions using methods based on experience, skills and relevant knowledge: a) materials used in the construction of gas installations and their nature; | |

- b) principles of gas dynamic processes;
 - c) nature and fields of use of fuel gas, thermodynamic state and composition of gas, combustion theory;
 - d) requirements of using gas equipment;
 - e) solutions for storing fuel gas and gas supply, potential uses;
 - f) main technical solutions of gas equipment and installations and principles behind their choice;
 - g) requirements of the explosion risk and energy efficiency of gas equipment and installations.
2. takes into account the specific nature of related fields (external communications, geotechnics, automatics, road construction, constructions, fire safety etc.).

Heat sources and heating centres

B.2.7 Heat sources and heating centres

EstQF Level 7

Performance indicators:

1. develops complex technical solutions using methods based on experience, skills and relevant knowledge:
 - a) construction physics qualities of buildings;
 - b) principles of thermodynamic, hydraulic and aerodynamic processes;
 - c) main technical solutions of heating systems belonging to buildings and principles behind their choice;
 - d) requirements of the energy efficiency of heating systems belonging to buildings.
2. takes into account the specific nature of related fields (e.g. energy supply, automatics, constructions and water supply).

Industrial and commercial cooling equipment and systems

B.2.8 Industrial and commercial cooling equipment and systems

EstQF Level 7

Performance indicators:

1. develops complex technical solutions using methods based on experience, skills and relevant knowledge:
 - a) principles of thermodynamic processes;
 - b) use, principles and construction of refrigeration system components;
 - c) principles of inspection and maintenance;
 - d) multi-stage refrigeration systems.
2. observes the use of the cooling cycle in accordance with the safety card of the refrigerant (EN-378 and F-GA requirements);
3. takes into account the specific nature of related fields (constructions, electricity supply, automatics, water supply, etc.).

Research and education

B.2.9 Research and education

EstQF Level 7

Performance indicators:

1. carries out research and development (applied research) to create new knowledge and skills and to help develop their company, cooperating with businesses, project teams, research institutions or universities;
2. uses research results to develop new products, processes or services, or to improve existing products, processes or services;
3. uses research results on an ongoing basis to offer solutions to practical problems;
4. teaches in accordance with curricula or study programmes;
5. compiles study materials using appropriate methods.

OPTIONAL COMPETENCES

To specialise in heating devices and systems, district heating and district cooling systems, heat sources and heating centres, gas devices and appliances and industrial and commercial refrigeration devices and systems, at least one competence from B.2.8-B.2.10 must be certified.

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| B.2.10 Building design | EstQF Level 7 |
| <p>Performance indicators:</p> <ol style="list-style-type: none"> 1. creates an informative and graphically comprehensible project layout, following technical calculations performed beforehand, competence restrictions (see Annex 1) and construction planning standards, norms and other normative documents; 2. chooses and utilises appropriate expertise, including software to fulfil the design task; 3. compiles a project layout, dealing with the necessary information materials (e.g. explanatory statements, charts, blueprints, graphic materials and other relevant documents) in accordance with the engineering content of the solution. | |
| B.2.11 Expert analysis of building projects | EstQF Level 7 |
| <p>Performance indicators:</p> <ol style="list-style-type: none"> 1. assesses their own capabilities in regard to the complexity and volume of the expert analysis to be compiled and decides on the need to involve further experts; 2. observes the competence restrictions of construction expertise (see Annex 1); 3. checks whether the construction project is in accordance with valid requirements, data (customer needs, previous blueprints, etc.) and planning conditions; 4. checks whether the separate parts of construction projects are in accordance with the source data and concept and whether the concept is in accordance with best practice; 5. compiles an expert analysis report in which they outline the results of the analysis without contradictions and in a comprehensible manner. | |
| B.2.12 Construction management | EstQF Level 6 |
| <p>Performance indicators:</p> <ol style="list-style-type: none"> 1. observes the competence restrictions of construction management (see Annex 1); 2. estimates the volume of construction work based on the project and requests a quote for the necessary materials, equipment and contractor work; 3. compiles or commissions a project for completing specialised work (including the organisation scheme of the construction site, work safety measures and timetables) and a budget; 4. gathers the necessary resources for specialised work on the construction site; 5. organises construction work in their specialised field in accordance with occupational standards, timetables and the project's budget and following occupational health and safety requirements and environmental protection requirements; 6. commissions or compiles schematics of products, explanatory statements and other documents, making sure that they are in accordance with construction norms and quality standards; 7. organises documentation (e.g. completed work, measuring and testing acts, implementation schematics, equipment and material documentation and maintenance and user manuals) as required; 8. organises quality control to assess compliance with construction norms and quality requirements before the transfer of the construction site. | |
| B.2.13 Owner's supervision | EstQF Level 7 |
| <p>Performance indicators:</p> <ol style="list-style-type: none"> 1. follows the competence restrictions pertaining to owner's supervision; 2. assesses the compliance of the design documentation forming the basis for construction with applicable legislation; 3. checks whether construction work is in accordance with the construction project for which the construction permit was issued; 4. verifies that environmental and occupational safety regulations and maintenance requirements are followed in areas related construction in their area of specialisation; 5. verifies the existence of construction documents drafted during construction activities and their proper and timely drafting, presentation and revision; 6. verifies the compliance of the documentation of the technical system or network being installed with requirements and on the basis of the documents submitted their compliance with requirements and accordance with the construction project; 7. notifies clients of any deficiencies identified in the course of owner supervision. | |

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| B.2.14 Organising equipment operations | EstQF Level 7 |
| <p>Performance indicators:</p> <ol style="list-style-type: none"> 1. compiles maintenance plans and operation plans for technological networks and systems in accordance with the use and maintenance manuals provided by the manufacturer; 2. supervises and assesses the progress of technological processes (gas, district heating, refrigeration, etc.); 3. manages technological networks and systems in accordance with operation manuals, assesses potential risks involved in operating them; 4. checks the compliance of energy devices and systems with standards, normative documents and technical requirements, as well as operating readiness; 5. manages the maintenance, regulation and upkeep of technological networks and systems in their area of specialisation, following appropriate maintenance manuals; 6. organises the elimination of faults in technological networks and systems, offers solutions to problems related to potential deviations; 7. systematises and documents operation and management activities in a format that can be reproduced. | |

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 | 07-01112018-1.1.2/6k |
| 2. Occupational qualification standard compiled by: | Eimar Jõgisu, Nomine Consult OÜ Aleksander Iivanainen, Inspecta Estonia OÜ Toomas Rähmonen, Termopilt OÜ (Skype) Kauri Koster, Adven Eesti AS, Eesti Soojustehnikainseneride Selts Riho Pilv, Cooltec OÜ Andres Siirde, Tallinna Tehnikaülikool Igor Krupenski, Heatconsult OÜ Vladislav Mašatin, AS Utilitas Tallinn Aleksei Lebedev, Eesti Mereakadeemia Imre Soorand, Eesti Külmalülit |
| 3. Occupational qualification standard approved by: | Energy, Mining and Chemical Industry |
| 4. No. of decision of Sectoral Council | 12 |
| 5. Date of decision of Sectoral Council | 01.11.2018 |
| 6. Occupational qualification standard valid until | 29.03.2023 |
| 7. Occupational qualification standard version no. | 6 |
| 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 Thermal Energy Engineer, EstQF Level 7 |
| C.3 Annexes | |
| Lisa 1 Competence restrictions concerning occupations | |
| 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](#)