

OCCUPATIONAL QUALIFICATION STANDARD

Diploma Engineer in Hydrotechnical Engineering, 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)
Diploma Engineer in Hydrotechnical Engineering, EstQF Level 7	7

Part A DESCRIPTION OF WORK

A.1 Description of work

An engineer in hydrotechnical engineering acts as a specialist in the design, construction, expansion and reconstruction of hydrotechnical facilities and related installations, as well as in their demolition. The main task of an engineer in hydrotechnical engineering is developing engineering and technological solutions and implementing project solutions with regard to social, economic and ethical aspects, environmental protection and occupational health and safety. An engineer in hydrotechnical engineering cooperates with specialists from related fields.

The following occupational qualification standards have been developed in the profession of engineer in hydrotechnical engineering:

- Engineer in Hydrotechnical Engineering, Level 6
- Certified Engineer in Hydrotechnical Engineering, Level 7
- Chartered Engineer in Hydrotechnical Engineering, Level 8

Diploma Engineer in Hydrotechnical Engineering, EstQF Level 7 is a specialist who is responsible for the results of both their own work and that of their team.

To obtain the qualification of Certified Engineer in Hydrotechnical Engineering, Level 7, at least one of the following occupations must be chosen:

- a) compiling building design documentation for a hydrotechnical facility
- b) managing construction operations
- c) managing construction
- d) performing owner's supervision
- e) performing expert analysis on building design documentation for a hydrotechnical facility
- f) conducting audits of hydrotechnical facilities
- g) providing maintenance and operation services
- h) managing design work¹

The occupational qualification of Diploma Engineer in Hydrotechnical Engineering, EstQF Level 7 entitles the bearer, on a statutory basis, to act as a competent person independently and at their own risk within the limits described as follows:

I CONSTRUCTION and CONSTRUCTION MANAGEMENT OF A HYDROTECHNICAL BUILDING SUBJECT TO A BUILDING PERMIT

- a) hydrotechnical structures with a standard design and with an expansion height up to 14 m
- b) bridge attached to an embankment or other hydrotechnical structure which is not used by the public and which has a load-bearing opening up to 8 m
- c) buildings of geotechnical categories² 1, 2 and 3
- d) roads, squares or transport facilities belonging to a hydrotechnical installation which are not used by the public
- e) land improvement facilities
- f) small inland ports

II PREPARATION OF A CONSTRUCTION PROJECT FOR A HYDROTECHNICAL BUILDING SUBJECT TO A BUILDING PERMIT

- a) hydrotechnical structures with a standard design and with an expansion height up to 8 m
- b) bridge attached to an embankment or other hydrotechnical structure which is not used by the public and which has a load-bearing opening up to 6 m
- c) buildings of geotechnical categories² 1 and 2
- d) roads, squares or transport facilities belonging to a hydrotechnical installation which are not used by the public
- e) land improvement facilities
- f) small inland ports

III OWNER'S SUPERVISION

- a) hydrotechnical structures with a standard design and with an expansion height up to 8 m
- b) bridge attached to an embankment or other hydrotechnical structure which is not used by the public and which has a load-bearing opening up to 6 m
- c) buildings of geotechnical categories² 1 and 2
- d) roads, squares or transport facilities belonging to a hydrotechnical installation which are not used by the public
- e) land improvement facilities
- f) small inland ports

IV MAINTENANCE AND OPERATION

- a) hydrotechnical structures with a standard design and with an expansion height up to 14 m
- b) bridge attached to an embankment or other hydrotechnical structure which is not used by the public and which has a load-bearing opening up to 8 m
- c) buildings of geotechnical categories² 1, 2 and 3
- d) roads, squares or transport facilities belonging to a hydrotechnical installation which are not used by the public
- e) land improvement facilities
- f) small inland ports

V EXPERT ANALYSIS OF HYDROTECHNICAL FACILITY DESIGN DOCUMENTATION

VI HYDROTECHNICAL FACILITY AUDITS

VII DESIGN MANAGEMENT¹

The restrictions on the professions providing expert analysis of hydrotechnical engineering construction projects, audits of hydrotechnical facilities and design project management are analogous to those applicable to the preparation of construction projects of hydrotechnical structures subject to a building permit.

¹ Design management refers not to the management of a narrow speciality but to project management for an entire design project

² According to EVS-NE 1997-1:2006

A.2 Tasks

A.2.1 Mandatory competences of hydrotechnical engineer

1. Following the requirements of professional ethics
2. Professional self-improvement
3. Participating in teamwork and managing a team
4. Applying the principles of environmental protection and energy efficiency
5. Applying specialised knowledge to work
6. Digital competence and language skills

Elective areas of work

A.2.2 Compiling building design documentation for a hydrotechnical facility

1. Compiling the design project within the limits of competence provided by the occupational qualification level
2. Collecting and analysing source data
3. Selecting, calculating and dimensioning the scheme and type of the solution
4. Identifying stream beds and mass flow rates
5. Compiling the explanatory letter

6. Cooperating with the design team
7. Finalising design documentation for a hydrotechnical facility
8. Compiling hydrotechnical facility demolition documentation
9. Compiling hydrotechnical facility maintenance and operation instructions
10. Performing designer's supervision

A.2.3 Managing construction operations

1. Managing construction operations within the limits of competence provided by the occupational qualification level
2. Compiling tenders
3. Planning construction operations
4. Planning construction resources
5. Organising subcontractor procurements and entering into contracts
6. Procuring construction supplies
7. Organising construction operations during construction
8. Organising quality control and surveying
9. Preparing construction site transfer documentation
10. Arranging the transfer of the construction site

A.2.4 Managing construction

1. Managing construction within the limits of competence provided by the occupational qualification level
2. Conducting needs assessment surveys
3. Preparing procurements and compiling procurement documentation
4. Planning the building life cycle
5. Performing construction cost calculations
6. Preparing design work and organising work
7. Selecting designers and preparing contracts
8. Preparing for construction work
9. Preparing tender documentation
10. Selecting subcontractors
11. Coordinating the construction process as the client's representative
12. Transferring the construction site and taking it into use
13. Overseeing warranty-period procedures

A.2.5 Performing owner's supervision

1. Performing owner's supervision within the limits of competence provided by the occupational qualification level
2. Developing a supervision programme
3. Verifying the compliance of the design project with requirements
4. Verifying the compliance of construction work with the contract
5. Performing and assessing quality control
6. Verifying compliance with safety requirements
7. Verifying required documentation
8. Accepting the building
9. Distributing information
10. Making proposals

A.2.6 Expert analysis of building projects

1. Conducting expert analysis of a construction project within the limits of competence provided by the occupational qualification standard
2. Familiarising themselves with the project, collecting and analysing source data
3. Determining the volumetric accuracy of the design project
4. Determining the compliance of project solutions with their purpose and requirements
5. Compiling an expert analysis report

A.2.7 Conducting audits of hydrotechnical facilities

1. Conducting facility audits within the limits of competence provided by the occupational qualification level
2. Familiarising themselves with the system, collecting and analysing source data
3. Organising additional studies and tests

4. Performing control calculations and additional measurements
5. Compiling an audit report

A.2.8 Providing maintenance and operation services

1. Providing maintenance and operation services within the limits of competence provided by the occupational qualification level
2. Compiling maintenance and operating instructions
3. Identifying impact on the facility
4. Compiling the terms of reference for the reconstruction project

A.2.9 Managing design

1. Preparing the design contract
2. Assembling the design team
3. Organising the exchange of information
4. Coordinating design and managing quality
5. Arranging designer's supervision

A.3 Work environment and specific nature of work

Civil engineers work both indoors and outdoors. The workload may be distributed unevenly.

A.4 Tools

In addition to conventional office equipment and software, special computing programmes and equipment (measuring and marking tools etc.) are used.

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

Engineering requires analytical abilities, accuracy, spatial imagination, creativity, independence, decision-making, adaptability and communication, leadership and cooperation skills.

A.6 Professional preparation

A diploma engineer in hydrotechnical engineering generally holds a Master's degree or an equivalent five-year integrated higher education diploma in the field of hydrotechnics within the meaning of Government of the Republic regulation no. 312 of 25 October 2004, 'Framework requirements for medical training, veterinary training, pharmacist training, dentistry training, midwifery training, nursing training, architectural studies and civil engineering studies'. In addition, vocational and professional work experience and in-service training are required in the prescribed amount according to the occupational qualification level being applied for. All requirements are described in detail in the procedure for granting occupational qualifications and its annexes.

A.7 Most common occupational titles

project manager, site manager, designer, supervisor, consultant, expert

A.8 Regulations governing profession

Building Code and its relevant implementing acts.
Other professional standards, guidelines and norms.

Part B COMPETENCY REQUIREMENTS

B.1 Structure of occupation

To obtain the qualification of Diploma Engineer in Hydrotechnical Engineering, EstQF Level 7, mandatory competence B.2.1 and at least one optional competence from B.2.2-B.2.9 must be certified.

B.2 Competences

MANDATORY COMPETENCES

B.2.1 Mandatory competences of hydrotechnical engineer	EstQF Level 7
<p>1. Is guided in their work and occupational activities by generally accepted personal and occupational ethics (see Annex 1 – Engineer's professional ethics). Acts in accordance with agreements and takes responsibility for their decisions and actions. Respects and takes into account the best practice and standards underlying the behaviour of specialists in other occupational sectors.</p> <p>2. Keeps up to date on technological changes and developments in the sector and contributes to the development of engineering culture directed at innovation and creativity, where possible.</p> <p>Maintains and develops occupational competence through constant self-improvement. Acquires new techniques and methodologies.</p> <p>3. Actively contributes to teamwork in a result-oriented manner with the goal of achieving the best possible result. Is helpful and open, sharing knowledge and experience with their colleagues. Perceives their role in a team and is able to work in a multidisciplinary team.</p> <p>Leads and organises the work of working groups: delegates tasks and responsibility, verifies implementation of agreements, motivates and advises colleagues and solves problems and conflicts that may arise in the work process.</p> <p>4. Is guided by the principles of environmental preservation and sustainable development, keeps up to date on and implements the principles of energy efficiency in their activities.</p> <p>5. Implements knowledge of engineering on the level necessary to accomplish duties that are within the limits of their competence and to find functioning and optimal solutions to any problems that may occur. Possesses and uses to the necessary extent, in addition to the basics of natural sciences, professional disciplines of engineering, including engineering geology/hydrogeology, soil mechanics, statics, dynamics, mechanics of materials, structural mechanics, materials science, concrete structures, metal structures, timber structures, land improvement, hydrotechnical structures and environmental protection (water conservation), hydraulics, hydrology and hydrometry, etc.</p> <p>6. Uses a computer on a daily basis for information-processing, safety, communication, content creation and problem-solving at the Independent user level (see Annex 2 – Scale of self-assessment in digital competence). Uses the specialty-specific software solutions, programmes and information technology tools necessary for work.</p> <p>Uses Estonian in their work and in preparing documents at the B2 level (see Annex 3 – Language skills level descriptions) and at least one foreign language at the B1 level. Uses correct occupational terminology.</p>	

OPTIONAL COMPETENCES

To obtain the qualification at least one optional competence from B.2.2-B.2.9 must be certified.

B.2.2 Compiling building design documentation for a hydrotechnical facility	EstQF Level 7
<p>1. Compiles building design documentation for hydrotechnical facilities within the limits of competence of Certified Engineer in Hydrotechnical Engineering, Level 7 as listed in the A.1 description of work in the occupational qualification standard. Completes the tasks allocated to them, working as a member of a team under the guidance and responsibility of a colleague with a higher occupational qualification level when preparing design documentation that exceeds the limits of their competence.</p> <p>2. Collects and examines source data and determines applicable legal acts, standards, rules and instruction materials. Determines and analyses factors that have an impact on the facility (e.g. constant and variable loads, hydrostatic and dynamic loads, service life, environmental impact and foundation conditions). Prepares the terms of reference for additional surveys (e.g. geotechnical and hydrotechnical surveys), where necessary.</p> <p>3. Selects the basic scheme and type (material) of the solution, calculates and dimensions the structures of the facility, flow openings and rates, filtration, the control units of the foundation of the facility and the flow bed. Designs internal water bodies, their remediation and restoration, plans water protection and waste management activities and facilities, including land development and irrigation. Formulates calculation results.</p> <p>4. Determines the solutions of the facility based on source data (the intended purpose of the facility, quality grade, lifespan, environmental impact, etc.) and the overall project.</p> <p>5. Compiles an explanatory note according to the stage of design.</p> <p>6. Cooperates with the parties involved in the project, participates in design and expert assessment meetings, etc.</p>	

7. Prepares the final design of the hydrotechnical facility (textual and graphic part) according to the stage of design. Compiles production drawings, where necessary (reinforced concrete, steel and timber elements). Is able to use building information modelling (BIM).
8. Prepares a demolition project for a hydrotechnical facility, where necessary.
9. Compiles hydrotechnical facility maintenance and operation instructions, where necessary, taking the facility's intended lifespan into account.
10. Performs supervision during construction activities and provides consultation on project-related issues. Participates in the handover of the completed facility to the client, where necessary.

B.2.3 Managing construction operations

EstQF Level 7

1. Manages construction operations within the limits of competence of Certified Engineer in Hydrotechnical Engineering, Level 7 as listed in the A.1 description of work in the occupational qualification standard. Completes the tasks allocated to them, working as a member of a team under the guidance and responsibility of a colleague with a higher occupational qualification level when doing work that exceeds the limits of their competence.
2. Examines design and procurement documentation and other relevant materials. Evaluates the volume of the tender based on the construction project and requests a quote for the necessary materials, equipment and subcontracting work. Determines potential administrative costs, profits and the level of risk and provides a tender. Completes and formulates the final tender.
3. Enters into the construction contract. Compiles a plan for construction work (incl. work safety measures and a work schedule) and a goal budget. Commissions the work project if no such project has been prepared.
4. Supplies the construction site with the necessary resources (mechanisms, materials, workforce, energy, etc.). Determines the tasks and extent of responsibility of each member of the site management team.
5. Arranges for the procurement of the necessary building materials, equipment, means of transport, construction mechanisms and contractors and enters into contracts.
6. Orders or creates product sketches, ensuring their compliance with construction norms and quality requirements. Procures and/or orders the necessary construction products, organises their reception and storage.
7. Organises and coordinates construction work in accordance with the goal budget of the project. Is able to use building information modelling (BIM). Ensures compliance with occupational health and safety requirements, environmental safety regulations and the general upkeep of the construction site. Constantly ensures the proper documentation of construction work (incl. acts of work to be covered), the compliance of construction work with the contract and design and the fulfilment of construction norms and quality requirements. Conducts construction consultations, if necessary.
8. Organises quality control to assess compliance with construction norms and quality requirements and the performance of the necessary surveying work before the transfer of the construction site.
9. Compiles or orders the documentation necessary for the transfer of the construction site, incl. performance sketches, documentation for equipment and materials and instructions for maintenance and use.
10. Arranges for the transfer of the construction site.

B.2.4 Managing construction

EstQF Level 7

1. Manages construction operations within the limits of competence of Certified Engineer in Hydrotechnical Engineering, Level 7 as listed in the A.1 description of work in the occupational qualification standard. Completes the tasks allocated to them, working as a member of a team under the guidance and responsibility of a colleague with a higher occupational qualification level when doing work that exceeds the limits of their competence.
2. Carries out a needs assessment survey to clarify the source data of the project (planning, environmental impact, intended purpose, service life, temporal and volumetric purpose of the facility, requirements of the project, etc.). Compiles the technical part of the project implementation decision based on the needs assessment survey.
3. Examines the initial conditions (construction and environmental surveys, technological solution, functional and operational quality requirements, etc.) and prepares the procurement or compiles procurement documentation.
4. Compiles a schedule for construction work based on their technological processes.
5. Prepares a financial plan for construction work based on the estimated cost of construction, general and personalised cost calculations and time and payment schedules and taking into account the need for self-financing and the conditions presented in the procurement documentation.
6. Formulates the principles of carrying out the construction project and plans the organisational scheme of the project. Plans the necessary permit activities, prepares a schedule for carrying out the project and the division of project contractors. Compiles a design programme.
7. Selects designers and prepares design contracts.

8. Determines the principles of organisation of construction work incl. labour methods and distribution. Compiles the organisational scheme of construction work.
9. Formulates the time- and cost-related goals of construction work and prepares tender documentation based on these goals.
10. Selects the necessary contractors and enters into contracts with them if corresponding agreements have been made.
11. Coordinates construction work as a representative of the customer: communicates with contractors, the design team and the customer, holds meetings and discussions, exchanges information between the parties involved, processes additional work due to changes made to the project during construction work and monitors the compliance of the construction work with the design.
12. Carries out inspections. Plans and manages acceptance procedures, ensures the availability of necessary operating and maintenance instructions and other documentation and their handover to the client or user.
13. Conducts warranty-period procedures.

B.2.5 Performing owner's supervision

EstQF Level 7

1. Performs owner's supervision within the limits of competence of Certified Engineer in Hydrotechnical Engineering, Level 7 as listed in the A.1 description of work in the occupational qualification standard. Completes the tasks allocated to them, working as a member of a team under the guidance and responsibility of a colleague with a higher occupational qualification level when doing work that exceeds the limits of their competence.
2. Compiles a programme of supervision procedures, bearing in mind relevant legislation.
3. Assesses the compliance of the design documentation forming the basis for construction with applicable legislation and the construction design on the basis of which a construction permit was issued.
4. Monitors the compliance of construction activities with the conditions and quality agreed upon by the construction company and the owner of the building.
5. Monitors the compliance of the structure or parts thereof under construction with the construction project and the compliance of work to be covered and as-built drawings with requirements, reality and the construction project. Is able to use building information modelling (BIM). Monitors the correspondence of the real situation to the data of the environmental, hydrotechnical and/or geotechnical surveys on which the construction project was based.
6. Monitors compliance with environmental and occupational safety and maintenance requirements in the area involving construction.
7. Verifies the existence of construction documents drafted during construction activities and their proper and timely drafting, presentation and revision. Monitors the validity of the documentation of the construction products, materials and equipment permanently installed in the facility and, on the basis of the submitted documents, the validity and compliance with the construction project of the construction product, materials and equipment.
8. Assesses the stage of completion of the facility and participates in the handover of the facility of part thereof.
9. Notifies the relevant persons or agencies of any deficiencies identified in the course of owner's supervision.
10. Proposes additional quality control, measurements, tests and expert analyses of construction work, if necessary.

B.2.6 Performing expert analysis on building design documentation for a hydrotechnical facility

EstQF Level 7

1. Conducts expert analysis of the construction project of a hydrotechnical facility within the limits of competence of Certified Engineer in Hydrotechnical Engineering, Level 7 as listed in the A.1 description of work in the occupational qualification standard. Completes the tasks allocated to them, working as a member of a team under the guidance and responsibility of a colleague with a higher occupational qualification level when doing work that exceeds the limits of their competence.
2. Examines the project, determines applicable legislation, standards, rules and instruction materials. Verifies the compliance of the project with the primary task and the associated normative and instruction materials. Verifies the compliance of the people compiling the project with competence requirements.
3. Defines and analyses factors that have an impacts on the facility (constant and variable loads, service life, environmental impacts, geotechnical and hydrotechnical conditions, etc.).
4. Performs the necessary control calculations and/or verifies the calculations and calculation schemes of the designer, assessing the validity of the technical solutions implemented. Assesses whether the stability, safety and economy of the system or its parts presented in the project documentation serve the intended purpose.
5. Conducts expert analysis of design projects in accordance with legal requirements within the limits of their competence, participates in expert analysis meetings. Assesses the corrected project within the limits of their competence, if necessary.

B.2.7 Conducting audits of hydrotechnical facilities	EstQF Level 7
<p>1. Conducts audits of a hydrotechnical facility within the limits of competence of Certified Civil Engineer, Level 7 as listed in the A.1 description of work in the occupational qualification standard. Completes the tasks allocated to them, working as a member of a team under the guidance and responsibility of a colleague with a higher occupational qualification level when doing work that exceeds the limits of their competence.</p> <p>2. Performs initial visual inspection and collects the information needed for the auditing of the facility (construction project, measurements, surveys, photographs, etc.).</p> <p>3. Compiles a programme for and estimates the cost of further research and audits based on the goal within the limits of their competence and carries out or organises the carrying out of the necessary research and tests.</p> <p>4. Examines existing and procured documents and additional research reports, performs the necessary control calculations and additional measurements within the limits of their competence.</p> <p>5. In accordance with the goal of the audit, prepares within the limits of their competence a statutory audit report assessing whether the facility complies with the documentation prepared for the structure and is technically in order; in the case of in-service inspection, whether the operation of the structure for the intended purpose and in the intended manner is safe (including environmental safety); in the case of documentation examination, whether the proper documentation prepared for the structure and at least necessary for the safe operation and maintenance of the facility is available.</p> <p>In the absence of such documents, determines and records the current situation and organises the drafting of the necessary documents.</p>	
B.2.8 Providing maintenance and operation services	EstQF Level 7
<p>1. Maintains and operates a hydrotechnical facility within the limits of competence of Certified Engineer in Hydrotechnical Engineering, Level 7 as listed in the A.1 description of work in the occupational qualification standard. Completes the tasks allocated to them, working as a member of a team under the guidance and responsibility of a colleague with a higher occupational qualification level when doing work that exceeds the limits of their competence.</p> <p>2. Compiles hydrotechnical facility maintenance and operation instructions.</p> <p>3. Defines and analyses factors that have an impacts on the facility (constant and variable loads, service life, environmental impacts, geotechnical and hydrotechnical conditions, etc.).</p> <p>4. Where necessary, prepares the terms of reference for the compilation of a full-scale reconstruction project or a partial restoration project (concerning individual structures) of a hydrotechnical facility.</p>	
B.2.9 Managing design	EstQF Level 7
<p>1. Performs design management activities within the limits of competence of Certified Engineer in Hydrotechnical Engineering, Level 7 as listed in the A.1 description of work in the occupational qualification standard.</p> <p>2. Collects and examines source data, determines applicable regulations, standards, rules and instruction materials. Estimates the amount and limits of work, prepares and clarifies the work schedule, where necessary, and prepares the design contract(s).</p> <p>3. Assembles a design team, involving relevant contractors and specialists.</p> <p>4. Organises and carries out design meetings, documents decisions and develops and establishes principles of information exchange. Is able to use building information modelling (BIM).</p> <p>5. Leads and monitors the design process and solutions and verifies the integrity of the design documentation and the compatibility of its parts. Controls data exchange and collaboration between the general construction and other specialties involved in the project. Documents changes and additional work that occur in the course of design. Verifies the compliance of solutions with the primary task and contract and the compatibility between individual parts of the design documentation. Formulates the design documentation, applies for approval from the relevant authorities and arranges the transfer of the project to the customer.</p> <p>6. Organises designer supervision during the construction process.</p>	

Part C

GENERAL INFORMATION AND ANNEXES

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	22-14112023-4.11/12k

2. Occupational qualification standard compiled by:	Heiki Meos, EstKonsult OÜ Ants Raja, Ants Raja Ehituskorraldus FIE Andres Piirsalu, OÜ Entec Eesti Andres Piir, Projektbüroo KODA OÜ Peeter Parre, IB Aksiaal OÜ Aleksander Grünstam, Allux SG OÜ
3. Occupational qualification standard approved by:	Architecture, Geomatics, Construction and Real Estate
4. No. of decision of Sectoral Council	50
5. Date of decision of Sectoral Council	14.11.2023
6. Occupational qualification standard valid until	13.11.2025
7. Occupational qualification standard version no.	12
8. Reference to International Standard Classification of Occupations (ISCO 08)	2142 Civil Engineers
9. Reference to European Qualifications Framework (EQF)	7
C.2 Occupational title in foreign language	
English:	Diploma Engineer in Hydrotechnical Engineering, EstQF Level 7
C.3 Annexes	
Lisa 1 Engineers' professional ethics and code of conduct	
Lisa 2 Scale of self-assessment in digital competence	
Lisa 3 Language skills level descriptions	