STANDARD OF QUALIFICATION

Standard of qualification is a document describing the qualification and stating the requirements for competence for the one applying for or decertifying the qualification.

Name of the qualification	Level in Estonian qualification framework (EKR = EQF)
Diploma engineer	7

Speciality
Engineering of buildings and structures

Sub-specialities	Occupation
Engineering of buildings and structures	**Design** **Design management** **Site supervision** **Construction management** **Construction project management** **Construction cost evaluation**
Design and construction of waterfront structures	
Geotechnical engineering	**Design** **Geotechnical investigation** **Geotechnical site supervision** **Geotechnical management**

An applicant can be issued the qualification of a diploma engineer in several sub-specialities and professions.

Full list of specialities, sub-specialities and occupations of a civil engineer of buildings and structures is brought in **appendix 1.**

Qualification obtained based on the present standard of qualification is valid for 5 years.

A person holding a master's degree in engineering of buildings and structures, or who has finished corresponding integrated studies, is given the primary diploma engineer qualification, which is then stated on the diploma supplement if the curriculum meets the following parts of the standard of qualification for a diploma engineer:

- Skills and knowledge (appendix 5)
- Attitudes necessary for an engineer (B 2.3)

The curriculum has to be recognised nationwide.

Holder of the primary qualification may work in the field of engineering of buildings and structures if supervised by a specialist holding the qualification of a diploma or chartered civil engineer of buildings and structures.

While obtaining the primary qualification practical experience is not mandatory, which is why occupations are not defined. Primary qualification is termless.

Part A
PROFILE OF THE QUALIFICATION

A.1 Job description

Constructional engineers are middle or top level managers or specialists of a more specific profession when designing, building, extending, reconstructing, demolishing or restoring a building or a construction. Civil engineers of buildings and structures are responsible for developing constructional solutions and executing design conceptions considering social, financial, ecological, job safety and ethical aspects.

The standard of qualification includes the occupation's description and requirements for Level 7 diploma engineer.

General description for all professional levels of civil engineers of buildings and structures is brought in **appendix 2.**

Diploma engineer (EKR Level 7) works independently in difficult and unforeseeable situations, taking responsibility for the outcome of the work done by him and by working groups. Filling the tasks also involves distributing the resources and managing others' work.

Diploma engineers working in engineering of buildings and structures specialise in building construction, design and construction of waterfront structures or geotechnical engineering.

A.2 Elements of the job

The elements and tasks of the job of diploma engineers in the field of engineering of buildings and structures are brought separately by specialities and occupations listed on the first page. Corresponding list of job elements and tasks is in **appendix 3.**

A.3 Job environment and speciality

Civil engineers of buildings and structures work both indoors and at outdoor sites.

Work load may be uneven.

A.4 Devices needed

In addition to usual office equipment and software, special calculation programs and tools (marking and measuring instruments etc.) are used.

A.5 Personal characteristics necessary for the job

The job of an engineer expects a person to be with analysing skills, precise, with spatial imagination skills, creative, independent, with decision making skills, adaptable and willing to communicate, lead and cooperate. Depending on the occupation and its job elements and tasks (**appendix 3**) different personal characteristics may be needed or prioritised.

A.6 Professional preparation

Diploma engineer working in the field of engineering of buildings and structures has to obtain a master's degree the least or a higher education diploma in engineering of buildings and structures that is equal with the before mentioned. An applicant obtaining an applied higher education degree in engineering of buildings and structures is required to complete his studies in university and complete additional studies, which can also be done via APEL[1)]. Minimum requirements for skills and knowledge are brought in **appendix 5.**

Applicants for the qualification have to have professional experience according to the standard of qualification applied for. Minimum requirements for work experience are brought in **appendix 6.**

Presuppositions while applying for and restating the qualification are brought in **appendix 7.** Special cases while applying for the qualification are brought in **appendix 8.**

A.7 More common job titles

Diploma engineers in the field of engineering of buildings and structures work as middle or top level managers or specialists in jobs which are titled as a designer, owner supervision executor, construction manager, site manager, consultant.

A.8 Regulations for operating at a job market

The qualification of a diploma engineer proves the person is competent to work independently in the sphere of engineering of building and structures and is capable of taking responsibility for himself in the limits of proven competency considering the legal acts regulating the construction industry. Diploma engineer's range of authorisation in the field of engineering of buildings and structures is brought in **appendix 11.**

Note: 1. APEL = Accreditation of Prior and Experiential Learning

Part B
REQUIREMENTS FOR COMPETENCY

B.1 Structure of the profession

In the field of engineering of buildings and structures the qualification of a diploma engineer is given in the following sub-specialities and professions:

Sub specialities	Professions
Building construction	Design Design management Site supervision Construction project management Construction management Construction cost evaluation
Construction of waterfront structures	
Geotechnical engineering	Designing Geotechnical investigation Geotechnical site supervision Geotechnical management

B.2 Competency required while applying for the qualification

Competency - knowledge, skills, experiences and attitudes needed to be successful in the named profession.

Diploma engineer has to have competency, which in this standard consists of three main components:

1. Skills and knowledge
2. Special and professional experience and skills
3. Attitudes necessary while working as an engineer

While applying for the qualification of a diploma engineer one should follow the presumption system requirements for engineers stated in **appendix 7.**

Should the applicant's education not meet the requirements set in the standard of qualification, it is possible to issue it on the conditions listed in **appendix 8.**

B.2.1 Knowledge and skills

The knowledge acquired via post graduate studies in engineering of buildings and structures and via integrated studies corresponding to this educational level, but also this that is acquired via under graduate or applied sciences' studies which have been added a fixed amount of university studies on post graduate level have to embrace the following fields:

1. The basics of mathematics and natural science, technical sciences related to the field of construction, graphics.
2. Special knowledge that is mainly connected with construction materials, structural mechanics, strength theory, structural physics, energy efficiency, engineering of buildings and structures and structural technology.
3. General understanding of architectural planning and design.
4. Knowledge of the design and building of buildings' engineering and utility networks.
5. General knowledge of managing processes and organisations, incl. quality management.
6. Knowledge of the basics of social and humanitarian sciences, so that engineering would be connected with social, economical, environmental and ethical aspects.
7. Knowledge of the legislation, occupational safety and organisation of work connected with the field of construction.
8. Knowledge of foreign languages in the scope that enables one to work and study in his/her field.

Minimum requirements for knowledge in different fields are brought in **appendix 5.**

Description of foreign languages' reference levels is brought in **appendix 10.**

B.2.2 Special and profession related skills and experience

According to the issuing of the professional qualification a diploma engineer has to prove his experience in the field in one or more speciality (see B.1). Possible elements of the job and tasks connected with sub-specialities are brought by professions in **appendix 3.** Diploma civil engineer of buildings and structures has to be able to fulfil most of the tasks listed.

Work experience adequacy has to be checked according to the requirements set in **appendix 6.** Professional and work related experience is calculated starting from the moment the level of education or speciality required for the profession needed is acquired.

B.2.3 Attitudes necessary for the profession of an engineer

1. **Professional ethics**

   In all of his activities an engineer follows generally accepted personal and occupational code of ethics, see **appendix 4** "Code of engineer's occupational ethics and behaviour".

2. **Readiness for cooperation**

   1. Knows how to solve conflicts, orientates quickly in a new situation, realises his role in a team.
   2. Can work in a team of a multidisciplinary project.

3. **Personal development (lifelong learning)**

   1. Is aware of technological changes and contributes to the development of engineering culture directed to innovation and creativity.
   2. Conserves and improves his level of competency through continuous occupational development, see **appendix 9** "Consideration of the continuous professional development of engineers".

4. **Environmental performance**

   1. All his activities dwell on an attitude that is environmentally sustainable;
   2. In all of his activities he applies the principles of energy efficiency.

B.2.4 Assessment of competency

An applicant's suitability is assessed in complex according to the documents presented to the profession's committee according to "The procedure of issuing the profession of construction engineering", his competency is regarded as a whole. When assessing the knowledge of a construction engineer the principle that he has acquired the knowledge in his studies and has used most of it in practice, and that if necessary is capable of restoring and amending them is followed.

C.1. Information about the composition and affirmation of the standard, about the issuer of the

profession and a reference of the location of the professional standard in classificators.

C.1. Information about the composition and affirmation of the standard, about the issuer of the profession and a reference of the location of the professional standard in classificators.	
1. Marker of the professional standard in the registry of profession (code of the profession)	
2. Names of the professions	Primary qualification of a civil engineer, level 6 qualification Civil engineer, level 6 qualification Primary qualification of a diploma civil engineer, level 7 qualification Diploma civil engineer, level 7 qualification Chartered civil engineer, level 8 qualification
3. Similar professions	Highway engineer Heating, ventilation and air-conditioning engineer Water supply and sewerage engineer Hydrotechnical engineer Architect
4. People and organisations involved in the composition of the standard of qualification	Riho Oras — Estonian Association of Civil Engineers Heiki Meos — Estonian Association of Architectural and Consulting Engineering Companies Andres Piirsalu — Estonian Association of Water supply and Wastewater Engineers Tiit Metsvahi — Tallinn University of Technology Tiit Kerem — Estoanian Society of Heating and Ventilation Engineers Margus Sarmet — Ministry of Economic Affairs and Communications Siim Idnurm — Tallinn University of Technology Valdo Jaaniso Irene Lill Aleksander Klauson Tiit Koppel Jaan Miljan — Estonian University of Life Sciences Ivo Roolaht Jüri Tamm — TTK University of Applied Sciences Ants Raja — Estonian Association of Civil Engineers Aare Neudorf — Estonian Association of Construction Entrepreneurs Janne Kurg — Estonian Technical Surveillance Authority Erki Laimets — Estonian Association of Civil Engineers
5. Approver of the standard of qualification (name of the professional council)	Council of professional engineers
6. Number of the decision made by the professional council	
7. Date of the decision made by the professional council	
8. Validity of the standard of qualification	5 years
9. Version of the standard of qualification	First version
10. Reference to the Classifier Professions (AK 1999, ISCO 88)	214
11. Reference to the European Qualification Framework (EQF)	7.
C.2 Name of the profession in a foreign language	
In English	Diploma Civil Engineer of Buildings and Structures

C.3	Profession specific terms used in the standard of qualification

Part-C GENERAL INFORMATION AND APPENDIXES

Domain of engineering – type of practical engineering activity. The present standard of qualification covers the field of construction.

Speciality – a field that is defined more narrowly, and the levels of preparation, necessary knowledge and skills of a specialist with the qualification of an engineer are higher. In construction there are the following specialities: engineering of buildings and structures, highway engineering, environmental and technical engineering.

Sub-speciality – a field that is defined more narrowly, and the levels of preparation, necessary knowledge and skills of a specialist with the qualification of an engineer are the highest. In civil engineering of buildings and structures there are the following sub-specialities: building design and construction, design and construction of waterfront structures and geotechnical engineering.

Occupational activity – a field of activity that is shared by engineers fulfilling similar occupational tasks. The usual way of dividing occupations in engineering is the following: developmental, productional, consultation and management activities. The list of general division of professions in the field of construction can be seen in **appendix 1.** The division of occupations of 7. level qualification of civil engineering of buildings and structures is brought on the 1st page of the standard.

C.4 Appendixes

Appendix 1	List of specialities, sub-specialities and occupational activities in the field of construction
Appendix 2	General characterisation of civil engineers of buildings and constructions' levels of qualification
Appendix 3	Parts of job and tasks
Appendix 4	Code of engineer's occupational ethics and behaviour
Appendix 5	Minimum requirements for skills and knowledge
Appendix 6	Minimum requirements for work experience
Appendix 7	Presumptions for applying for the qualifications of engineers
Appendix 8	Special cases when applying for the qualification of a diploma civil engineer of buildings and constructions
Appendix 9	Consideration of the continuous professional development of engineers
Appendix 10	Description of language reference levels
Appendix 11	Diploma engineer's range of authorisation in the field of engineering of buildings and structures

Appendix 1

LIST OF SPECIALITIES, SUB-SPECIALITIES AND OCCUPATIONAL ACTIVITIES IN THE FIELD OF CONSTRUCTION

Domain of engineering	Speciality	Sub-speciality	Occupational activity
Civil Engineering	Engineering of buildings and structures	Building design and construction	- Design [1)] - Design management [1)] - Site supervision - Construction management - Construction project management - Construction cost evaluation - Education & training engineers and research [2)]
		Design and construction of waterfront structures	
		Geotechnical engineering [3)]	- Designing [1)] - Geological survey - Site supervision [1)] - Construction management - Education & training engineers and research [2)]

Notes:
1. Is only involved in the occupational activities of the 7th and 8th qualification standards.
2. Is involved only in the occupational activities of the 8th qualification standard.
3. Qualification in geotechnical engineering that is a sub-speciality in civil engineering gives a right to work as a responsible specialist in geotechnical works in highway engineering and environmental and mechanical engineering.

Domain of engineering	Speciality	Sub-speciality	Occupational activity
Civil Engineering	Road engineering	Bridge engineering	- Design [1)] - Design management [1)] - Site supervision [1.-3)] - Construction management - Construction project management - Bridge management - Education & training engineers and research [2)]
		Highway engineering	- Design and planning [1)] - Design management [1)] - Site supervision [1.-3)] - Construction management - Construction project management - Road management - Road safety audit - Education & training engineers and research [2)]
		Railway engineering	- Design [1)] - Design management [1)] - Site supervision [1)] - Construction management - Construction project management - Education & training engineers and research [2)]

Notes:
1. Is only involved in the occupational activities of the 7th and 8th qualification standards.
2. Is involved only in the occupational activities of the 8th qualification standard.
3. Mandatory to complete a training course set by the law.

Domain of engineering	Speciality	Sub-speciality	Occupational activity
Civil Engineering	Environmental and mechanical engineering	Heating, ventilation and air conditioning	- Design [1)] - Design management [1)] - Site supervision [1)] - Construction management - Construction project management - Education & training engineers and research [2)]
		Water supply and sanitation	
		Water supply and sewerage	- Design [1)] - Design management [1)] - Site supervision [1)] - Construction management - Construction project management - Maintenance and operation - Education & training engineers and research [2)]
		Hydrotechnical engineering	

Notes:
1. Is only involved in the occupational activities of the 7th and 8th qualification standards.
2. Is involved only in the occupational activities of the 8th qualification standard.

Appendix 2

GENERAL CHARACTERISATION OF THE QUALIFICATION LEVELS OF CIVIL ENGINEERS OF BUILDINGS AND STRUCTURES

Depending on the job's difficulty, necessary special knowledge, and the degree of dependence and responsibility, the qualification levels for civil engineers of buildings and structures are divided as following:

- Primary qualification of civil engineer of buildings and constructions (EKR. level 6)
- Civil engineer of buildings and constructions (EKR level 6)
- Primary qualification of diploma civil engineer of buildings and constructions (EKR level 7)
- Diploma civil engineer of buildings and constructions (EKR level 7)
- Chartered civil engineer of buildings and constructions (EKR level 8).

Short descriptions of the before mentioned qualification levels are brought below.

Primary qualification of civil engineer of buildings and constructions

Is capable of using general and construction related technical knowledge under the supervision of a civil engineer of buildings and constructions, diploma civil engineer of buildings and constructions or a chartered civil engineer of buildings and constructions.

Civil engineer of buildings and constructions

Can work alone in difficult and unforeseeable situations. Takes the responsibility for the work outcome of himself and of his team, as well.

Primary qualification of diploma civil engineer of buildings and constructions

Is capable of using general and construction related technical knowledge under the supervision of a diploma or a chartered civil engineer of buildings and constructions.

Diploma civil engineer of buildings and constructions

Can work alone in situations that are difficult, unforeseeable or of a kind that requires innovative approach. Takes the responsibility for the work outcome of himself and of his team, as well.

Chartered civil engineer of buildings and constructions

Works as a leading specialist or project manager in situations that are difficult, unlimited and require new strategic approach. Analyses and syntheses new and difficult profession related ideas and presents them via the results of developmental and research studies, or via practical appliances. Takes the responsibility for himself and also for the planning and developing of the field of work or knowledge, or of the strategical activities of an organisation.

Appendix 3

OCCUPATIONAL ACTIVITIES

1.	**Design** [1)] A. Building design and construction	
	1A.1.	Composing a construction project
		- Gathering input data and getting acquainted with it.
		- Defining the applicable decrees, standards, rules and instruction materials.
		- Defining the forces applicable to the building (permanent and changing forces, environmental influences, subgrading conditions).
		- Choice of the building's load-bearing scheme and type (material) depending on the input data (architecture, purposeful usage of the building, quality class, life expectancy, environmental influences etc). Obtaining the approval for the choice made from the architect / principal design office / client.
		- Calculations for the load bearing constructions and dimensioning. Formatting / preserving of the calculations made.
		- Calculations and dimensioning of the surface below the construction and foundation, incl. pile width. Formatting / preserving of the calculations made.
		- Defining typical solutions for enclosure constructions (both internal and external) dependent on the input data (architecture, purposeful usage of the building, quality class, life expectancy, environmental influences etc.). Obtaining the approval for the choice made from the architect /client.
		- Composing an additional study program.
		- Composing a specification / work explanation according to the stage of the design development.
		- Considering the input data obtained during the design development (architectural solution developing in the course of work, tasks for separate parts etc.) while composing the construction project, also giving tasks to co-designers.
		- Composing the final project for the construction (text and graphics) according to the stage of the design development. This also includes composing a demolition project, should it be necessary.
		- Composing product design drawings (reinforced concrete, steel and wooden elements).
		- Taking part in design development meetings and project expertise meetings.
		- Taking part in construction meetings and carrying out author supervision
		- Composing the building construction section of the building's user manual.
		- Taking part in the acts involved when delivering the finished building to the client.
		- Planning and controlling the building's cycle of life.
		- Auditing (expertise) of the construction project.
		- Constructions' expertise [2)] (buildings' constructions and foundations).
	1A.2.	Developing [2)]
		- Composing the instructions for design development.
		- Composing algorithms for calculating.
		- Conducting company based special schooling.
	Designing [1)] B. Design and construction of waterfront structures	
	1B.1.	Composing a construction project
		- Gathering input data and getting acquainted with it.
		- Defining the applicable decrees, standards, rules and instruction materials.
		- Defining the forces applicable to the construction (dimensioning vessel, live load, environmental influences (incl. waves, currents, ice) geotechnical conditions for construction).
		- Choice of the building's load-bearing scheme and type (material) depending on the input data (building conditions, purposeful usage of the construction, quality class, life expectancy, environmental influences etc). Obtaining the approval for the choice made from the principal design office / client

		- Calculations for the load bearing constructions and dimensioning. Formatting / preserving of the calculations made.
		- Composing an additional study program.
		- Composing a specification / work explanation according to the stage of the design development.
		- Considering the input data obtained during the design development (architectural solution developing in the course of work, tasks for separate parts etc.) while composing the construction project, also giving tasks to co-designers.
		- Composing a demolition project.
		- Composing the final project for the construction (text and graphics) according to the stage of the design development.
		- Composing product design drawings (reinforced concrete and steel elements).
		- Taking part in design development meetings and project expertise meetings.
		- Taking part in construction meetings and carrying out author supervision.
		- Composing the building construction section of the construction's user manual.
		- Taking part in the acts involved when delivering the finished construction to the client.
		- Planning and controlling the construction's cycle of life.
		- Auditing (expertise) of the construction project.
		- Constructions' expertise [2)] (constructions and foundations of waterfront structures)
	1B.2	Developing [2)]
		- Composing the instructions for design development.
		- Composing algorithms for calculating.
		- Conducting company based special schooling.
	Designing [1)] C. Geotechnical engineering	
	1C.1.	Geotechnical design
		- Composing a soil investigation program.
		- Evaluating the geological conditions dependent on the data acquired from the soil study and planning the subgrading solution.
		- Calculating the general stability and load baring capacity of slopes, embankments and hollows; planning of pile sheet retaining walls.
		- Designing a drainage system.
		- Planning the thickening, improving and reinforcing of the soil.
		- Evaluating the pile's load bearing capacity.
		- Evaluating the influence of the building activities, construction made and its exploitation to the surroundings.
		- Construction's expertise [2)] (geotechnical solutions).
	1C.2.	Developing [2)]
+		- Composing the instructions for design development.
		- Composing algorithms for calculating.
		- Conducting company based special schooling.

2.	**Design management** [1]	
	2.1.	Project management
		- Gathering input data and getting acquainted with it.
		- Defining the applicable decrees, standards, rules and instruction materials.
		- Evaluating the limits and capacity of the works, setting / adjusting a time schedule and preparing the design development contract. Defining the design development team.
		- Taking part in the design development start-up meeting.
		- Arranging profession related design development meetings, setting up the documenting and information systems of the latter.
		- Permanent control and management of the course of work of design management. Supervising if necessary. Checking data exchange between building design and construction and other professions in the project (reciprocal tasks).
		- Checking the compliance between the solutions and norm documents and the contract.
		- Content and volume checking of the construction documentation made, organising formatting, copying, binding and presenting to the client (according to the stage of the design and development).
		- Obtaining coordination from applicable authorities.
		- Documenting necessary adjustments and additional works.
		- Taking part in construction start-up meeting and if necessary in the following construction meetings.
		- Taking part in the acts involved when delivering the finished construction to the client.
	2.2.	Development[2]
		- Composing project management instructions.
		- Developing a quality system.
		- Conducting company based special schooling.
3.	**Site supervision**[1]	
	3.1.	Carrying out supervision
		- Composing a supervision program.
		- Checking of the completeness of a construction project.
		- Evaluating the geodetic works related to the laying-out works of the construction.
		- Comparing real subgrading conditions to the soil data or the data acquired from geotechnical investigations that had been used when composing the construction project.
		- Checking the compliance between the construction being built and its parts and its construction project; evaluating the compliance with the conditions and quality agreed upon by the constructor and the construction's owner.
		- Checking the timely and proper filling of the construction's technical documents.
		- Making proposals for the construction quality evaluations, measuring, testing and expertises, and supervision of the mentioned.
		- Supervision of covered works and parts of construction, checking the compliance with the construction project and documentation.
		- Checking the environmental safety and maintenance of the construction being built and of its land unit.
		- Checking the observation of the occupational safety requirements.
	3.2.	Developing [2]
		- Composing algorithms for calculating.
		- Developing a quality system.
		- Conducting company based special schooling.

4.	**Construction management**	
	4.1.	Study for necessity
		- Putting requirements for solving the need for space or a technological aim.
		- Comparison between different variants for obtaining a land unit and / or rooms.
		- Preparing the technical part for the project execution decision.
	4.2	Planning a construction procurement
		- Getting acquainted with the general and detail planning related to the construction site.
		- Getting acquainted with the existing construction investigations and planning new investigations.
		- Processing a technological solution and/or room program into a constructional task.
		- Formulating functional, field of use related and quality requirements.
		- Planning the constructions energy balance according to the aim set.
		- Planning the life cycle of the construction.
		- Composing the initial cost evaluation and formulating the aimed cost.
		- Formulating the principals of carrying out the construction project and planning the organisation scheme of the project.
		- Planning the building permit activities.
		- Composing a general calendar plan.
		- Composing the constructional technical part of an investment decision.
	4.3.	Preparations for the design development
		- Gathering and analysing of the initial data needed for design development
		- Arranging design developmental works - organisational scheme, time schedule for design development, division the design works between subcontractors.
		- Composing a design development program.
		- Proceeding the choice of design developers.
		- Preparing the design development contracts.
	4.4.	Preparations for the construction activity
		- Defining the principals used for construction works arrangement - agreement method, dividing tasks between subcontractors.
		- Composing a construction works' organisation scheme.
		- Formulating the construction's time and cost related aims.
		- Preparing the documentation for the proposal.
		- Proceeding the choice of contractors.
		- Preparing the construction contracts.
	4.5.	Coordinating a construction progress as a representative of the construction client
		- Leading construction consultations.
		- Proceeding additional works and adjustments.
	4.6.	Acceptance and using of the construction
		- Inspection of general construction works.
		- Inspection of technical systems.
		- Planning and leading of the acceptance procedures of a construction.
		- Checking of the using and maintenance instructions and systemising of the mentioned for handing those to the owner or the user.
		- Procedures during the time of warranty.
	4.7.	Development [2)]
		- Composing instructions for project management.
		- Developing a quality system.
		- Conducting company based special schooling.

5.	**Construction project management**	
	5.1.	Composing the proposition for a construction
		- Analysing and defining the initial task.
		- Calculation of the capacities.
		- Inquiring for the cost of materials, applications and subcontracts, comparing and analysing them.
		- Defining the administrative costs, profit and the level of risk.
		- Composing the price for the proposition.
		- Composing and completing the documents required for the proposition.
	5.2.	Planning of the construction activity
		- Making construction employment contract.
		- Ordering or composing construction documentation, should it not exist.
		- Composing a working project (incl. organisation scheme of the construction site and a time schedule for fulfilling the work to be done).
		- Composing an aim-budget for the construction works.
		- Compiling the construction with necessary resources.
		- Appointing tasks and responsibility to the management team of the construction.
	5.3.	Managing the construction activities
		- Arranging procurement proposals for construction materials, applications, means of transportation, structural mechanisms and subcontracts, making contracts with the best bidder.
		- Assuring the construction activities are compatible with the contract and with the structural design, assuring building codes and quality requirements are met.
		- Organising and coordinating construction activities, which are in accordance with the time schedule of the works to be done, at the construction site.
		- Organising construction meetings.
		- Supervision of covered works and parts of construction and composing corresponding acts.
		- Organising the work of structural mechanisms and means of transportation.
		- Assuring organisational health and safety requirements are met.
		- Assuring the environmental safety and maintenance of the construction site.
		- Required documentation of the construction works.
		- Constantly comparing the actual construction cost with the aim-budget (financial management of the project).
		- Arranging the delivery of the construction works.
	5.4.	Management of the production of structural elements
		- Ordering or composing technical drawings of products.
		- Assuring the structural elements are compatible with the technical drawings, building codes and quality requirements.
		- Obtaining and gathering the necessary resources needed for the production of the structural elements.
		- Arranging the stocking of structural elements.
		- Arranging the delivery of structural elements.
	5.5.	Quality control
		- Checking the construction works' compatibility with the building codes and quality requirements.
		- Carrying out measuring and tests.
		- Construction's expertise [2)] (construction technology).
	5.6.	Development [2)]
		- Composing instructions for the construction process.
		- Developing a quality system.
		- Conducting company based special schooling.

6.

6.	**Evaluation the cost of the construction**	
	6.1.	Carrying out cost and profitability studies
		- Explaining the projects initial conditions.
		- Composing the evaluation for the aimed cost.
	6.2.	Composing the client's budget, cost planning
		- Analysing and specifying the projects initial data.
		- Evaluating the aimed cost of building expenses and operating costs.
		- Cost evaluations for the construction parts.
		- Comparing the costs of different solution options of the construction project.
	6.3.	Composing a construction proposal
		- Analysing and specifying the procurement documentation.
		- Choosing the most optimal technologies and methods.
		- Composing a working project (incl. organisation scheme of the construction site and a time schedule for fulfilling the work to be done).
		- Calculating the capacities.
		- Inquiring for the cost of materials, applications and subcontracts, comparing and analysing of them.
		- Defining the administrative costs, profit and the level of risk.
		- Composing the price for the proposal.
		- Composing and completing the documents required for the proposal.
	6.4.	Development [2)]
		Maintaining a database of unit prices.
		Composing instructions for calculating the cost of constructions.
		Developing a quality system.
		Conducting company based special schooling.
7.	**Geotechnical investigations**	
	7.1.	Field investigations
		- Taking soil samples.
		- Sounding, penetrating and plate bearing tests.
		- Carrying our hydrogeological investigations; groundwater measurements.
		- Evaluating the conditions of groundwater.
		- Test loading of piles.
		- Composing investigation reports: statistical analysing of the data, composing geological cuts.
	7.2.	Laboratory tests
		- Defining the physical and mechanical parameters of the soil.
		- Presenting the description and quality of soil layers, explaining the test results.
	7.3.	Analysis of settlings
		- Evaluating settlings based on field investigations and lab tests.
		- Forecasting the timely development of settlements by doing geodetical measuring.
	7.4.	Development [2)]
		- Composing instructions for design development, investigations and tests.
		- Composing algorithms for calculating.
		- Conducting company based special schooling.
8.	**Education & training civil engineers and construction related research[2)]**	
	8.1.	Schooling
		- Composing a schooling program, organising the studies.
		- Lecturer and theoretical and practical trainings, supervising projects and laboratory works.
		- Developing - composing study books and other study materials
	8.2.	Scientific or applied research
		- Planning and leading a research.
		- Doing and / or supervising a research and composing reports.
		- Using the results of a research in practice.
		- Writing academic articles and performing in public.
		- Construction expertise.

Notes: 1. Is only involved in the occupational activities of the 7th and 8th qualification standards.
2. Is involved only in the occupational activities of the 8th qualification standard.

Lisa 4

CODE OF ENGINEER'S OCCUPATIONAL ETHICS AND BEHAVIOUR

1. In his/her professional activity, Engineer is obligated to consider the effect of science and technology on mankind and the environment and not to forget his/her responsibility to society while performing his/her duties.
2. Engineer shall work and communicate in compliance with the standards of conduct accepted in European countries and pay particular attention to respecting the professional rights and the dignity of the people he/she is working with.
3. In his/her activity an engineer shall be governed by the following ethical convictions.

II Personal ethics

1. Engineer shall keep his/her professional skills at a level enabling him/her to provide work-related services in his/her speciality at the international level. He/she shall honour the laws of the country he/she is working in.
2. His/her professional qualities and integrity shall guarantee an impartial attitude towards work-related analyses, evaluations and decisions.
3. He/she shall keep all the work-related promises and information non-disclosure agreements which he/she has voluntarily made.
4. He/she shall be committed to Engineer's work and participate in the work of the EEL member organisations and other engineers' associations corresponding to his/her speciality, particularly in those events that propagate the profession of Engineer and contribute to continuous professional development.
5. He/she shall only use the titles and designations he/she is entitled to.

II Professional ethics

1. Engineer may only accept duties falling within his/her competency. If a duty requires skills and knowledge falling beyond his/her competency, he/she shall use the assistance of an expert in a corresponding speciality.
2. He/she is obligated to personally organise the performance of the duties assumed.
3. He/she shall personally ascertain the precise description of the services and works expected from him/her.
4. He/she shall do everything humanly possible to eliminate the factors hindering the performance of the duties, at the same time guaranteeing the safety of the persons, property and environment related to the work.
5. He/she shall charge a fee for the work in strict accordance with the quantity and quality of the services provided by him/her and with the responsibility related to the services. He/she shall accept no illegal payments.
6. He/she shall also have the wages of his/her colleagues and assistants correspond to the services provided by them and the responsibility borne by them.
7. He/she shall try to use modern methods and means of work, thereby promoting a high level of work and ensuring a pleasant working environment for colleagues and subordinates.

III Social responsibility

1. Engineer shall honour his/her fellow workers and their personal rights and take their requests and pursuits into account in his/her work, provided they are in compliance with the law and the work ethics;
2. Engineer shall monitor the safety and health of nature, the environment and people, and work for the benefit and welfare of mankind and for sustainable development;
3. Engineer shall provide the public with unequivocal information concerning the achievements, opportunities and plans in his/her speciality, which enables the public to correctly evaluate the effect on society of decisions related to science and technology;
4. Engineer shall have a respectful attitude towards the traditions of the country he/she is working in.

Appendix 5

MINIMAL REQUIREMENTS FOR KNOWLEDGE AND SKILLS

Field of knowledge	Subject	Minimal requirements
Mathematics	Linear algebra	- Knows the theories of vectors and vector space; - Knows the principles of solving equation systems; - Knows the theories of matrixes and determinants, and knows how to solve basic calculations using the named theories; - Knows the practical appliances of the mechanics of linear algebra;
	Mathematical analysis and differential and integral calculus	- Knows main elementary functions and knows how to analyse them; - Knows the terms of a function's limit value and continuity, and knows how to calculate simple limit values; - Knows the terms of derivative and partial derivative, knows how to find them and is able to use the methods of differential calculation to study functions with either one variable or more; - Knows the basics of the theory of differential equations; - Orientates in less complex differential equations with regular or partial derivatives, and is able to solve the easiest; - Knows the applications of differential calculus in spatial geometry; - Knows the terms of indefinite, definite and double integrals, is able to carry out basic integration techniques; - Understands the geometrical and mechanics related appliances of definite integral.

Field of knowledge	Subject	Minimal requirements
Universal nature sciences	Physics	- Knows and understands the laws, models and limits of usage of mechanics, thermodynamics, optics, electromagnetism and molecular physics; - Knows physical sizes and units, can solve the main exercises of different branches of physics; - Can use vector algebra, differential and integral calculus when analysing problems of physics and solving problems; - Knows the principles of carrying out tests in physics, can analyse the accuracy of the measuring, interpret test results and format a test report.
	Chemistry	- Can do calculations which are related with gases and fumes, preparation and treatment of liquid solutions and solid matters; - Knows the principles of corrosion treatment on metals; - Knows the principles of matching different materials regarding the possible chemical reactions on their contact surfaces.
	Informatics and programming	- Knows the general principles, methods, means and main developmental phases of creating information technology applications; - Knows how to use the possibilities of table calculation programs when solving the problems of an engineer; - Can compose time schedules by using corresponding widespread programs; - Knows at least one necessary programming language in order to make more difficult engineering calculations and knows how to create simple programs; - Knows the basics of the information models of construction.

Field of knowledge	Subject	Minimal requirements
Arts	Foreign language	- Has acquired at least level B2 in one working language (English, French or German) of European engineering organisations (see appendix 10).
	Estonian and ease of expression	- Uses correct Estonian and professional terminology in Estonian in both speaking and writing; - Can compose and present different types of presentations; - Knows the basics of composing common and technical documents; - Can compose structural engineering texts which language is correct.
Social sciences	Philosophy	- Can orientate in the main developmental phases of western philosophy; - Knows the general terms of philosophy and the main standing points of the philosophers of different eras; - Has experience in reading original texts of philosophers and understands the content and discussion logic of the latter; - Understands what philosophical argumentation is and is able to dispute and put through arguments on philosophical basis.
	Law	*NB! See legislation and regulation of the field of construction under "construction production"*
	Psychology	- Knows the principles of managerial psychology and knows how to use them.
	Environmental protection and sustainable development	- Knows the initials of main environmental problems and main principal positions of their sustainable solving; - Understands the connections between environmental and social processes and can use his knowledge to raise and solve joint problems of environmental protection, economics and sociality.

Field of knowledge	Subject	Minimal requirements
Graphics	Descriptive geometry	- Knows the terms of descriptive geometry and the solutions of the latter, can formulate and read technical drawings; - Can derive plane images from 3D objects; - By using different methods of imaging can depict different technical objects on a plane.
	Technical and constructional drawing	- Knows the rules of formulating technical drawings; - Knows how to put the volumes of images, tolerances, connection and surface features on a technical drawing; - Knows how to construct shades; - Knows the methods of deriving perspective; - Can hand sketch different elements of mechanical engineering and assemblies of building constructions; - Knows how to use any widespread technical drawing software.

Field of knowledge	Subject	Minimal requirements
General technical science related with the field of construction	Hydraulics	- Knows the main laws of hydrostatics and knows how to apply them while solving practical problems; - Knows how to interpret the hydrostatic equation; - Knows the main principles of the theory analysing the flow of liquids and understands practical problems related with flowing liquids; - Knows how to evaluate the influence of different flow resistances and based on that hydraulically calculate less complex piping; - Knows the working principles of pumps of different types and can practically determine working parameters of a pump. **Additional for the sub-speciality of design and construction of waterfront structures** - Knows about the diffusion of waves and waves' influence on waterfront structures; - Knows the characteristics of a flow in open beds; - Knows the hydraulics of overflow weirs; - Knows the factors influencing the formation of beaches and the progress of coastal processes: - Can evaluate human influence on the balance of beach processes;

Field of knowledge	Subject	Minimal requirements
	Geotechnics	- Knows the characteristics of soil formation; - Knows the characteristics of main soil types and knows what are the possibilities of defining them; - Knows the main types of soil and their structural geological characteristics in Estonia; - Knows the types of structural geology investigation and the subject of the parameters defined by them. **Additional for the sub-speciality of geotechnical engineering** - Knows how to compose a program of geotechnical investigations; - Knows how to plan and conduct field and laboratory studies and how to analyse the obtained test results according valid requirements; - Knows instructional materials related to geotechnical investigations.
	Electrical engineering	*NB! See buildings' electrical installation, construction site's electrification and building's automatics under "Techno systems"*
	Geodesy	- Knows how to solve direct and inverse geodetic problems; - Knows how to use a theodolite for measuring horizontal and vertical angles; - Can process and evaluate the precision the data obtained at a theodolite survey; - Knows the main methods used in topographic measuring and in imaging objects on plans; - Knows how to use an optic levelling base; - Is capable of processing the data obtained when levelling; - Knows how to solve main construction related geodetic problems: surface levelling, marking of the objects, calculations and markings of curves; route measuring, composing longitudinal and cross profiles, settlings' measuring.

Field of knowledge	Subject	Minimal requirements
Architecture. Parts of a building	History of architecture	- Knows historical styles of construction, related constructions and well known architects; - Knows the connections between historical architectural traditions and today's directions in Europe and in Estonia.
	Basics of architecture	- Knows main theoretical architecture terms and their meanings; - Knows urban construction aspects related with architectural design; - Knows the general principles of architectural design of a modern block of flats and / or any important type of a public building; - Knows the main principles of instructional material for designing different buildings; - Knows the principles and the design procedure of planning a site plan for a building's construction site; - Knows the main principles of formatting structural drawings and of writing a specification.
	Structural physics	- Can calculate the thermal transmittance of building envelope and building total thermal loss; - Can define a border's regime of humidity and a fence's effectiveness in different environmental conditions; - Knows the main measuring tools used for measuring thermophysical parametres of a building; - Knows how to plan rational fence constructions for both new and to be renovated buildings; - Knows the sound insulation requirements for fences and can calculate a building's thermal loss; - Knows the requirements for natural and artificial lighting in different types of rooms and knows the basics of lighting calculation and calculation methods.
	Design of a construction	In the sub-speciality of building design and construction - Knows the requirements for different parts of a construction and knows how to compose main constructions for civil and industrial buildings; - Can evaluate the advantages and disadvantages of different construction materials when designing main constructions for a building; - Knows the energy-saving measures of the building envelope. In the sub-specialty of design and construction of waterfront structures -

Field of knowledge	Subject	Minimal requirements
Mechanics	Statics	- Can solve balance problems; reduce force systems; find the location of a body's centre of gravity; and calculate surface moments of difficult cross-sections; - Can find support reactions in a surface or space construction defined by statics; - Can find the location of a body's centre of gravity.
	Strength theory	- Knows the rules based on longitudinal, shearing and bending strain elasticity theory and can compose balance and continuity equations; - Can calculate inner forces in a bar and less complex bar constructions and define stress diagrams corresponding to the inner forces in the cross-section of the element; - Knows the voltage and strength theories of isotropic materials and can apply strength criteria; - Knows strength qualities of different materials, and knows the method of experimentally defining different qualities of materials; - Can calculate displacement shifts of a bar; - Based on calculations made can check the stability of a pressed slim bar; - Can calculate less complex constructions defined by statics and the indefinite ones by using the method of maximum capacity of inner forces; - Can complete bar calculation in the presence of the influence of a dynamic load.
	Structural mechanics	- Can model the loads affecting beams, cross web girders, posts and their connections and supports; - Can define the level of indeterminacy of bar systems and can use opportunities arising from symmetry or asymmetry to simplify calculations; - Can compose inner forces' stress diagrams of the statically defined bar systems; - Can compose influence lines of statically defined beams, arches and cross web girders; - Can find displacement shifts in a bar system defined by statics; - Can find inner forces in a statically indefinite bar system (frame, continuous beam and arch) using force and deformation methods; - Knows the physical and mathematical basis of the method of finite elements; - Knows how to compose strut-and-tie, two-dimensional elasticity problem and finite element plate models and can formulate correct boundary/bounding conditions for these tasks.

Materials engineering	Construction materials	- Knows main construction materials - natural and artificial stones, construction mortars and plasters, structural steels, structural timber, structural ceramics, thermal- and hydro insulation materials, glass, polymeric materials, their characteristics, production and usage in construction; - Upon making the choice for a construction material can consider their mutual compatibility and their environmental compatibility; - Knows the principles of corrosion treatment on metals; - Knows the causes of decay of the materials most commonly used; - Knows the principles of testing construction materials and the method of testing the most common materials.
	Mineral binders. Study of concrete	- Knows the production principles of mineral binders used in construction - lime, gypsum, cement; - Knows different types of cements; - Knows the technology behind concrete production, matters influencing the characteristics of concrete; - Knows the types of corrosion of reinforced concrete and their characteristics; can reduce their influence; - Knows the methods of defining physico-chemical and mechanical characteristics of binders and concrete; - Knows the environmental problems connected with the field and the principles of sustainable construction.

Field of knowledge	Subject	Minimal requirements
Construction design	Main principals of design and construction	- Can define the loads influencing the construction; - Has a wide knowledge of buildings and typical constructions working as a complete system and of assuring the durability of the construction; - Knows the design standards based on Euro codes; - Can compose technical drawings of a construction project and specifications. **Additional for the sub-specialities of design and construction, design management and owner supervision** In the sub-speciality of building construction - Can compose load combinations for different maximum states; - Can calculate and plan systems assuring the rigidity of constructions; - Knows the use of numerical methods while calculating building constructions. In the sub-speciality of design and construction of waterfront structures - Can define the loads influencing waterfront structures; - Has a wide knowledge of waterfront structures working as a complete system and of assuring the durability of the corresponding structures; - Knows the use of numerical methods while calculating building constructions.

Field of knowledge	Subject	Minimal requirements
	Concrete constructions	- Knows the characteristics of reinforced concrete as a composite material and the prerequisites on which calculations are based; - Can analyse static working of a building of average complexity; can compose the suspension system of the latter and its calculation scheme; - Can design complex beams, panel decks working in one direction or two, point-supported panel decks, eccentrically loaded columns, main types of foundation and grillages; - Knows the working principles of pressure concrete constructions and their opportunities of use; - Is familiar with the static and dynamic working and planning of buildings and structures; - Knows the working principles of spatial constructions; - Knows the instructional material for planning and designing concrete constructions. **Additional for the sub-specialities of design and construction, design management and owner supervision** In the sub-speciality of building construction - Can design framework for industrial and civil constructions of medium complexity, their elements and main joints; - Knows the basics of designing main constructions: reservoirs, bunkers and silos; - Knows the theory and method of designing pressure concrete construction; - Knows the theory and method of designing main spatial constructions. In the sub-speciality of design and construction of waterfront structures - Knows how to design harbour quays, docks, piers, breakwaters, bank protection structures and foundations for waterfront structures; - Knows the basics of designing large scale dams and canals.

Field of knowledge	Subject	Minimal requirements
	Metal constructions	- Knows the characteristics of construction steels; - Can analyse static working of buildings of medium complexity; can compose a suspension system for them and its calculation scheme; - Can calculate the load capacity of beams and bar systems influenced by different forces and solve the stability problems of them; - Can calculate framework elements of medium complexity - posts, beams and girders; - Can calculate bolted and welded assemblies; - Knows the instruction materials related to the design of steel constructions. **Additional for the sub-specialities of design and construction, design management and owner supervision** In the sub-speciality of building construction - Can design main constructions and their joints of a steel framework building; - Knows the behaviour of steel constructions in case of fire; - Knows the theory and method of designing steel and concrete composite constructions; - Knows the basics of designing main constructions: reservoirs, bunkers and masts and towers; - Knows the theory and method of the design of the main large-bay constructions. In the sub-speciality of design and construction of waterfront structures - Knows the peculiarities of designing steel quay constructions.

Field of knowledge	Subject	Minimal requirements
	Soil mechanics and foundations	- Can calculate pressures in soil and evaluate water's influence to the behaviour of the soil; - Knows the methods of calculating the load capacity of distribution and pile foundations and the ways of strengthening foundations; - By calculating can prognosticate the settlings of single foundations and of a building as a whole; - Knows the calculation methods for the timely progression of settlings; - Depending on the characteristics of the soil and the construction can choose expedient foundation solutions; - Can choose expedient methods for improving the soil; - Can check the durability of a slope of soil; - Can calculate the soil's influence to the wall and design supporting walls. **Additional for the sub-specialities of design and construction, design management and owner supervision** In the sub-speciality of building construction - Can design shallow and pile foundations in the presence of structural geological conditions of medium complexity; - Knows the design of dynamic load machine foundations; - Can design foundation pits and solve problems related with water lowering; - Can design deep foundations; - Knows the main methods for strengthening foundations and investigations related to strengthening of foundations. In the sub-speciality of design and construction of waterfront structures - Can design foundations for quay constructions and bank protection; knows the basics of the design of the foundations of waterfront structures. - Knows the piles used in waterfront structures and can plan them in the presence of structural geological conditions of medium complexity; - Knows the anchoring options for quays and bank protections and their calculation methods.

Field of knowledge	Subject	Minimal requirements
	Timber constructions	In the sub-speciality of building construction - Knows the characteristics of wooden and wood-based construction materials; - Can analyse static working of buildings of medium complexity; can compose a suspension system for them and its calculation scheme; - Based on calculations is able to evaluate load capacity and rigidness of beams and bar systems influenced by different forces; - Can calculate framework elements of medium complexity - posts, beams and girders; - Can calculate different joints of wooden elements; - Knows the methods that assure fire and bio persistence of wood; - Knows the instruction materials related to the design of wooden constructions. **Additional for the sub-specialities of design and construction, design management and owner supervision** - Can design the main constructions for buildings of wooden framework and modular spaces, and their joints; - Knows the behaviour of wooden constructions in case of fire and can calculate the fire persistence of wooden elements; - Knows the basics of designing main constructions: masts and towers; - Knows the theory and method of the design of plastic structures; - Knows the theory and method of designing steel and wooden composite constructions; - Knows the theory and method of the design of the main large-bay constructions and formworks.

Field of knowledge	Subject	Minimal requirements
	Stone constructions	In the sub-speciality of building construction - Knows the types of masonry and characteristics of materials; - Can analyse static working of buildings of medium complexity; can compose a suspension system for them and its calculation scheme; - Based on calculations is able to evaluate load capacity and deformation of walls, lintels and posts influenced by different forces; - Can calculate different joints of masonry; - Knows the instruction materials related to the design of masonry. **Additional for the sub-specialities of design and construction, design management and owner supervision** - Can design main constructions for buildings of stone and small-size blocks and their joints; - Knows the calculation and construction of buildings' diaphragm of rigidity; - Knows the basics of designing special constructions - retaining walls and chimneys; - Knows the opportunities of making additional openings into stone constructions and the opportunities of strengthening the latter.
	Testing of a construction	**Knowledge necessary for the sub-specialities of design and construction, design management and owner supervision** - Knows the methods of testing a construction, the applications used at testing and the software used for registering and analysing the test data; - Knows the principles of planning a testing, can analyse the test data and compose a report of the test results; - Knows the principles of test loading main types of constructions made of different construction materials; - Knows the main standing points of the theory of modelling.

Field of knowledge	Subject	Minimal requirements
Building production	Building management	- Knows the phases of building procurement, their aims and outputs; - Knows the principal functions of project management and their content; - Knows the principles of planning a building's life cycle; - Knows how to plan construction works' organisation scheme for different types of building procurements; - Knows how to make a general calendar plan for a building procurement; - Knows the principles of forming the cost of construction; - Knows the content and principles of composing proposal documents, is familiar with the method of organising proposal inquiries; - Knows the procedures connected with the acceptance and start of use of a construction; - Knows the principal methods of management and can organise team work. **Additional for the sub-specialities of construction management and construction cost evaluation** - Coordinating the construction process as a representative for a construction company and the client; - Knows the basics of real estate economics and management and finance methods related; - Knows the principles and techniques of documenting building procurements;
	Legislation and regulations connected with construction	- Knows the mechanisms of legal regulations and Estonian court system; - Knows the general principles of civil legislation and rule-based frameworks of property law, law of obligations and commercial law; - Knows the legal regulations of employment relationships and knows the responsibility for fulfilling the rules; - Orientates in legal and norm acts regulating the field of construction, and knows from where and how to obtain the information needed; - Orientates in legal acts dealing with occupational safety and occupational health; - Knows the principles and techniques of composing construction and design contracts.

Field of knowledge	Subject	Minimal requirements
	Construction technology and the organisation of construction works	- Knows the working principles of main construction machines, their opportunities for use; can evaluate their productivity; - Knows the technologies of main construction processes - montage, concreting, masonry, knows how to compose a project for executing the named processes; - Knows the technologies of excavating, piling, woodwork, insulating, roof covering and decoration works; - Knows the legal and technical side of insuring and checking the quality of building production; - Knows the principal requirements for safety engineering and knows the main risks related with construction processes. **Additional for the sub-specialities of construction management and construction cost evaluation** - Can plan the use of construction machines and mechanisms; - Knows the principles of organising the work of a company producing construction materials and products; - Can calculate salary, labour cost, duration of the works, can compose calendar schedules and evaluate techno-economic expediency of different technological variants; - Knows the regulations and classification systems of categorising construction costs; - Knows the principles and methods of evaluating construction costs; - Knows the variants of pricing a construction; - Can use means of information technology for budgeting.

Field of knowledge	Subject	Minimal requirements
Techno systems	Water supply and sewerage	- Knows the working principles of main sanitary appliances, knows the necessary technical indicators for choosing one; - Can dimension individual sections of piping and less complex piping systems; - Knows the opportunities modern software offers for modelling and operating water and sewage piping. In the sub-speciality of building construction - Knows the designing of water supply and sewage solutions for a simple building and its property. In the sub-speciality of design and construction of waterfront structures - Knows the working principles of ports' engineering structures and systems, knows the necessary technical indicators for choosing those applications; - Knows the basics of calculating culverts, channels and utility galleries; - Knows the basics of calculating pumping units.
	Heating and ventilation	- Knows different heating systems and their working principles; - Knows different heaters and the principles of heat output calculation and choosing one; - Knows the designing of water-heating system for a simple building; - Knows the principles of planning different ventilation solutions; - Knows the principles of planning the conditioning of indoor air; - Knows the defining of the parameters for the quality of air and the air exchange that arises from the first; - Knows the principles of the cost calculation for techno systems; - Knows the principles of the effective use of energy and the actions taken for saving the energy.

Field of knowledge	Subject	Minimal requirements
	Electrical installation of buildings. Building site power supply. Automation of buildings	- Knows the basics of electrical engineering; - Knows the processes occurring in the circuits of direct and alternating currents and in one and three phase circuits; - Knows the terminology of electricity, the notations used in technical drawings and main symbols used; can read a electrical installation drawings; - Knows the characteristics and ways of using electro-technical applications; - Knows how to plan a construction site's electricity supply; - Knows the principles of electrical measurements and knows how to interpret the results; - Knows the requirements for safety and work organisation arising from the legislation of electrical safety and standards; - Knows the principles of automation the management of techno systems and knows the opportunities of automation to use in order the building effective exploitation.

Appendix 6

MINIMAL REQUIREMENTS FOR WORK EXPERIENCE

A. Building construction

Speciality	Description of a work experience
Construction project management	Work experience in one of the following: - Construction's manager when erecting buildings with the complexity corresponding his/her professional level - Managing the production process of construction materials - Managing a production unity of a company producing construction material
Construction cost evaluation	Work experience in the following: - Construction cost evaluation for constructions with the complexity corresponding his/her professional level
Construction management	Work experience in the following: - Managing a building procurement with the complexity corresponding to his/her professional level as an main contractor.
Design	Work experience in both of the following: - Building constructor when designing constructions with the complexity corresponding his/her professional level - Building constructor when designing construction products
Design management	Work experience in both of the following: - Building constructor when designing constructions with the complexity corresponding his/her professional level - Managing the design works of a construction project with the complexity corresponding his/her professional level
Site supervision	Work experience in the following: - Executing owner supervision for constructions with the complexity corresponding his/her professional level

B. Design and construction of waterfront structures

Speciality	Description of a work experience
Construction project management	Work experience in the following: - Construction's manager when erecting waterfront structures with the complexity corresponding his/her professional level
Construction cost evaluation	Work experience in the following: - Construction cost evaluation for structures with the complexity corresponding his/her professional level
Construction management	Work experience in the following: - Managing a building procurement with the complexity corresponding to his/her professional level as an main conrtactor.
Design	Work experience in the following: - Building constructor when designing waterfront constructions with the complexity corresponding his/her professional level
Design management	Work experience in both of the following: - Building constructor when designing waterfront structures with the complexity corresponding his/her professional level - Managing the design works of a waterfront structure project with the complexity corresponding his/her professional level
Site supervision	Work experience in the following: - Executing owner supervision for waterfront structures with the complexity corresponding his/her professional level

C. Geotechnical engineering

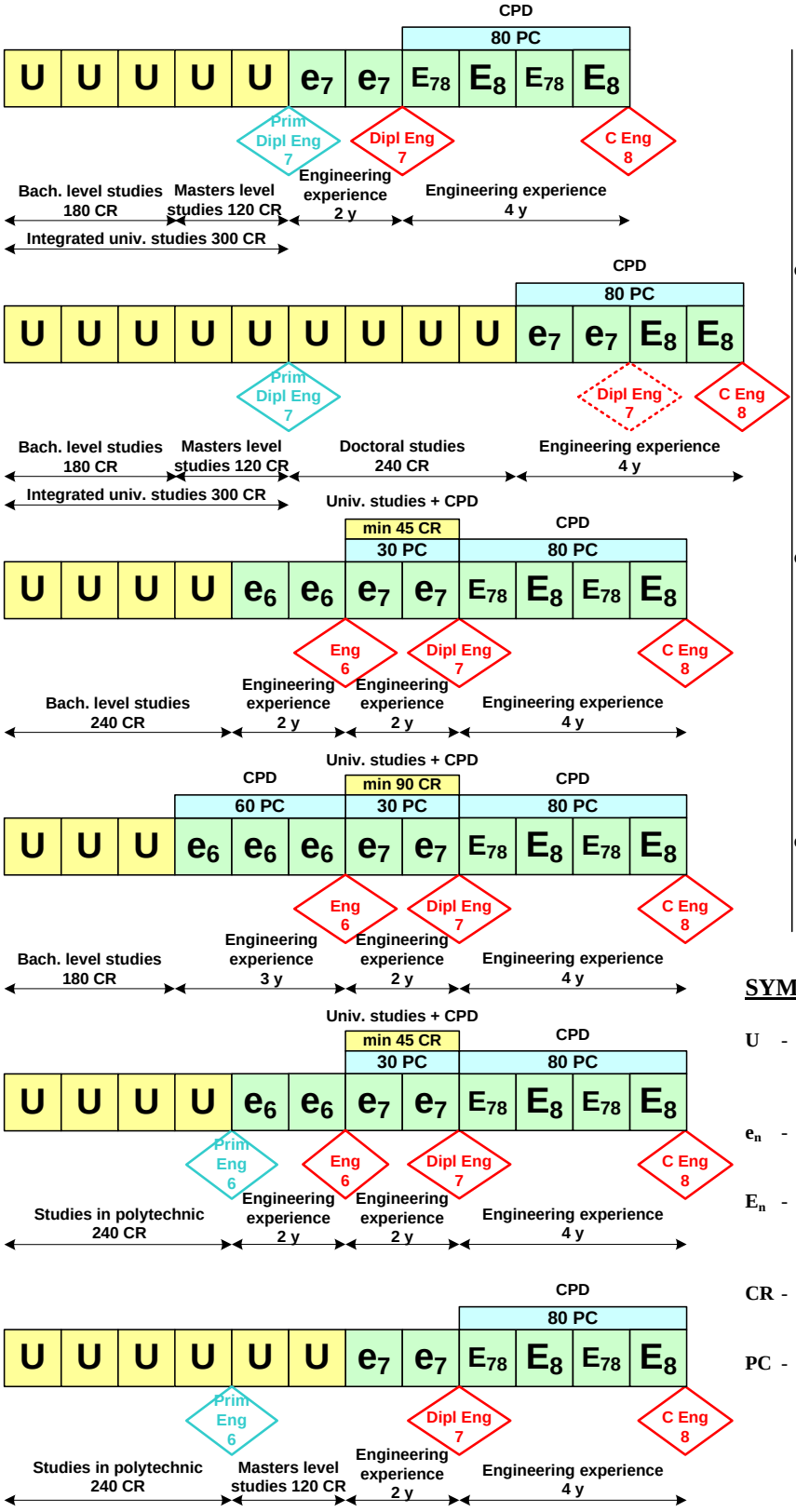
Speciality	Description of a work experience
Construction project management	Work experience in the following: - Construction's manager when erecting geotechnical structures with the complexity corresponding his/her professional level
Geotechnical investigations	Work experience in one of the following: - Managing the fieldworks of geotechnical investigations - Taking part in engineering geological laboratory tests and / or in a working group of data processing
Design	Work experience in one of the following: - Building constructor when designing geotechnical structures with the complexity corresponding his/her professional level - Consultant when designing the foundation for a building with a medium complexity
Site supervision	Work experience in the following: - Executing owner supervision for geotechnical structures with the complexity corresponding his/her professional level

Note: Criteria "complexity corresponding his/her professional level" refers to the conditions described in Appendix 11 "Specialist's in charge range of authorisation"

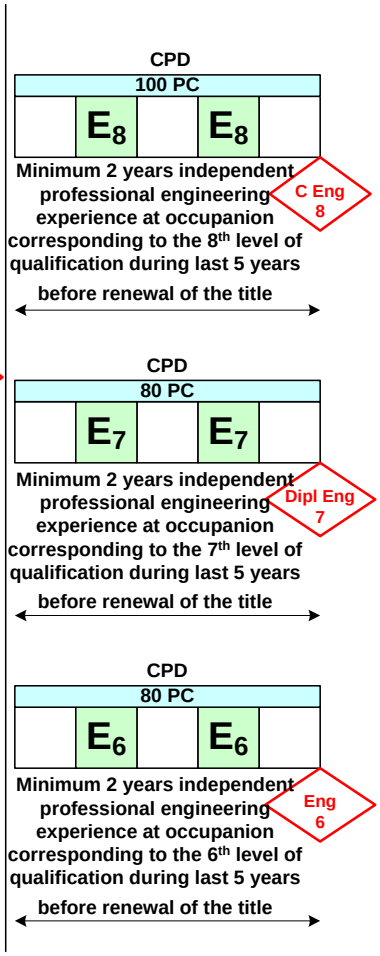
Appendix 7

PRESUPPOSITIONS WHILE APPLYING FOR THE QUALIFICATION OF AN ENGINEER

The first application of the title



Renewal of the title



SYMBOLS:

U - 1 academic year (ca 60 ECTS credits) of studies given by polytechnic or by university

e_n - 1 year of engineering experience at appropriate occupation level

E_n - 1 year of independent professional engineering experience at appropriate occupation level

CR - ECTS credits awarded at the appropriate level of education;

PC - credits of continuing education; 1 PC = 1 academic hour of training courses instructed or educated by engineer of the 8th level of qualification

Appendix 8

SPECIAL CASES WHILE APPLYING FOR THE QUALIFICATION OF A DIPLOMA CIVIL ENGINEER OF BUILDINGS AND STRUCTURES

Special cases while applying for the qualification are applicable when the applicant's educational preparation does not meet the requirements described in the present qualification standard but he/she still has a long and successful work experience in the sub-speciality and profession.

1. special case

The applicant has a master's degree or an equivalent diploma of higher education in a speciality of construction different from the speciality applied for (see **appendix 1**) or in a field of technology based on the science of mechanics.

2. special case

The applicant has completed the bachelor studies or has a degree in applied higher education in the field of engineering of buildings and structures.

In both cases a diploma civil engineer may apply for the profession when all the requirements below are met:

- The applicant has at least an 8-year work experience in civil engineering immediate to applying, the last 4 of which have to be continuous in the field of the sub-speciality and profession applied for;
- In the past 4 years the applicant has obtained 100 continuing education units (see **appendix 9**) in the speciality applied for or in a similar speciality (see. similar specialities in the standard's section C1). At leas 75 units have to be in the field of the profession applied for.
- The applicant has to be at least 35 years old.

While issuing the qualification in special conditions professional and special work experience is looked at with special carefulness and issuing of the qualification may contain procedures described in the document "Issuing a qualification for the engineers of the field of construction".

Appendix 9

CONSIDERATION OF THE CONTINUOUS PROFESSIONAL DEVELOPMENT OF ENGINEERS

1. Contents of the continuing education

Continuous professional development refers to a situation when an engineer maintains his/her skills, knowledge and experience related to his speciality and profession on his/her own initiative in order to improve his/her quality throughout his/her career as an engineer. It involves both technical and non-technical subject matter.

In general there are two ways in continuous professional development - schooling and individual studying

Continuous professional development via schooling

- attending lectures
- taking part in seminars and practical trainings
- attending conferences of scientific and practical type
- "constructive" reading - a test or an exam is taken after reading the material
- presentation at a conference, seminar or a course
- professional publications
- training students or supervising the training of engineers
- taking part in the activities of the committees and work groups developing and new rooting professional ideas and initiatives

Continuous professional development via individual studying

- explaining a specific problem related with the job and presenting solutions for it
- reading special or other technical literature
- listening and watching audiovisual programs

2. Evaluating the continuous professional development

The central indicator of the counting system is listening to an hour-long analysing and generalising lecture, which deals with timely or perspective questions, given by a specialist with the qualification of a chartered engineer (Estonia). This equals with one **professional development credit - 1 PC**. In order to consider the value according to the lecturer's qualification, content of the lecture and the length of the training the value of the training or its part in continuing education units is calculated by multiplying three factors:

$$\mathbf{PC = LQ \times CT \times h},$$

where **PC –** Professional development credit unit

LQ – lector's qualification

1,2 – professor of a university or a college

1,0 – lecturer of a university or a college (excl. professors); a specialist with the qualification of a chartered engineer (Estonia)

0,8 – diploma engineer

0,7 – engineer

CT – content of the training

0,9 ÷ 1,1 – explaining the content of timely or perspective calculations, explaining the methods of project management, generalising different aspects of the practical experience of engineering

0,7 ÷ 0,9 – explaining the general principles of calculation methods, presenting practical experience of project managing and engineering

0,3 ÷ 0,7 – product presentation, a company's speciality seminar etc.

h – duration of training in academic hours

The lector receives units for continuing education for preparing and presenting in an amount that is tripled compared to the units received by the listeners.

3. Minimal requirements for the applicant for professional qualification

Minimal number of continuing education units for applying for different professional qualifications is brought in **appendix 7** "Presuppositions while applying for the qualification of an engineer".

When applying for the qualification of a diploma engineer if 5 or more years have passed since the specialist graduated from a university or college giving engineer or continuing education, also when renewing the qualification of a diploma engineer one has to:

1. The total of the continuing education units **in past 5 years** has to be at least **80 PC.** At least **60 PC** have to be received via continuing education.
2. At least 75% of the points received from a training and of the total have to be received in the speciality, or a similar one, which qualification is applied for which is wanted to be renewed.

Appendix 10

DESCRIPTION OF THE LANGUAGE SKILLS

Council of Europe: European language levels: self assessment grid

	UNDERSTANDING		*SPEAKING*		*WRITING*
Level	*Listening*	*Reading*	*Spoken interaction*	*Spoken production*	*Writing*
A1	I can understand familiar words and very basic phrases concerning myself, my family and immediate concrete surroundings when people speak slowly and clearly.	I can understand familiar names, words and very simple sentences, for example on notices and posters or in catalogues.	I can interact in a simple way provided the other person is prepared to repeat or rephrase things at a slower rate of speech and help me formulate what I'm trying to say. I can ask and answer simple questions in areas of immediate need or on very familiar topics.	I can use simple phrases and sentences to describe where I live and people I know.	I can write a short, simple postcard, for example sending holiday greetings. I can fill in forms with personal details, for example entering my name, nationality and address on a hotel registration form.
A2	I can understand phrases and the highest frequency vocabulary related to areas of most immediate personal relevance (e.g. very basic personal and family information, shopping, local area, employment). I can catch the main point in short, clear, simple messages and announcements.	I can read very short, simple texts. I can find specific, predictable information in simple everyday material such as advertisements, prospectuses, menus and timetables and I can understand short simple personal letters.	I can communicate in simple and routine tasks requiring a simple and direct exchange of information on familiar topics and activities. I can handle very short social exchanges, even though I can't usually understand enough to keep the conversation going myself.	I can use a series of phrases and sentences to describe in simple terms my family and other people, living conditions, my educational background and my present or most recent job.	I can write short, simple notes and messages. I can write a very simple personal letter, for example thanking someone for something.
B1	I can understand the main points of clear standard speech on familiar matters regularly encountered in work, school, leisure, etc. I can understand the main point of many radio or TV programmes on current affairs or topics of personal or professional interest when the delivery is relatively slow and clear	I can understand texts that consist mainly of high frequency everyday or job-related language. I can understand the description of events, feelings and wishes in personal letters.	I can deal with most situations likely to arise whilst travelling in an area where the language is spoken. I can enter unprepared into conversation on topics that are familiar, of personal interest or pertinent to everyday life (e.g. family, hobbies, work, travel and current events).	I can connect phrases in a simple way in order to describe experiences and events, my dreams, hopes and ambitions. I can briefly give reasons and explanations for opinions and plans. I can narrate a story or relate the plot of a book or film and describe my reactions.	I can write simple connected text on topics which are familiar or of personal interest. I can write personal letters describing experiences and impressions.
B2	I can understand extended speech and lectures and follow even complex lines of argument provided the topic is reasonably familiar. I can understand most TV news and current affairs programmes. I can understand the majority of films in standard dialect.	I can read articles and reports concerned with contemporary problems in which the writers adopt particular attitudes or viewpoints. I can understand contemporary literary prose.	I can interact with a degree of fluency and spontaneity that makes regular interaction with native speakers quite possible. I can take an active part in discussion in familiar contexts, accounting for and sustaining my views.	I can present clear, detailed descriptions on a wide range of subjects related to my field of interest. I can explain a viewpoint on a topical issue giving the advantages and disadvantages of various options.	I can write clear, detailed text on a wide range of subjects related to my interests. I can write an essay or report, passing on information or giving reasons in support of or against a particular point of view. I can write letters highlighting the personal significance of events and experiences.
C1	I can understand extended speech even when it is not clearly structured and when relationships are only implied and not signalled explicitly. I can understand television programmes and films without too much effort.	I can understand long and complex factual and literary texts, appreciating distinctions of style. I can understand specialised articles and longer technical instructions, even when they do not relate to my field.	I can express myself fluently and spontaneously without much obvious searching for expressions. I can use language flexibly and effectively for social and professional purposes. I can formulate ideas and opinions with precision and relate my contribution skilfully to those of other speakers.	I can present clear, detailed descriptions of complex subjects integrating subthemes, developing particular points and rounding off with an appropriate conclusion.	I can express myself in clear, wellstructured text, expressing points of view at some length. I can write about complex subjects in a letter, an essay or a report, underlining what I consider to be the salient issues. I can select a style appropriate to the reader in mind.
C2	I have no difficulty in understanding any kind of spoken language, whether live or broadcast, even when delivered at fast native speed, provided. I have some time to get familiar with the accent.	I can read with ease virtually all forms of the written language, including abstract, structurally or linguistically complex texts such as manuals, specialised articles and literary works.	I can take part effortlessly in any conversation or discussion and have a good familiarity with idiomatic expressions and colloquialisms. I can express myself fluently and convey finer shades of meaning precisely. If I do have a problem I can backtrack and restructure around the difficulty so smoothly that other people are hardly aware of it.	I can present a clear, smoothly-flowing description or argument in a style appropriate to the context and with an effective logical structure which helps the recipient to notice and remember significant points.	I can write clear, smoothly-flowing text in an appropriate style. I can write complex letters, reports or articles which present a case with an effective logical structure which helps the recipient to notice and remember significant points. I can write summaries and reviews of professional or literary works.

Appendix 11

CIVIL ENGINEERS' OF BUILDING AND STRUCTURES RANGE OF AUTHORISATION
Engineering of buildings and structures

Profession	Sub-speciality	Speciality	Range of authorisation of level 6 civil engineer of buildings and structures
Civil engineer of building and structures	Building construction	Construction management	Building structures with the height up to 30 m from the ground and up to 5 in depth and their constructions considering the following span limitations: - monolithic concrete constructions 18 m; - precast concrete constructions 25 m; - steel 36 m; - timber constructions 18 m. Building structures with up to 2. geotechnical category. [1)] Building in-site roads, squares and transportation structures provided engineering geological conditions are not complex. Industrialised production of construction elements.
		Construction project management	
		Site supervision[3)]	
		Construction cost evaluation	
	Design and construction of waterfront structures	Construction management	Quays for small ships, piers, bank protections and break waters with the depth up to 3.5 m Building structures with up to 2. geotechnical category. [1)]
		Construction project management	
		Construction cost evaluation	
	Geotechnical engineering [2)]	Geotechnical investigations	Organising fieldworks of geological investigations Data processing of geological investigations with the 1. geotechnical category. [1)]
		Construction management	Building structures with up to 2. geotechnical category. [1)] Building in-site roads, squares and transportation structures provided engineering geological conditions are not complex.

Notes:

1) According to the classifications in EVS-EN 1997-1:2006
2) Qualification in sub-speciality of geotechnical engineering, which is in the speciality of engineering of buildings and structures, gives the right to work as a chief specialist of level 6 qualification in geotechnical works in highway engineering and environmental and mechanical engineering.
3) Permitted only for low risk buildings - Class of consequenses CC1 according to the EVS-EN 1990:2002+NA:2002

Profession

Profession	Sub-speciality	Speciality	Range of authorisation of level 7 civil engineer of buildings and structures
Diploma civil engineer of buildings and structures	Building construction	Design	Structure with a usual construction solution: - where there is no influence of great static and dynamical loads; - which is no more than 30 m above and 5 m below the ground; - which load bearing openings do not exceed: - monolithic concrete constructions 18 m; - precast concrete constructions 25 m; - steel 36 m; - timber constructions 18 m. - which are not meant for groups' gathering. Design and construction and owner supervision of structures of up to 2. geotechnical category[1)] .
		Design management	
		Site supervision	
		Construction management	Building structures with the height of up to 50 and their constructions.
		Construction project management	Building in-site roads, squares and transportation structures. Industrialised production of complex construction elements.
		Construction cost evaluation	Building structures with up to 3. geotechnical category. [1)]
	Building and construction of waterfront structures	Design	Quays for ships, piers, bank protections and break waters with the depth up to 9.5 m, with the computational wave height of up to 2.0 m. Structures of the 1. and 2. geotechnical category [1)].
		Design management	
		Site supervision	
		Construction management	
		Construction project management	
		Construction cost evaluation	
	Geotechnical engineering [2)]	Design	Data processing of the geological investigations of structures' of the 3. geotechnical category[1)] and their building. Geotechnical engineering of the objects with up to 2. geotechnical level[1)], their supervision.
		Geotechnical investigations	
		Site supervision	
		Construction management	

Notes:
1) According to the classifications in EVS-EN 1997-1:2006
2) Qualification in sub-speciality of geotechnical engineering, which is in the speciality of engineering of buildings and structures, gives the right to work as a chief specialist of level 7 qualification in geotechnical works in highway engineering and environmental and mechanical engineering.

Profession	Sub-speciality	Speciality	Range of authorisation of level 8 civil engineer of buildings and structures
Chartered civil engineer	Building construction Design and construction of waterfront structures	Design	Without technical limitations in the corresponding speciality, sub-speciality and profession while following the occupational code of ethics and behaviour. A right to carry out expertise for structures and construction designs in the field of the corresponding speciality, sub-speciality and profession.
		Design management	
		Site supervision	
		Construction management	
		Construction project management	
		Construction cost evaluation	
		Education & training engineers, research	
	Geotechnical engineering [2)]	Design	Without technical limitations in the corresponding speciality, sub-speciality and profession while following the occupational code of ethics and behaviour. A right to carry out expertise for structures and construction designs in the field of the corresponding speciality, sub-speciality and profession.
		Geotechnical investigations	
		Site supervision	
		Construction management	
		Education & training engineers, research	

Notes:

2) Qualification in sub-speciality of geotechnical engineering, which is in the speciality of engineering of buildings and structures, gives the right to work as a chief specialist of level 8 qualification in geotechnical works in highway engineering and environmental and mechanical engineering.