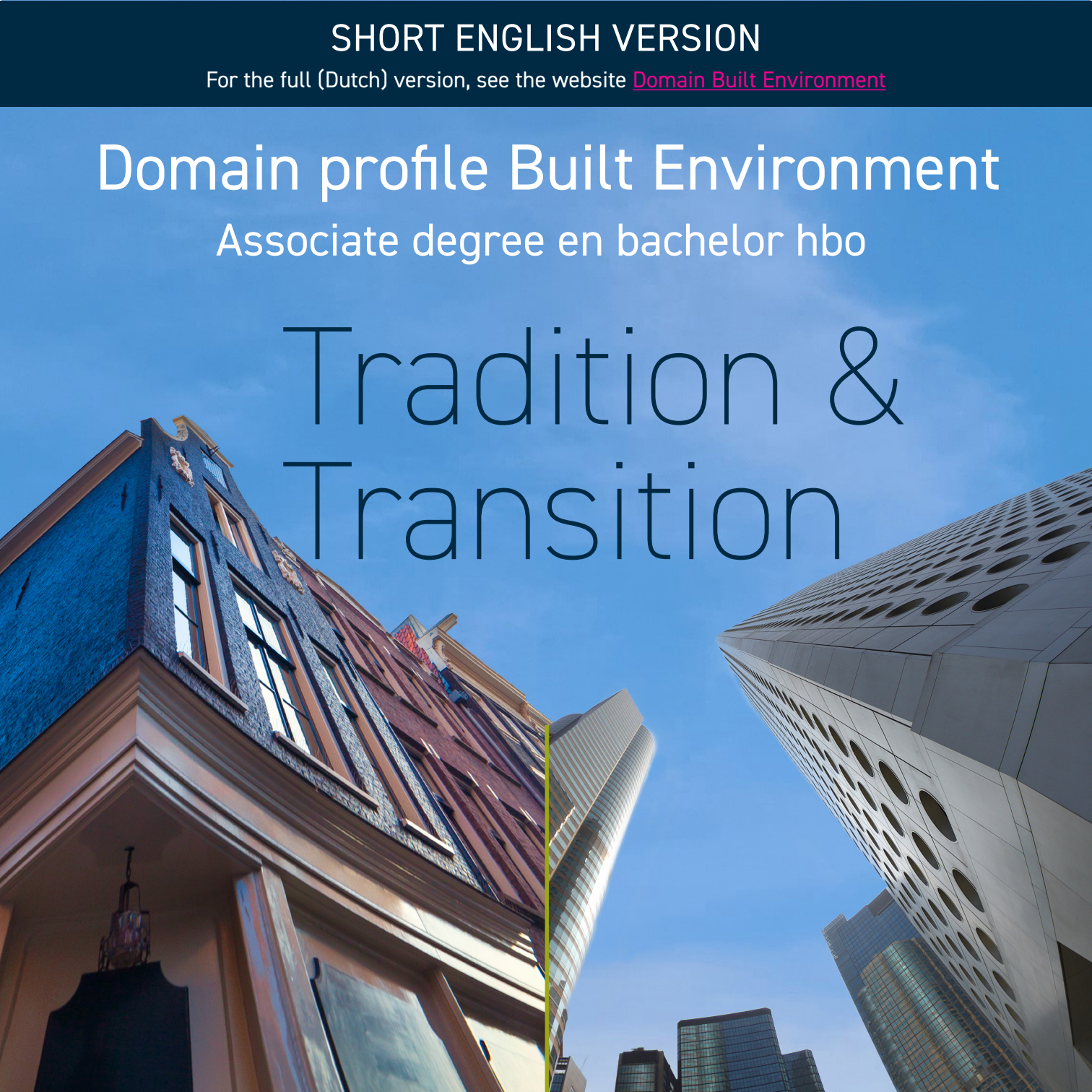
SHORT ENGLISH VERSION

For the full (Dutch) version, see the website Domain Built Environment

Domain profile Built Environment

Associate degree en bachelor hbo

Tradition & Transition



General introduction (summary)

The Netherlands is facing major social issues regarding safety, climate impact and energy transition. Millions of houses that have to stop using natural gas, a safe and healthy living environment with enough affordable homes for everyone, flooding and extreme drought, sustainable mobility, a circular economy. This day and age is characterized by a number of great and complex challenges. This certainly also applies to the professionals in the Built Environment domain, who are facing the challenge of coming up with innovative solutions based on technological developments such as digitalization and new materials.

Today's big challenges, however, cannot be solved without cooperation. Our society calls for innovative, dedicated, and enterprising professionals who will get to work with their inquisitive attitude and problem-solving skills in interdisciplinary teams to reach sustainable solutions. Professionals with a strong foundation in their own discipline, who are able to apply and deepen their knowledge and skills in a creative and substantiated manner.

It's imperative that education moves in line with these changes and fully embraces life-long development and practice-based research. After all, today's professional bachelor's, and associate degree programmes* and tomorrow's professional must constantly relate to these changes. In this regard, universities of applied sciences take their responsibilities and prepare students and employees as well as possible for the dynamic labour market. They support prospective students in their awareness process. Awareness of their abilities and their passion, of the way they can develop these abilities and what this could lead to. During their education, students are offered different types of education in which they are increasingly in charge of their own learning process. This way, the programmes in the Built Environment domain train future-oriented professionals. They believe in an approach in which practical learning, flexible learning, inclusive learning, and transition learning are key.

Due to these developments in the professional field and in education, the creation of an updated domain profile* has become necessary. A continuation of the 2015 domain profile was chosen, in which the existing competences were not only specified in further detail but the separation between technical and general competences was also reversed. This created the new competence set of nine competences: Initiate, Design, Specify, Implement, Control, Manage, Research, Communicate and Professionalize.

In addition, the ten focus areas (Spatial Planning and Design, Water, Soil and Environment, Infrastructure and Mobility, Building and Technology, People and Society, Governance, Policy and Law, Economy, Applied Research, Communication, and Management and Organization) have been broadened. This way, the connection to current practice (tradition) and the innovative future (transition) in the domain profile of Built Environment remains guaranteed.

Besides their own identity, universities of applied sciences also have regional profiling, which in its turn influences the content of the study programme. Students can also give their own colour to the study programme by working in various professional roles (from public information officer to BIM modeller and from policy officer to structural engineer) and by producing various professional products (from planning and inspection reports to risk analyses and infrastructural designs).

The competence set and corresponding focus areas of the Built Environment domain form the frameworks for and provide direction to the programme-specific profile. Together they form a recognizable reference point amidst professional, regional, and university-specific developments and continuous change. Now that the new domain profile is complete, the ball is in the court of the individual universities of applied sciences and their specific study programmes. Sufficient room has been left to differentiate and to allow their own identity to shine through.

Keeping the domain profile up to date is in fact not a one-off action. Feedback from managers of the various study programmes in the domain and representatives from the professional field or the surrounding educational field may give rise to interim adjustments. For that reason, representatives from the domain maintain regular contact with stakeholders, both in bilateral consultations with sector organizations (professional practice and education), and in thematic meetings with larger groups of stakeholders who, depending on the topic, come from professional practice and/or education.

A general framework for the programmes

The competence set and the focus areas

Built Environment students acquire the knowledge, skills and professional attitude required for their specific professional context. With their technical knowledge, communicative skills, and critical attitude, they contribute to political decision-making, spatial development, design, construction and management of structures, infrastructure, public spaces, heritage, waterworks, and buildings in the various stages of the lifespan and at the different levels of scale of the street, city, and region.

The competence set* and corresponding focus areas* of the Built Environment domain form the frameworks for and provide direction to the programme-specific final qualifications*. Together they form a recognizable reference point amidst professional, regional, and university-specific developments.

Future-oriented education

Lecturers in the Built Environment domain guide students in their personal and professional development towards becoming Engineer of the Future: an engineer who will work within the built environment in a competent, ethical, and socially responsible way within the complex context of tradition and transition. During their education, students are offered different types of education, in which they are increasingly in charge of their own learning process. This way, the programmes in the Built Environment domain educate future-oriented professionals. They believe in an approach in which four learning pillars are key:

1 Practical Learning I In professional practice or in close cooperation with professional practice, students develop into responsible professionals. The curriculum, with its projects, internships and final-project assignments offers students many opportunities to do so. The professional field is closely involved in the development and implementation of the curriculum. The education in its turn supports the developments in the professional field by conducting applied research. Students work together with the profession field on current social issues. Collaborative learning and innovation are explicitly encouraged.

2 Flexible learning I In the wide variety of professions and disciplines that characterize the Built Environment domain, students develop into responsible, curious, and critical professionals. They develop their talents as designers or managers, specialists, or generalists, and shape their own profile as T-shaped professionals*: monodisciplinary, interdisciplinary, or multidisciplinary. Flexible learning transcends the boundaries of time and space, context and discipline.

3 Inclusive learning I Students are invited to study together with students from other backgrounds. The strong social cohesion between students and lecturers is the basis for a safe and powerful learning environment, in which students feel at home, are able to develop their talents and can develop into stable professionals who work well with other disciplines within an international and intercultural context.

4 Transition Learning I Students prepare for the urgent and accelerating transition. Innovative thinking and proactive action, responding to changing situations, leadership and readiness for change are important characteristics for effective action within themes such as the circular economy, digitalization, climate adaptation, sustainability, energy transition and quality of life. Students contribute to the acceleration of these transitions.

The four pillars of learning are inextricably linked to the competences. Programmes integrate the competences into their curricula, thus giving substance to the four pillars of learning.

Starting points for the competences

The competences define the knowledge, skills and attitude that graduates must possess in order to successfully commence their profession. As such, they form the final qualifications within the domain profile. The domain profile has a sustainable character, so it's recognizable and relevant to both existing professions and professions yet to be developed. This is why the descriptions of the competences are general in nature. In order to speed up the reading process and increase understanding, the competences are described in a uniform way. A description of a competence contains at least the following components [Leeuwen, 2012]:

1 The description of the action using a verb that expresses an action;
2 The result as a consequence of the action (professional product*). Also called the objective of the action;
3 The effect of the action (leads to satisfaction of those involved in the professional situation. Is therefore of the right level and has the required quality).

Competences do not describe what you are capable of. They describe what you do in a professional situation and how well you do it. They refer to a process. Not to a linear process but to an iterative, cyclic process of innovation and development.

Institutions can design the curriculum and the learning environment as they see fit, as long as they meet the standards of the accreditation system of the Accreditation Organisation of the Netherlands and Flanders (NVAO). The professional field must recognize itself in the terminology used. After all, it's important for employers to know what someone with a bachelor's degree has to offer as a future employee.

The competence set is now as follows:

1 **Initiate** | You identify, analyse, and define an issue or task relevant to society and/or the profession. You formulate the context, the preconditions, the requirements, and the objective, so a well-founded and well-defined decision can be taken, or an action can be initiated.

2 **Design** | You develop a future-proof solution based on various perspectives and a project definition, a process, frameworks, guidelines and/or requirements. You justify your approach, weigh alternatives, and substantiate your choices. In doing so, you always take into account the wishes of the stakeholder(s), social developments and the consequences during the realization, use, management, and demolition.

3 **Specify** | You work out the chosen solution in detail from an integral approach, taking into account preconditions and other disciplines. Your solution meets the requirements and is technically, legally, and economically feasible, as well as socially responsible and inclusive. Your solution is ready to be realized and the relationship between the parties involved is specified.

4 **Implement** | You make the necessary preparations for the implementation of the intended solution. You perform all actions necessary for implementation and ensure that the result demonstrably meets the specification.

5 **Manage assets and data**| Maintaining the quality of objects on, in and below the living environment, taking into account their social consequences in the short and long term. You set guidelines and requirements for the efficient control of these objects. You acquire digital and analogue research, design, and monitoring data, process it, and archive it in such a way as to make it sustainable, accessible and in line with (inter)national standards, so the performance of the objects can be adjusted.

6 **Manage projects and processes** | You manage and facilitate the process/project with the aim of creating value. In doing so you ensure active communication and relevant management information. You oversee the complexity of the process and intervene if necessary. You adequately deal with risks and clarify and monitor the interests of all people and parties involved. Upon delivery, you check whether the end result is satisfactory and, if necessary, you start a new cycle.

7 **Research** | You formulate and validate a research question based on a task that is relevant to society and/or the profession. You choose one or more methods, collect data, and analyse it in order to provide a substantiated answer to the question. You report on all activities, data, and findings in such a way that they are reproducible.

8 **Communicate** | You communicate in a purposeful and target-oriented way. You are aware of the environment and your role and position in it. You are focused on interaction and cooperation, and contribute to knowledge and opinion formation and/or decision-making.

9 **Professionalize** | You consider your own actions and their results and show that you learn from them. You take a critical view of the professional culture and the ethical and social standards of the profession and develop a good image of your personal and professional identity. You are aware of the effect of your actions on your professional environment. You are valued as a professional.

Additional positioning with extra competence

With these nine competences, the profile of the engineer for the Built Environment is complete. Within the Built Environment domain, individual universities of applied sciences or one or more of their specific programmes are free to add an extra competence and take the opportunity to uniquely position themselves that way.

Competence points and standardization

To enable the definition of the desired final level of a competence, three levels are distinguished[1]: levels 1, 2 and 3. Each level has three aspects: nature of the task, nature of the context and degree of independence, see Table 1. To achieve a level for a competence, at least two of these three aspects should be present at the level to be ssessed. The level at which students demonstrate their competences depends on their degree programme, specialization and final-project topic. As soon as students demonstrate their competences at the final level defined by the specific programme they have chosen, they qualify for the diploma. The flexible learning pillar makes it possible for both students and the programme to realize their own ambitions and to deepen their competences and levels. Where possible, individual students take on this responsibility themselves.

Each Bachelor's programme in the Built Environment domain describes the competence profile for its own programme and the final level in the domain competences. The final level is expressed in so-called competence points. With level 1, students earn one point, level 2 provides two points and level 3 gives them three competence points. Thus students can obtain a maximum of 27 competence points for the nine domain competences together (9 competences x 3 levels). To be awarded a bachelor's degree, students need to have achieved at least 23 competence points across all nine domain competences. Thus, they cannot omit a domain competence. The minimum final level is therefore always level 1. If a 10th competence is added, the total number of competence points is at least 25.

In the same way, a sum of at least 12 competence points has been established for the Ad programmes. In view of the nature and profile of the Ad-programme level, the requirement to demonstrate at least level 1 in each competence has been dropped.

Table 1 Description of the competence levels on the aspects task, context, and independence.

Level	Nature of the task	Nature of the context	Degree of independence
1	• Simple • Structured • Fits familiar methods	• Known • Simple • Mono-disciplinary	• Controlling supervision
2	• Complex • Structured • Uses familiar methods in changing situations	• Known • Complex • Mono-disciplinary • In practice	• Coaching supervision
3	• Complex • Unstructured • Handles methods in new situations	• Unknown • Complex • Multidisciplinary • In practice	• Independent • Supervision if needed

1 To determine the level of final qualifications for the programmes in the Built Environment domain, a system based on international and national degree programme standards was used.

The ten focus areas

The professional field experiences competences without focus areas* as too general and not sufficiently recognizable. By splitting the final qualifications into competences and focus areas — which are, in fact, the professional contexts — they have become more concrete. This way, the business community as well as students get a better idea of the programmes in the Built Environment domain and their differences in emphasis.

The focus areas can form a structure for the Body of Knowledge and Skills (BoKS)* of the Built Environment domain. In its periodic national consultation, each core curriculum* makes agreements on the focus areas based on current insights. Subsequently, the universities of applied sciences are free to fill in these focus areas, in consultation with their own professional field committee* and other degree programmes nationally. The focus areas thus gain in content and significance for the degree programme. In practice, this also leads to differences between programmes of different universities of applied sciences, which they can use to uniquely position themselves.

The programmes in the Built Environment domain include many disciplines. Together they have a broad palette of knowledge and skills at their disposal. This requires a clear and recognizable classification. The commonly used layer approach forms the basis of the ten focus areas. It allows room for the technical and physical dimensions of the subsurface (water, soil, and environment), networks (infrastructure and mobility) and occupation (buildings and technology). The creating context of the Built Environment

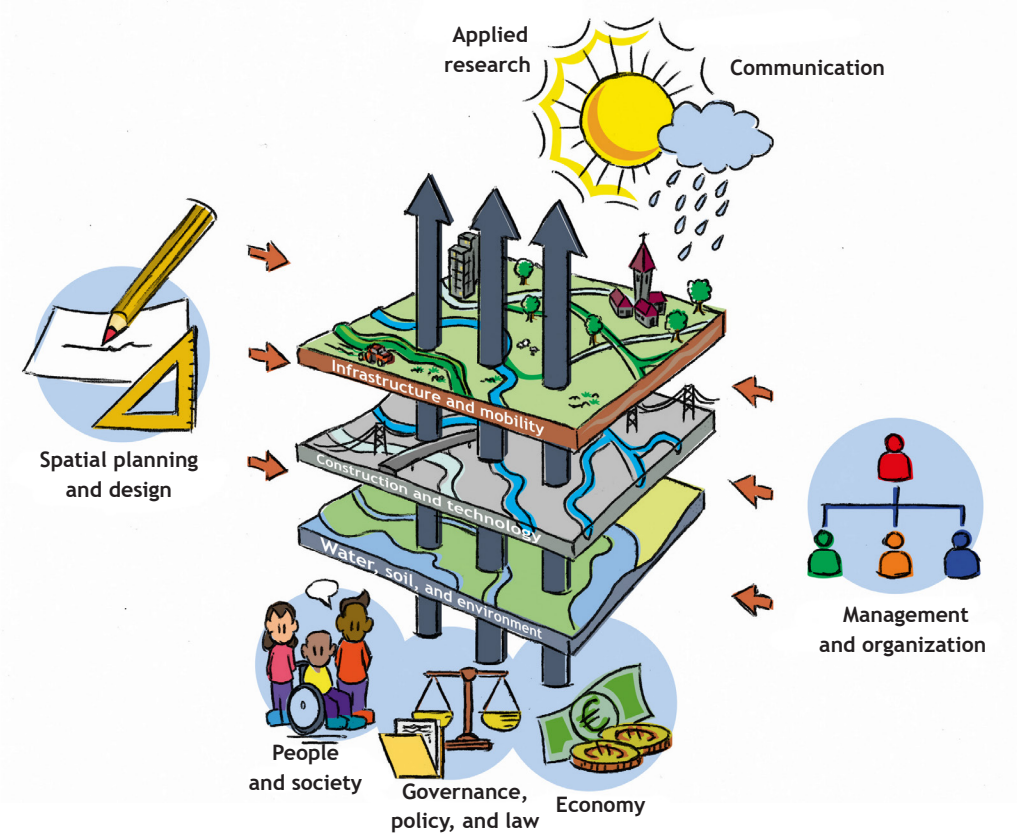


Figure "Water based" planning of space. Deltares, BoschSlabbers & Sweco (2021), re-edited by Bart Hartman

domain is characterized by Spatial Planning and Design. This precedes the design of the three layers. The human scale and the social context come together in the three focus areas People & Society, Governance, Policy and Law, and Economy. These focus areas form the links between the technical-physical space and society. The defining qualities of higher-educated professionals lie in the focus areas of Applied Research, Communication and Management and Organization. These clarify, connect, change, slow down or accelerate. And facilitate.

The ten focus areas listed below can be arranged in the main categories of methodology (1), technical-physical aspects (2, 3 and 4), economy and society (5, 6 and 7) and the professional bachelor (8, 9 and 10).

1 Spatial planning and design
2 Water, soil, and environment
3 Infrastructure and mobility
4 Construction and technology
5 People and society
6 Governance, policy, and law
7 Economy
8 Applied research
9 Communication
10 Management and Organization

Appendix 1 briefly describes the focus areas.

Porta Susa station in Turin, an example of green technology: the solar panel structure is integrated into the glass roof.

From a general framework to specific study programmes

Bachelor programmes

The graduated professionals of the seven bachelor's programmes in the Built Environment domain have the following in common: they are broadly and deeply oriented (have technical, political, and social insights), are familiar with important developments within the domain and are cooperation-, market-, solution- and result-oriented. They have a proactive, flexible, and stimulating attitude and an eye for the roles and responsibilities of stakeholders and decision-makers. They think outside the box and approach complex issues with a critical and inquisitive attitude. They work with advanced computer tools and techniques on integral, sustainable, and future-proof issues. They have social and communicative skills, are customer- and environment-focused, proactive, innovative and are widely employable. They are aware of the impact on the public living environment and have an eye for administrative and political processes.

Archaeology

The Bachelor's programme of Archaeology educates students to become archaeologists in the domain of Construction & Space. Archaeologists approach heritage research with a broad (interdisciplinary) view. As generalists, they play an important role in carrying out archaeological and cultural-historical research, heritage management and policy within the prevailing legal framework. Archaeologists know the technical, organizational and logistical activities involved in researching (archaeological) heritage and carry them out. They have a broad knowledge of archaeological and historical periods and materials, are skilled in analogue and digital acquisition, processing and storage of research data and translate this for a wider audience. In doing so, archaeologists are aware of their social responsibility.

Professional roles | Archaeologist, materials researcher, public information officer, municipal or provincial official, surveyor, GIS researcher.

Professional products | Reports for the AMZ cycle, metadata datasets, excavation plan, area investigation plan, site management, drilling research, archaeological exhibition, spatial analysis.

Structural Engineering

The Bachelor's programme of Structural Engineering educates students to become construction engineers. Construction engineers work in a multidisciplinary context in all phases of the life cycle of a building: from design and construction to operation, management, maintenance and demolition or reallocation.

At the architectural schools in the country, students can specialize further within a graduation topic with specializations such as Architectural Design, Construction Technology, Structural Design or Construction Management.

Construction engineers know the trends and developments in construction - pressure on cost price, customer focus, more intensive legislation and regulation, new forms of cooperation, further digitalization, automation and industrialization, energy transition, making the construction process more sustainable, and the building — and can respond to them.

Professional roles | BIM modeller, design engineer, assistant superintendent, work planner, calculator, quality assessor.

Professional products | SO Sketch design, VO Preliminary design, DO Final design, BIM model, site survey, operation, planning, MJP.

Construction Management

The Bachelor's programme of Construction Management educates students to become all-round managers. All-round managers have an understanding of construction engineering and building processes and of commerce, economics, organization, communication and management. The focus is on the implementation of construction work for a construction company or a construction-related consultant. The programme strikes a balance between immediate applicability of knowledge and an eye for the changes that will cause tomorrow's professions to be different from today's. The programme is based on three core values: 1. professional/practical 2. inquisitive/curious and 3. responsible/aware.

Typical of all-round managers — and this distinguishes them from structural engineers — is that they mainly look at how things are built and why. The focus is always on implementation and on the future, with an emphasis on business administration and innovation within the construction process.

Professional roles | Junior project manager, assistant, supervisor, environmental manager, construction logistics employee.

Professional products | Planning, site layout, execution plan, budget, contracts, communication plan, UO Execution design, cost-benefit analysis.

Civil Engineering

The Bachelor's programme of Civil Engineering educates engineers who seek integrated solutions to complex technical issues involving various disciplines. These are projects that have an important function in society and contribute to the quality of life and economic development, such as large-scale infrastructure and systems to prevent, drain and conserve water. The programme focuses on the development, design, implementation, and management of these systems in public space.

Students can specialize and tune their profile to hydraulic engineering, water management, infrastructure, geotechnical engineering, building organization & construction technology, and constructions or a mix of these. A civil engineer works for a government organization, a consultancy and engineering firm or a contractor.

Professional roles | designer, structural engineer, work planner, contractor, geotechnical consultant, road builder, hydraulic engineer, systems engineer, BIM coordinator.

Professional products | Requirement specification, Design, model, simulation, construction, plan, specifications, traffic plan, foundation plan, management & maintenance plan, road inspection, risk session.

Spatial development

The Bachelor's programme of Spatial Development educates students to take an integrated and inclusive approach to complex issues, weighing up technical, social, administrative, political, spatial, and economic aspects. The programme has seven variants (in 2021), which vary widely in scope: Construction Management & Real Estate, Climate & Management, Geodesy, Environmental Sciences, Mobility, Spatial Arrangement & Planning, and Urban Design. What these programme variants have in common is that they take a broad, integrated view of spatial developments and look for the connections between them.
In order to be able to connect, the professional must be able to discuss a variety of subjects. The degree programme gives universities of applied sciences the scope to focus, in specifying the profile, on training either pure generalists or specialists with sufficient content mastery to play a connecting role.

Professional roles | Property manager, project developer, geodesist, traffic consultant, spatial designer, urban planner.

Professional products | Evacuation plan, risk analysis, traffic policy plan, feasibility study, urban development plan.

Stoofbrug in Amsterdam, a 3d-printed bridge, source Wikipedia

Water management

The Bachelor's programme of Water Management educates students in the field of delta technology to become integral water managers. In an international, multidisciplinary context, they are responsible for sustainable, climate-resistant water management and the development of safe, liveable, and vital delta regions all over the world. Water managers focus on river basins, water systems and the water chain, and their relationship with the desired uses of delta areas. Water managers devise technically, economically, and socially feasible solutions from a hydrological, physical, chemical, ecological, spatial and/or administrative perspective and can implement these solutions spatially.

Professional roles | Water manager, policy advisor, dike builder, plan advisor, technical staff member, GIS specialist.

Professional products | Water management plan, GIS map, technical design, climate adaptation plan, design vision, cost-benefit analysis, asset management plan, spatial analysis, hydrological model.

Built Environment

The Bachelor's programme of Built Environment educates students to become broad generalists and 'deep' specialists. The tasks in the areas of living environment, infrastructure and buildings require an integral and inclusive approach. The professionals can therefore act in various disciplines in the built environment as a whole and bring different fields of knowledge together in order to achieve multidisciplinary cooperation.
They are familiar with all phases of the construction process and have no trouble moving around in the administrative, political, and social force fields associated with the built environment. Each university of applied sciences can compile its own profile for this purpose on the basis of the variants of the six programmes discussed above.

Professional roles | BIM modeller, project manager, geodesist, GIS expert, sustainability consultant, planner, construction site manager, architectural draughtsman/modeller, renovation consultant, area manager for housing corporations, asset manager, construction cost expert, technical commercial employee.

Professional products | Design, environmental management plan, feasibility study, advice (architectural, planning, mobility, circular, etc.), asset management, renovation plan.

Associate degree programmes

Associate degrees were introduced in the Netherlands in 2006. They are two-year higher professional education programmes at level 5. They bridge the gap between the level of senior secondary vocational education (level 4) and the bachelor's level (level 6). The strength of Level 5 lies in its connection. The graduate forms a crucial link between the mbo-4-trained employees with a profession specifically focused on the operational level and the bachelor-trained employees who think more on a tactical and strategic level.

Ad graduates are unique and capable of translating tactics into concrete actions on the work floor. They are also familiar with the operational tasks to be carried out and are able to make the connection to the strategic level. In doing so, they link thinking to doing. The seven Ad programs are organized in a national consultation body. They are described below.

Ad Construction

The Ad programme of Construction Engineering educates students to become construction professionals at hbo level 5. Ad professional engineers work in a multidisciplinary context, at an operational level, in all phases of the life cycle of a building: from design and construction to operation, management, maintenance and demolition or conversion. At the national architecture courses, students can specialize further within a graduation topic with specializations such as Building Technology, Construction Management and Construction Execution.

Ad construction engineers know the trends and developments in construction — pressure on cost price, customer focus, more intensive legislation and regulation, new forms of cooperation, further digitalization, automation, and mechanization, making the construction process and the building more sustainable — and can respond to them.

Professional roles | (BIM) modeller, assistant superintendent, junior superintendent, work planner, calculator.

Professional products | Construction site layout, construction drawings, BIM model, execution schedules, price comparisons, preservation proposal.

Ad Integral Construction Management

The Ad programme of Integral Construction Management educates students to become professionals in construction or civil engineering. Civil engineering relates to ground, road and waterway construction and infrastructure technology. Construction covers all aspects of the construction world, from design to implementation. The programme trains professionals who can work together in the construction chain and use the latest ICT applications in the construction chain.

Professional roles | Superintendent, assistant project manager, technical construction/infrastructure designer, specification writer, calculator, cost expert, work planner.

Professional products | Elaboration of technical construction and civil designs, detailing of parts of constructions, 3D models and their management in a BIM environment, calculation and preparation, supervision of the implementation of the construction work.

Ad Built Environment

The Ad programme of Built Environment trains students to become professionals with a broad basic knowledge of the Built Environment. BE professionals work on practice-oriented, sustainable solutions for concrete challenges in the Built Environment and make these solutions operational for the doing the actual construction work every day.

Students mainly acquire coherent, practice-oriented knowledge and skills in the field of spatial and real estate development, architecture, and civil engineering, which they apply in their work for governments, housing corporations, project developers, construction and civil engineering companies, and architectural and consultancy firms.

Professional roles | Employee in spatial development, property development, with architectural and consultancy firms and in executive building and civil engineering.

Professional products | land and development exploitation, spatial analysis and vision, area design, permit application, (partial) design and partial elaboration construction and civil, planning, budget, and project preparation.

Ad Construction Management

The Ad programme of Construction Management educates students to become BIM modellers and planners, two crucial and central functions in the construction process. Construction managers play a key role in both the design and preparation phases. They not only elaborate the designs from a construction engineering point of view using the knowledge and insights gained in construction studies, business administration and building physics, but also coordinate and organize the preparatory phase in such a way that the execution proceeds smoothly. During the course, students are also introduced to other roles such as that of structural engineer, project organizer and consultant, thus acquiring knowledge and experience of all aspects in the chain.

Professional roles | BIM modeller, work planner.

Professional products | 3D model BIM, model control & clashes, procurement schedules, work instructions, construction planning, budget, building code review.

Ad Building Services Technology (GGIT)

The GGIT Ad programme educates students to become engineers or project managers in installation technology. There is a great demand in the installation technology sector for modern trained employees who are aware of the place of the installation sector in the chain. Installations are less and less stand-alone systems and interact with the physical qualities of the building. Today's installers are therefore system integrators. Graduates bridge the gap between the shop floor and R&D specialists. Based on existing systems, they optimize applications, discuss them with contractors, users, and technical specialists, and subsequently make a technical installation design according to a strict step-by-step plan.

Students who wish to continue studying after completing the Ad GGIT can opt for Bachelor of Electrical Engineering, Mechanical Engineering or Bachelor of ICT.

Professional roles | engineer installation technology, project manager installation technology.

Professional products | Installation engineering design, commissioning of installations

Ad Construction employee

The Construction Technician Ad programme educates students for essential construction jobs. Technical construction employees are strong in the execution. They also play an important role in the preparation and implementation of construction projects. During their studies and on the job, students acquire not only technical but also generic competences that enable them to justify the choices they make. Building technicians bridge the gap between theory and practice, between management and the shop floor and between (technical) specialists. They translate the client's request into a construction solution, taking into account the environment and users' health. Sustainability is a core theme in the training.

Professional roles | Work Planner, Superintendent and Estimator.

Professional products | Construction solution, implementation plan, budget, cost calculations.

Ad Civil Engineering Project preparation and implementation

The Ad programme of Civil Engineering Project Preparation and Implementation trains students to become civil engineers with an understanding of sustainable infrastructure. Students combine their studies with practical work. They apply the knowledge they have gained during their studies in drawing up and elaborating civil engineering management plans or designs directly in their work in preparing civil engineering projects and redevelopment and transformation projects. They always take sustainability aspects into account in their work.

Professional roles | Engineering manager, work planner, junior advisor, assistant project manager, drafter.

Professional products | Project preparation, drawings, implementation plan.

Appendix 1 Focus areas

The ten focus areas as formulated in the context of the Domain Profile form the content and context by which and within which the student works. The ten focus areas are briefly described below. Attention is paid to both content and situation, knowledge and area of application, professional field and working environment.

The descriptions provide structure and coherence in the implementation of the curricula. The descriptions are emphatically open collections and outline a stable and abstract framework for the longer term. They provide insight into integration in the chain, with an eye for tradition and transition.

The BE student pays attention to:

1 Spatial planning and design | the way our living environment is designed. The focus is on knowledge of spatial structures, typologies, and arrangements, and on how these can be analysed and visualized. This knowledge is used to create visions, strategies, processes, and designs for the living environment. Attention is paid to design methods and techniques, such as an integral design approach and participatory design.

2 Water, soil, and environment | understanding the physical, natural subsurface and its management both inside and outside built-up areas. The focus is on the relationship between climate, ecology, landscape, soil, and man both in the present and in the past, and the implications this has for the future. Water and subsoil determine choices that are made within the domain and, conversely, these choices influence water and subsoil. Knowledge of water and soil management, including soil and water quality, forms the basis for policy. Knowledge of geotechnics and soil science, among other things, is the basis for implementation. The context includes the world of government, politics, and science.

3 Infrastructure and Mobility | the world of waterways, highways, traffic, and transport, as well as infrastructure for water, sanitation, energy and data. The focus is on the design, improvement, construction, management and maintenance of roads, waterways, rails, pipelines (GWL), sewers, sanitation, communication networks and cables. Stakeholders include engineering firms, road builders, traffic engineers, consultants, government agencies and politicians, travellers' organizations, and interest groups.

4 Construction and technology | the way buildings and structures are constructed in the present, past and future. The focus is on the materialization, construction and building physics of buildings and structures and the techniques used to conserve, build, manage, transform, or dismantle/demolish them. There is also attention for traditional and industrial construction, the building process, safety, chain integration, logistics and building information model (BIM), energy transition and circularity.

5 People and society | the end user, the people in society. The focus is on quality of life, sustainable use, and life-cycle-friendly functions of buildings, structures and public spaces. Lifestyle and desired behaviour determine the choices to be made in new buildings, redevelopment, or demolition. Social and societal themes influence these choices in design and implementation. Environmental impact assessments and community management provide clarity and transparency. Attention is paid to the TCO (total cost of ownership) of all stakeholders, now and in the future. Technical solutions, human behaviour and political choices play an important role here.

6 Governance, policy, and law | the administrative organization and its mechanisms. The focus is on the development, implementation, and enforcement of policy. Attention is paid to the development of laws and regulations, (building) codes and the implementation of these laws and regulations in application and enforcement. Modern commissioning such as Design, Construct, Maintain and Repair also has a number of legal aspects to which attention can be paid.

7 Economy | the development of value in the living environment from a broad and sustainable perspective. The focus is on financing, feasibility, costs and benefits, entrepreneurship, and marketing on the scale of a building or structure. On the scale of the district, city and region, attention is paid to macro-economic aspects, social and spatial economics.

8 Applied research | solving a problem with the correct application of research methods and techniques. The object or problem to be researched comes from society and/or the practice of the professional field. The objective of research can be, for example, finding solutions or increasing knowledge. Attention is paid to the way in which both the problem definition and the research itself relate to the broader (social) context.

The focus is on both a specific (unique) situation and the application of knowledge from one's own and other disciplines. When setting up and carrying out research, its reliability and validity are considered in such a way that the research is reproducible (Open Science). The methods and techniques used determine the general or specific validity of the results and are related to the desired degree of participation and social relevance.

9 Communication | various methods and techniques in communication, paying attention to written, visual and oral skills, as well as to the more generic communication strategies and campaigns relevant to informing stakeholders. The focus is on both the communication carriers (texts, visuals, videos, renderings, audio), and the communication channel (social media, press, speaking engagements) and the communication strategy.

10 Management & Organization | the distribution of tasks and authorities in the social context, aimed at productive cooperation in projects or processes. When designing systems and processes, future management of data, objects and human effort is taken into account. Attention is paid to influences from outside one's own direct context and the (possible) impact of these on the project or process, such as logistics, social processes, and digitalization.

Appendix 2 Glossary

Associate degree programme An associate degree programme is a 2-year higher professional education programme that is often developed in cooperation with senior secondary vocational education (mbo) and the professional field. The graduate level of the associate degree is EQF level 5.

BoKS The BoKS is the Body of Knowledge and Skills. It is the collection of knowledge components and skills that students must acquire during their education in order to become competent to perform a role in their professional field.

Core curriculum Degree programmes registered under the same CROHO number have the same core. A core curriculum consists of all programmes with the same CROHO* registration number.

Competence Students are competent if they are able to act appropriately in their workplace. A competence describes the behaviour that they can show in a certain situation. This behaviour shows that they have the required knowledge and skills.

CROHO Central Register of Higher Education Study Programmes. This register includes all higher education programmes funded by the Ministry of Education, Culture and Science.

Domain profile Built Environment The domain profile is a national framework document and describes the final qualifications for graduates of Dutch higher professional education (hbo) programmes in the Built Environment domain. Degree programmes base their own programme profile, learning outcomes*, learning objectives and curricula on this. By linking the own programme profile to the generic domain description, the content and final level of the programme are assured.

Final qualification Also called starting qualification. The minimum level that students must have attained in order to enter the labour market adequately equipped and to be able to develop further during their professional career.

Focus areas A focus area is the context in which the professionals work. Here, the competences they possess become visible. Together, the ten focus areas provide a good overall picture of the world of the Built Environment domain. They include technical-physical, socio-economic, social, methodological, and professional aspects.

Learning outcome Work/study and part-time students always demonstrate their competences in their own professional context. This makes it possible to test and assess independent of the learning pathway. To ensure that students learn the right things, both the desired professional behaviour at higher professional education level and the professional tasks and evidence to be provided are described in a recognizable and durable way. The descriptions leave enough room for variation in practical situations and methods. Such a description is called a learning outcome.

Professional field committee Also called professional field advisory committee or work field advisory committee. The committee is composed of representatives of the professional field and one or more representatives of the programme or a broader faculty that the programme falls under. The committee meets at least twice a year and advises the study programme on the quality and content of the curriculum and identifies new developments in the professional field that are relevant to the education.

Professional product During their education, students are given assignments and problems (professional tasks) that originate from or are at least related to their future professional field. In order to solve such a problem, they set to work in the most professional way possible. The product (physical product or service) that results from this is called the professional product. Examples are: a treatment plan, a chemical analysis, a business case, a sensor technology, policy advice. What a professional product is and which quality requirements it must meet, is always determined in consultation with the professional field. This is often done in the Professional Field Committee*.

Root programme Programmes with the same CROHO* registration number belong to the same root and are called root programmes. A root includes all programmes with the same CROHO registration number.

T-shaped professional
The T-shaped professional has specialist knowledge in his own field (the vertical leg of the T) and is able to look beyond the borders of his own field and make connections (the horizontal leg of the T).